Sept. 22, 1936. C. B. DREYER 2,055,215

METHOD OF PRODUCING COMBINED SOUND AND PICTURE FILMS

Filed Oct. 12, 1935

Fig. 1

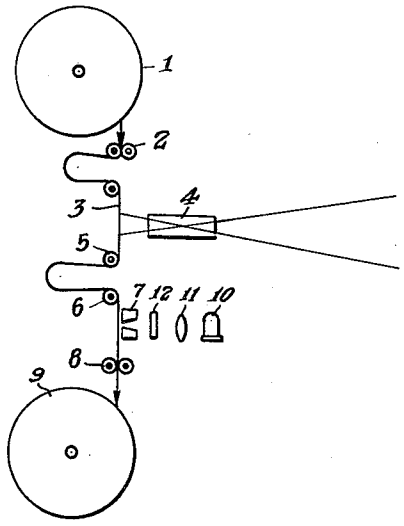


Fig. 2

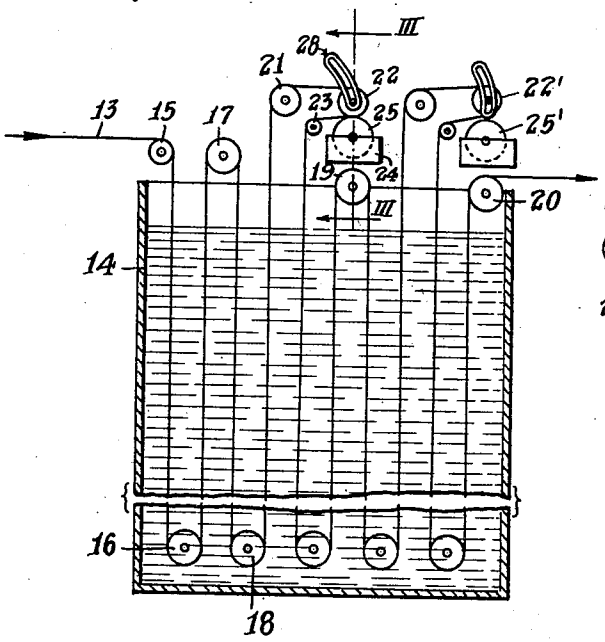
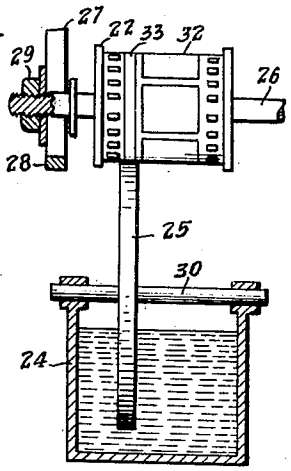


Fig. 3



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METHOD OF PRODUCING COMBINED SOUND AND PICTURE FILMS

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3 Claims. (Cl. 95—88)

This invention relates to the art of producing films adapted for use in cinematography, said films bearing thereon pictorial representations and sound adapted to accompany said pictorial representations. The invention is particularly directed to a method whereby a film bearing latent images of pictures and sound in adjacent longitudinally extending portions thereof may be handled during development in a facile and efficient manner, to the effect that the pictorial representations and the sound record are simultaneously developed to the desired extent without the necessity of separately photographing the pictures and separately recording the sounds and then separately and differently developing the two films.

It has been pointed out in the Vogt et al. Patent No. 1,825,598, that photographic pictorial representations require one type of developing solution and one type of developing treatment while photographically recorded sound requires another and different type of development. In accordance with the Vogt et al. patent, it is necessary to record pictures and sound adapted to accompany the pictures simultaneously but upon different and separate lengths of film. These two separate records of pictures and sound are then separately and differently developed and the two negatives thus made are then printed upon a single piece of positive film.

The present invention obviates the necessity of recording the pictures and accompanying sound on separate and different lengths of film, thereby permitting a great saving in cost of negative film. Moreover, the present invention permits a film bearing latent images of sound and of pictures to be passed through a single and common bath of developing solution so that it is not necessary to employ separate and distinct developing machines nor subject sound recordings to one type of development whereas the picture recordings are subjected to another.

It is an object of this invention, therefore, to disclose and provide a method whereby a film bearing latent images of both pictures and appropriate sound may be subjected to the action of a developing solution without sacrificing either the pictorial effect or result, or the fidelity of the sound.

In describing the invention, reference will be had to the appended drawing, in which:

Fig. 1 diagrammatically illustrates an apparatus adapted for use in producing a film bearing latent images of pictorial representations and appropriate accompanying sound.

Fig. 2 diagrammatically illustrates a developing tank and apparatus whereby the method of this invention may be placed into operation.

Fig. 3 is an enlarged view of a portion of the apparatus shown in Fig. 2, said view being taken along the plane III—III of Fig. 2.

In developing motion picture films, the strip film is customarily passed through a developing machine, which machine contains the developing solution and passes or pulls the film therethrough at a predetermined rate of speed so that each and every portion of said strip of film is maintained in contact with the developing solution a period of time sufficient to develop the latent pictorial image to the required degree of contrast. Obviously, in the event such strip film bears latent images of both pictorial representations and of sound, the density of the sound image will be dependent upon the developing treatment given to the pictorial image.

Generally stated, the present invention contemplates continuously passing a film through a developing bath in the normal and customary manner, without any pre-treatment, but provides for the application of a development-restrainer (that is, a substance capable of inhibiting, stopping, preventing or markedly slowing down the development of the image) to a desired portion or portions of the film during the developing process, and then continuing the normal passage of the film through the developing solution so as to permit a suitable development of remaining portions of the film. Thereafter, the film is removed from the bath or developing machine, washed, fixed and otherwise treated in the normal manner.

As stated hereinabove, Fig. 1 diagrammatically represents one arrangement of elements whereby pictures and accompanying sounds may be photographically impressed upon a film simultaneously. The unexposed negative film may be fed from a reel 1 between rollers 2 to a film gate or aperture 3 wherein it is exposed to the objects, actors, scenes and the like through the lens 4. The pictorial images are thus impressed upon the film, the film moving intermittently past the gate 3. Thereafter the same film may be passed over rollers 5 and 6 and continuously drawn past a sound recording valve 7 by a continuously driven sprocket 8 from whence the film is collected upon a reel 9. The valve 7 may receive light from a constant source, such as the lamp 10, the light being focused upon the valve or upon the film beyond the valve by means of a lens system, indicated at 11. The valve 7 may be actuated by oscillatory or other currents

supplied by suitable amplifiers, which in turn receive impulses from a suitable microphone or microphones.

The apparatus briefly described hereinabove is adapted for the production of what are generally termed "variable area" and/or "variable density" records. Instead of using the arrangement described, the oscillatory voice currents may be caused to influence the intensity of light emitted by the lamp 10, in accordance with the general manner described by De Forest in "Transactions of the Society of Motion Picture Engineers", May, 1923, pages 61 ff. At all events, the film collected by the reel 9 bears latent images of the scene or picture and of the accompanying sound.

A film thus made may then be passed through a developing treatment or developing machine of the character illustrated in Fig. 2. The negative 13 may pass into the tank 14 over a roller 15 and then pass over rollers 16, 17, 18, etc. in a circuitous path through the solution in the developing tank 14. The rollers 16, 18 and the like may be positioned or suspended in the bottom of the tank whereas the rollers 17 and 19 may be positioned above the solution level in the tank, thereby causing the film to repeatedly move downwardly and upwardly through the solution on its way to a discharge roll 20. In its passage over the various rolls, the emulsion side of the film is preferably kept out of contact with the rolls.

It is to be understood that two or more rolls, such as 16 to 20 inclusive, may be positioned in alignment or on the same shaft so as to cause the film to pass in loops from one series to another. Details of construction need not be shown as numerous developing machines are available and are well known in the art.

It is to be understood that the invention is not limited in its adaptation to any particular type of developing machine. For example, the negative 13 may be pulled through the entire developing machine by means of a take-up, or certain of the rollers may be driven either directly or through friction clutches. The lower rolls, such as the rolls 16 and 18, may either be mounted on fixed shafts or may be simply suspended within the loops of film.

At desired points along the developing tank means are provided for supplying a development-retarding, restraining, or inhibiting substance or solution to a portion of the film. For example, the negative 13 after passing over roll 18 may pass over a roll 21, then over a roller 22, and finally over a roller 23 before again entering the solution in the developing tank 14. The roller 23 may be provided with shoulders which only contact the film at areas adjoining the marginal edges, thereby preventing the emulsion on which the images are recorded from contacting the roller itself.

The roller 22 may be adjustably positioned with respect to a trough or receptacle 24 and a rotatably mounted disc or roller 25, the lower portion of said disc being adapted to extend into a treating agent or solution carried by the trough or receptacle 24. The roller 22, for example, may be journaled upon a shaft 26 extending through a slot 27 formed in a fixed arcuate member 28, said shaft 26 being adjustably positionable at various points in the slot 27 by means of a lock nut 29 threadedly engaged with the end of the shaft 27. The roller 22 is then journaled on the fixed shaft 26. It will be obvious that the roller 22 may be selectively brought into substantial contact with the disc 25 journaled on the shaft 30. In Fig. 2 the roller 22 is shown in such position that the film passing thereover is brought into contact with the disc 25 whereas the roller 22' is in raised position so as not to contact the roller 25'.

The troughs or receptacles 24 are provided with a development-restraining, inhibiting or stopping agent. Numerous such restrainers are available. Substantially any and all alkaline salts of citric and other weak acids may be used, such as, for example, sodium citrate, potassium citrate, sodium acetate, ammonium phosphate, and the like.

Solutions containing sodium or potassium iodide and/or bromide of sufficient acidity to neutralize the developer may also be employed. The following are given as specific examples of restraining solutions suitable for this purpose:

(1)—A solution containing 5 grams of potassium bromide and 3 grams of potassium ferric cyanide per thousand cc. of water.

(2)—A solution containing 10 grams of potassium iodide and 0.5 cc. of glacial acetic acid per thousand cc. of water.

(3)—A solution containing 5 grams of potassium iodide, 10 grams of potassium bromide, 10 grams of sodium citrate and sufficient acid to neutralize the developer, per thousand cc. of water.

The last-mentioned restraining solution is almost instantaneous in its effect.

It is to be understood that the disc or discs 25 are of sufficient width to contact with the emulsion side of the film over those areas on which it is desired to restrain or terminate development. When, for example, a film containing both pictorial and sound images or records is being passed through the developing machine and it is desired to terminate or restrain development of the sound track at the point reached when the film is passing over roller 22, then said roller 22 is lowered so as to bring the emulsion side of the film into contact with a disc 25, said disc 25 being so positioned with respect to the roller 22 and of such width that its edge portion contacts with the side track only of the film. Such relationship is indicated in Fig. 3, the pictorial record carried by the film 13 being indicated at 32 and the sound track at 33. The disc 25 may be either rotated by positive means (as, for example, by having said disc mounted on a shaft 30, such shaft positively driven) or rotation of said disc 25 may be imparted by frictional contact with the moving film. Since the edge of the disc in the lower portion of its travel is immersed in the restraining solution within the trough 24, a quantity of such restraining solution is carried by the edge of the disc 25 and transferred to the film at the point of contact, between said disc edge and the film. Such contact permits the restraining solution to become absorbed by the emulsion and restrain or terminate further development. The film thus treated may pass over the roller 22 and again be subjected to the developing solution within the tank 14 in the normal manner, such further development affecting only those areas which had not been treated with the restraining solution.

It will be obvious to those skilled in the art that the above described method will permit the operator to supply a restraining solution to desired portions of the film at any desired point of development. If, for example, it is believed desirable to restrain the development of the sound track at a late stage in the development of the

entire film, then the roller 22 may be elevated so as to prevent contact of the film with the disc 25 and the roller 22' may be depressed so as to bring the film in contact with the disc 25' at the later stage of development.

Moreover, it is to be understood that the development of the picture area may be retarded or restrained while the sound track is permitted to pass through the developer without the application of restraining solution. As a further modification, the restraining solutions may be applied to both sound track and picture areas at differing points in the travel of the film through a standard developing solution. Great flexibility of control is thus permitted and any desired result may be attained by the judicious application of the restraining or inhibiting solutions.

It is also to be understood that the mode of operation described hereinabove is not limited to original negative films on which latent images of pictorial representations and of accompanying or appropriate sounds have been simultaneously formed. The mode of procedure is applicable to positive films in their undeveloped stage. Moreover, the sound may be recorded upon or printed upon a film bearing latent images of pictorial representations at a time subsequent to the actual taking of the pictures. The sound may be printed or recorded upon previously unexposed areas of a film exposed to pictures only from a record made either before or after the photographing of the pictures took place.

In certain instances it may be desirable to apply a restrainer to portions of a film bearing latent images prior to contact of the film with a developing solution during the recording of the sound. For example, a light composed essentially of the violet and ultra violet rays may be used as by the insertion of a suitable light filter 12 in the recording system shown in Fig. 1. By the use of shorter wave lengths, the latent image is formed only in the outer layers of the emulsion. A restrainer is then applied to the sound track prior to development in any suitable manner as, for example, by means of a device similar to that herein disclosed, said restrainer being applied in amount sufficient to retard the development partially only.

The treated film may then be passed through the developing machine and at an appropriate or desired point further restrainer may be applied to the sound track.

In all instances, the invention contemplates an application of restrainer in amount sufficient to permit the sound track to develop a desired degree of contrast (commonly termed "gamma") at a point in the development of the film prior to the development of the desired degree of contrast in the picture areas. In this manner, further development of the sound track may be terminated at any required point by the operator without interfering with the normal and most effective development of the pictures.

It may be noted that fixing of film treated in accordance with this invention may be somewhat retarded as the result of the use of potassium iodide. By adding ammonium chloride to any acid fixing bath, the fixing time may be expedited and thereby brought up to the normal speed.

I claim:

1. In a method of producing a combined sound and picture film, the steps of continuously passing a strip film bearing latent images of pictorial representations and of sound through a developing bath, applying a solution of chemical development-restrainer to a desired portion of the film while said film is passing through said bath and is undergoing said developing treatment, whereby said agent is absorbed by said desired portion of said film, continuing the developing treatment until the remaining portion of the film is suitably developed, and withdrawing the film from the bath.

2. In a method of producing a combined sound and picture film, the steps of forming a latent image of pictures and a latent image of sound recordings to accompany the pictures upon adjacent longitudinally disposed portions of a single film, subjecting said single film to the action of a developing solution, and impregnating a longitudinally disposed portion of the emulsion side of said film with a solution of development-restraining agent prior to the complete development of the remaining portion of said film.

3. In a method of developing films bearing latent images of pictorial representations and of sound in substantially adjacent longitudinally extending portions, the steps of subjecting said film to the action of a developing solution for a period of time sufficient to develop said latent image of sound to the desired extent, then impregnating portions of said film bearing said sound recording with a solution of development-restraining agent, and continuing the development of said film for a length of time sufficient to develop said pictorial representations to the desired degree of contrast.

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