

May 21, 1935.

O. A. ROSS

2,002,188

METHOD AND APPARATUS FOR FORMING SOUND MOTION PICTURE RECORDS

Filed Aug. 17, 1929

2 Sheets-Sheet 1

Fig. 1.

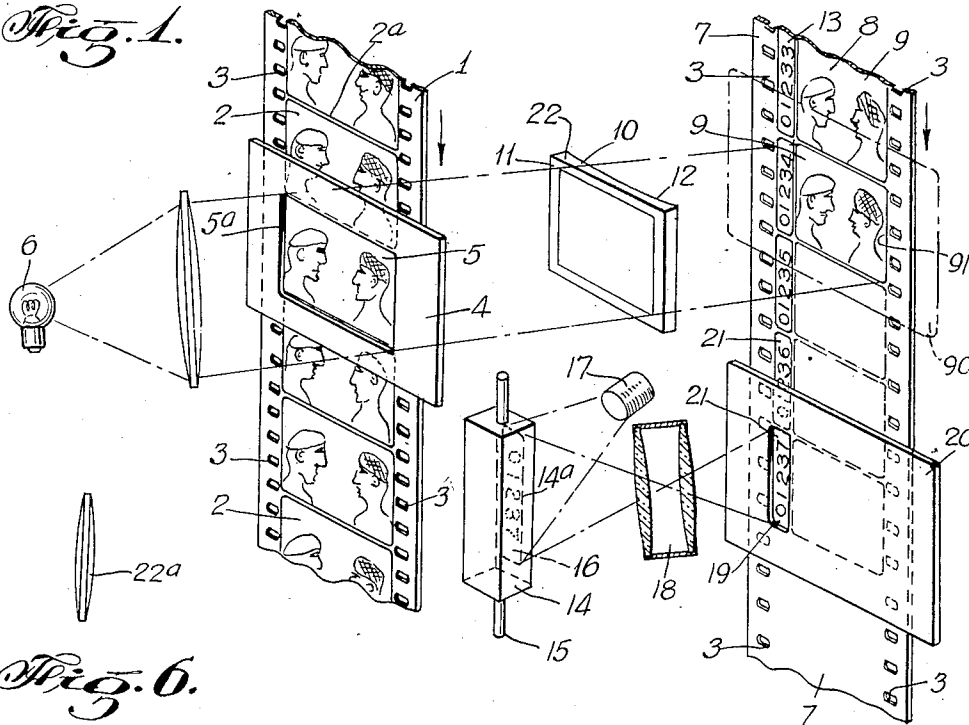


Fig. 6.

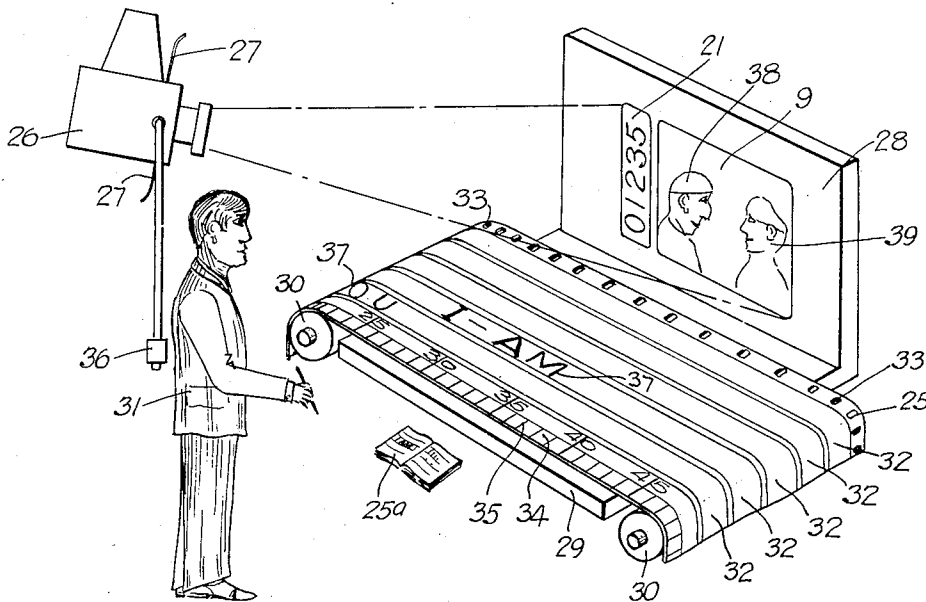


Fig. 2.

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2 Sheets-Sheet 2

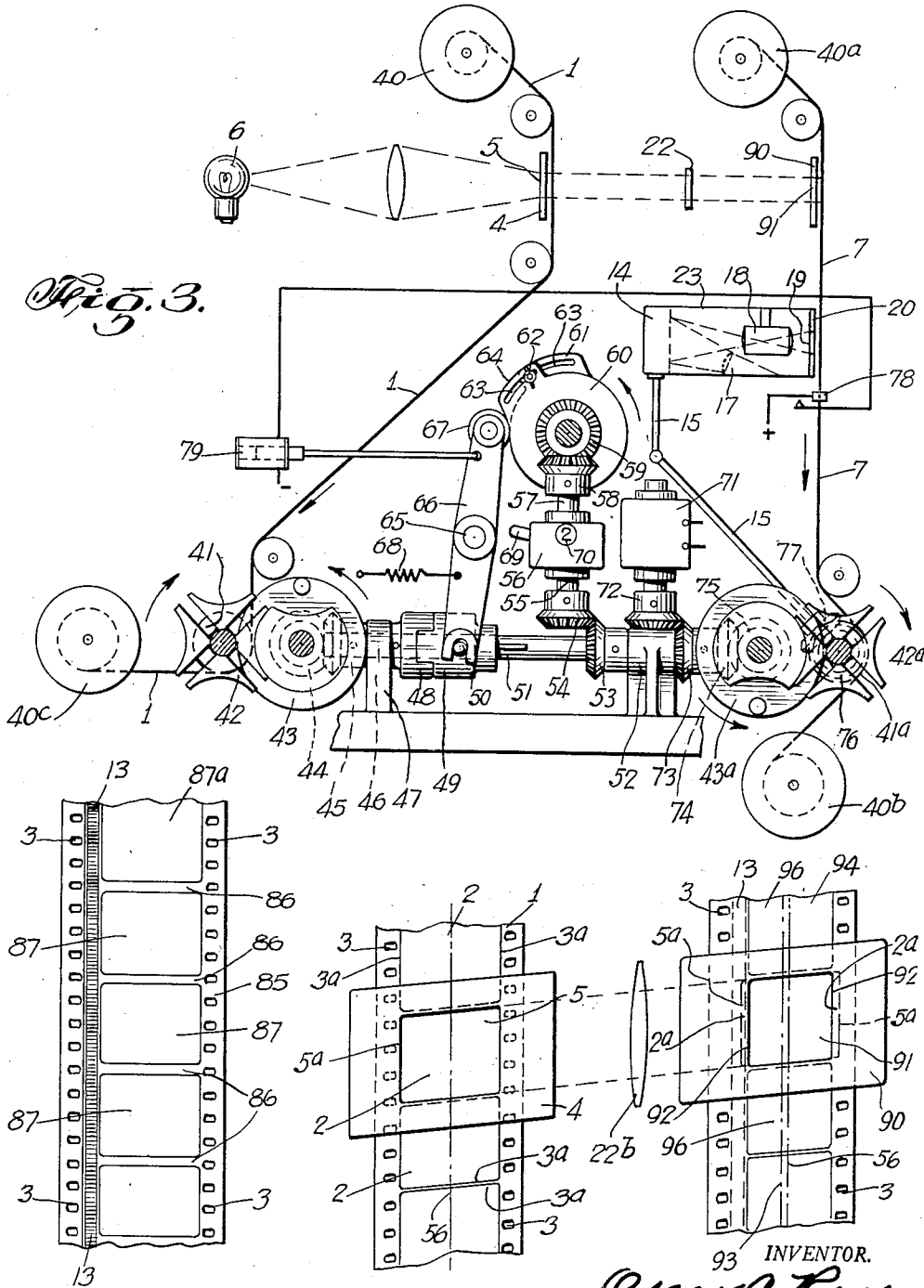


Fig. 3.

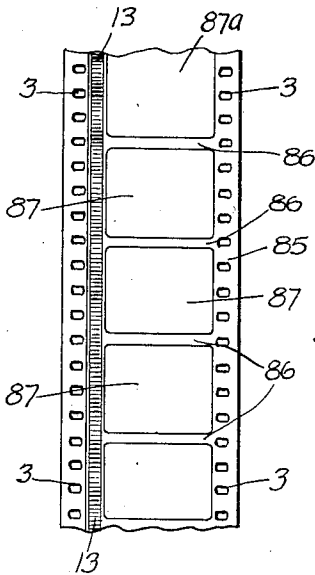


Fig. 4.

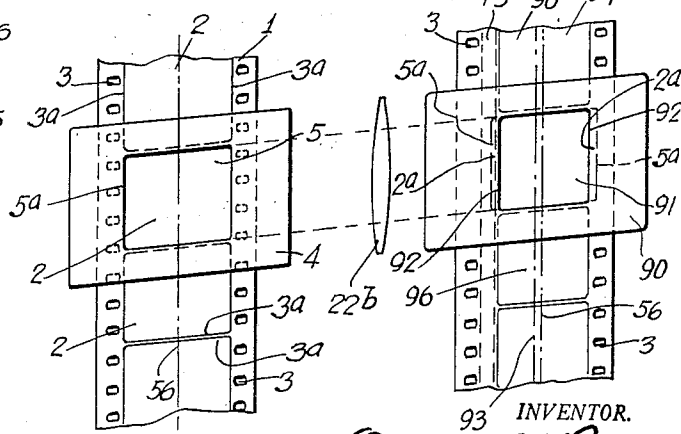


Fig. 5.

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METHOD AND APPARATUS FOR FORMING
SOUND MOTION PICTURE RECORDS

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Application August 17, 1929, Serial No. 386,663

6 Claims. (Cl. 88-24)

This invention refers to talking, or sound motion pictures and more particularly to that class preferably termed "deferred vocalized sound motion pictures".

Whereas attempts to synchronously correlate speech or other sound to motion pictures initially recorded without sound have been made, suitable persons speaking the lines to be recorded as a motion picture was projected onto a screen, it has been found that such recorded speech, when reproduced does not synchronize with the lip action, the disparity being of the order of one half second and more. It appears this disparity is due to the lack of prior knowledge on the part of the speakers as to just when the speech is to be initiated. Obviously the speaker must await until he sees the lip action and thereafter initiate the speech thereby causing a lag of the sound, whereas if he attempts to anticipate the action, a lead of the sound is introduced, and this disparity seems to obtain no matter how skilled the speaker may be.

One object of the applicant's invention is to overcome the above mentioned disparity by a novel method of advancing a composed depicted word print, or record before the speakers, the print advancing at a rate of travel synchronous with the projected action, and the speakers speaking the depicted words as they intersect a stationary guide line arranged transversely to the line of travel of the depicted words.

Furthermore, motion pictures produced prior to the advent of sound motion pictures, were generally recorded at 16 to 20 frames per second whereas standard sound motion pictures are recorded and projected at 24 frames per second. Obviously if the 16 frames per second films are projected at 24 frames per second for deferred vocalization, the action is "raced" and likewise any deferred speech subsequently recorded therewith would likewise be raced. It is therefore another object of this invention to furnish means whereby motion pictures recorded at less than 24 frames per second may be converted into 24 frame per second films without producing any "racing" or faster action than was produced when projecting the original film at its normal frame travel.

Another object is to furnish a novel method and apparatus for more accurately vocalizing motion picture productions initially produced as silent motion pictures.

Another object is to furnish a novel method and apparatus for converting a comparatively low rate of frame travel film into a recognized

comparatively higher standard rate of frame travel without speeding up the action, and whereby sound or speech to be synchronized to the standard rate of frame travel film will be reproduced at normal pitch and tempo when reproduced as a sound motion picture exhibition.

Another object is to furnish novel apparatus for printing duplicate negatives whereby a negative recorded at a comparatively low rate of frame travel may be caused to produce a duplicate negative having a recognized standard comparatively higher rate of frame travel without speeding up the action as initially recorded on the comparatively low rate of frame travel negative.

Another object is to furnish a novel method and apparatus for printing frames of a non-sound motion picture film onto another negative film whereby a sound track is formed parallel to the frame track without sacrificing any of the image field of the non-sound film.

Another object is to furnish novel printing apparatus for printing motion picture frames onto a frame track and simultaneously photographically recording a consecutive reference character adjacent each frame for the identification thereof.

Other objects and advantages will appear as the description of the invention progresses and the novel features of the invention will be pointed out in the appended claims.

In describing the invention in detail reference is had to the accompanying drawings wherein the applicant has illustrated embodiments of the invention, and wherein like characters of reference designate corresponding parts throughout the several views, and in which:—

Figure 1 diagrammatically illustrates a method of printing non-sound motion picture films onto sound motion picture films, and Fig. 2 diagrammatically illustrates a method of composing a dialogue, or sound character print, or record, and Fig. 3 is a part elevational, part diagrammatic view of printing apparatus for one step of converting non-sound films into sound films, and Fig. 4 is a plan view of a converted sound motion picture film, and Fig. 5 diagrammatically illustrates another method of printing sound films from non-sound films, and Fig. 6 is an elevational view of a lens, or optical system.

Referring to Fig. 1, showing a method for converting non-sound motion picture films into sound motion picture films whereby a sound track may be added thereto. The film 1 assumed to be of the non-sound type having standard non-sound

frames 2—2 uniformly spaced between the perforations 3—3, is also assumed to be advanced by an optical printer of the step type, more fully hereinafter described, and relatively to aperture plate 4, positioned to have a beam of light directed onto aperture 5 thereof, by the light source 6. Also arranged to be advanced with film 1, is negative film 7, positioned to receive the imaged beam from aperture 5, an optical system, or member 22, being inserted in the path of said image beam and arranged to reduce the width but not the height thereof whereby each frame as 9—9 printed onto action track 8 of film 7 will likewise be reduced in width only as compared to the dimensions of frames 2—2. Optical system 22 may comprise a convex cylindrical member 10 having a convex surface 11 and cylindrical surface 12, said member and film 7, being positioned whereby the frames as 9—9 are printed adjacent one row of the perforations 3—3, in this manner forming a sound track space, as 13 between the other row of perforations and frames 9—9.

Numeral depicting apparatus 14 is connected to shaft 15 arranged to operate said apparatus and depict a successively differing numeral, as 14a, each time the film 7 is advanced one frame, and the dial 16 thereof is arranged to be illuminated by a light source 17, said dial being positioned within a light proof enclosure 23, see Fig. 3, whereby the objective 18 photographically records an image, as 21—21, thereof onto said sound track 13, the aperture plate 20 having aperture 19 acting as a mask for allocating said images on said track.

Referring to Fig. 2, showing the method of composing, or preparing a continuity print or sound character record, as 25. The projector 26, of known form, is assumed to advance a positive film 27 printed from the converted negative action film 7, whereby the frames as 9—9 are successively depicted onto screen 28 preferably forming a part of table or work bench 29. Said table is preferably arranged to support rollers or spools 30—30 having record tape or ribbon 26 wound thereon whereby the operator 31 may scribe, or otherwise mark the sound characters, or words, as 37—37, onto sound character depicting tracks, as 32—32 for composing print 25. Said tape 26 is also formed with perforations, as 33—33 for subsequently advancing said print at a rate of frame travel synchronous with the frame travel of a converted sound motion picture film, as more fully hereinafter described. Said tape has also displayed thereon the frame travel track 34 having frame divisions 35 indicating frames of a motion picture film. Continuity print 25 is similar to a continuity print more fully disclosed in my co-pending application Serial No. 381,793, filed July 29th, 1929. Projector 26 is arranged to advance film 27 one frame each time the button 36 is depressed by the operator 31.

Referring to Fig. 3, showing a motion picture film printing apparatus of the step type arranged to convert non-sound films into sound films. The non-sound film 1 supported by reel 40 is advanced frame by frame by sprocket 41 rotated by star wheel 42, actuated by pin wheel 43 of known form, said wheel being driven by bevel gear 44 secured thereto and meshing with a similar gear 45 secured to shaft 46 rotating in bearing 47, said shaft also having secured thereto female portion 48 arranged to receive male portion 49 of clutch 50, said male portion being arranged slidably on shaft 51 rotatably supported by bearing 52, said

shaft also having secured thereto bevel gear 53 arranged to drive a similar gear 54 secured to shaft 55 arranged to drive change speed gear mechanism 56, said mechanism having output shaft 57 supporting bevel gear 58 arranged to drive a similar gear 59 secured to cam disk 60, a similar disk 61 being adjustably clamped thereto by bolt 62, slots 63—63 providing for such adjustment whereby the face of cam 64 may be varied circumferentially.

Pivotally supported on shaft 65 is lever 66 having roller 67 arranged to engage cam 64 pivotally supported at one end thereof, the other end being arranged to engage and dis-engage the male portion 49 of clutch 50, said lever being normally restrained to engage said clutch by spring 68.

Change gear mechanism 56 is arranged to vary the gear ratio between the shafts 55 and 57 by movement of handle 69, a frame ratio numeral being indicated in the dial 70.

Motor 71 is arranged to drive shaft 51 through bevel gears 72 and 73, gear 73 being formed with a similar gear 74 meshing with bevel gear 75 formed on pin wheel 43a arranged to rotate star wheel 42a and sprocket 41a, said sprocket being arranged to advance negative film 7 supported by supply reel 40a and arranged to be wound onto take up reel 40b.

Sprocket 41a is formed with a bevel gear 76 arranged to drive a similar gear 77 secured to shaft 15 for advancing numeral depicting apparatus 14 one numeral each time negative film 7 is advanced one frame.

Clutch 50 may also be disengaged by circuit closer 78 arranged to be closed by a notch in film 7 in known manner, thereby energizing magnet 79 arranged to reciprocate lever 66.

Suitable shutters, not shown, are provided for masking off the light beams projected onto apertures 5 and 19 as films 1 and 7 are advanced by sprockets 41 and 41a.

Referring to Fig. 4, showing a modified form of converted sound motion picture film, as 85, and which it is assumed has also been produced by the printing apparatus shown by Fig. 3, modified by omitting the optical system 22 and substituting the optical system 22a of Fig. 6, therefor, thereby reducing both the width and height of frames 87 recorded onto frame track 87a and whereby more widely spaced non-printed portions as 86—86 are formed between said frames longitudinally of said film. In other words the ratio of the width and height of frames 87 is the same as that of frames 2—2 of film 1.

Referring to Fig. 5, showing a modified method of producing sound film from non-sound films, the film 1 is again assumed to be advanced relatively to aperture plate 4, having aperture 5, the margin 5a of which substantially registers with the margin 3a of frames 2—2, or it may be said the center line 56 substantially registers with the center line of frames 2—2. Negative film 94 is also advanced relatively to aperture plate 90 having an aperture 91, the margin 92 of which has been reduced in width only and so positioned with respect to film 94 whereby the sound track 13 may be formed thereon. The optical system 22b, similar to system 22a, is inserted in the image beam between films 1 and 94 whereby the frames projected onto aperture plate 90 are substantially of the same dimensions as those of frames 2—2 of film 1, however as the margins 92 of aperture 91 are comparatively less widely spaced, the sides of the projected frames 2—2 overlap said margins

as indicated by the dotted lines 5a—5a, and therefore the edge portions, as 2a—2a will be masked off as said frames are photographically recorded onto film 94. In other words, it may be stated that the center line 5b of frames 2—2 has been offset with respect to the center line 93 of film 94.

Application

Assume it is desired to vocalize a silent motion picture production which normally was recorded at 16 frames per second, whereas the present recognized standard of recording and projection of sound motion picture films is 24 frames per second. It will be apparent that if the 16 frame per second film were projected at 24 frames per second, the action would be raced and likewise any speech which might be synchronized therewith for exhibition purposes. In other words the action and sound would be projected fifty percent faster than when the silent film was initially recorded. Obviously such racing of the action and speech would mar, if not entirely destroy any value of adding the speech to the silent film, or drama. To overcome this first objection, the applicant has conceived the novel method of interposing additional frames by duplicating original frames. It will be noted by reference to the dial 70, (Fig. 3) that a reference numeral "2" appears therein indicating that for each two frames recorded by film 1 and additional frame, or a total of 3 frames will be recorded onto film 7, film 1 being halted by withdrawal of clutch 50 while film 7 is advanced one frame by sprocket 41a. Also simultaneously with the advancement of film 7, the numeral depicting device 14 will be actuated by shaft 15 to display a successive differing numeral, as 14a which is photographically recorded onto said film for the identification thereof.

Assume that any one or more sequences of the production to be vocalized has been initially recorded at 18 frames per second. The change speed gear handle 69 is moved until the numeral 3 appears in dial 70, thereby indicating that for every third frame advancement of film 1, the clutch 50 would be disengaged and an additional frame will be printed onto negative 7, in this manner making a total of 24 frames printed onto film 7 for every 18 advanced by film 1.

Assume again that other sequences, of which film 1 may form a part, were initially recorded at 20 frames per second. The handle 69 would be moved until numeral 5 appeared in dial 70, and, as films as 1 and 7 are advanced by the printing apparatus shown, said clutch 50 would be disengaged every fifth frame of advancement of film 1 whereby 24 frames will be recorded onto film 7 for every 20 frames advancement of film 1.

If other sequences were recorded initially at 21 frames per second the handle 69 would be moved to numeral 7 and every seventh frame advancement of film 1 clutch 50 will be disengaged and additional frame added to film 7, or for 21 frames advancement of film 1, 24 frames will be recorded onto film 7, and it is to be noted that said extra frames are added automatically as the films are advanced during the printing operation.

It is to be noted that in converting a non-sound film to a sound film by adding frames as described, the mask 90 may be replaced by a duplicate mask 4 whereby the frames 2—2 of film 1 may be printed of the same proportion and size onto a film as 7. Such converted films may be employed for sound motion picture exhibition wherein disk sound records furnish the accompanying sound, however it is assumed that both the action and sound records

are to be printed onto a single film of known form and that therefore a sound track as 13 is to be added parallel to the frame track 8, of film 7.

As standard projectors equipped for sound motion picture projection have their gate apertures substantially of the proportions as indicated by frame 9, it is preferable to likewise furnish films as 7 or 94 wherein only the width of the frames have been reduced, and it is more preferable to make such reduction by the method shown in Fig. 1, whereby the entire field is retained, the objects being made more slender, an ardent aim of most of the actors.

The numeral depicting apparatus 14, objective 18, light source 17 and aperture plate 20 are supported by a light proof housing 23 comprising in substance a camera, the shutter of which is not shown.

It will be noted that whereas the numerals as "01235" "01236" etc. are photographically recorded in advance of printing the frames 9—9, they are however positioned relatively transversely of the film and correlated thereto whereby each frame may be positively identified for synchronizing sound to the action depicted thereby.

After the negative film, as 7 has been printed from film 1 as described, one or more positive prints are made therefrom, said prints being placed in projectors as 26 and projected onto screens, as 28 before which skilled operators analyze the lip and facial action of the actors, or action by comparison with the words or sounds produced as indicated by the book of lines, as 25a, or a continuity print, as more fully disclosed in my co-pending application, Serial No. 381,793, filed July 29th, 1929, said operators scribing or otherwise indicating the words or other sound characters to be produced on lines 32—32, preferably employing one line for each speaker, or source of sound produced, the sound characters being placed on said lines transversely opposite the frame division 35 to which it is correlated.

Referring to Fig. 2, it is assumed that one of the actors as 38 or 39 has completed the statement "I am", the beginning of the lip movement being seen on frame "01228" and the final movement appearing on frame "01235" depicted on screen 28. The operator 31 therefore has scribed the letter "I" transversely opposite frame division "01228" and the end of the word "am" transversely opposite the frame division "01235", as shown.

It is to be noted that other forms of sound may be recorded onto lines 32—32, as for example, indicating the ringing of a telephone bell; blowing of a whistle, or horn; name or number of phonograph disk to be played; etc.

After the print, as 25 has been composed it is advanced in the presence of speakers, or other artists, the rate of travel thereof being such that the frame divisions 35 travel synchronously with the rate of travel of frames 9—9 and during which advancement, the sound produced is recorded onto a sound record member for subsequently re-recording onto a sound track as 13 parallel to the frame track 8 whereby a sound motion picture film is produced for effecting sound motion picture exhibitions and as more fully disclosed in my co-pending application, Serial No. 381,793, filed July 29th, 1929.

Whereas only one frame as 9 has been shown as projected onto screen 28, said screen may accommodate the projection of several frames whereby the operator 31 may more fully analyze the action thereon.

After the converted negative as 7 has been

completed and the sound record film correlated thereto has been produced, the sound record to be added to sound track 13 is printed thereon by the printing method disclosed by my co-pending application Serial No. 381,973, filed July 29th, 1929, whereafter the resulting completed sound and action negatives are employed to print positive films for exhibition purposes, said positive films being projected by sound motion picture apparatus of known form for the exhibition of sound motion pictures.

What I claim is:—

1. The method of printing sound picture films from printing picture films having the printing pictures substantially equally spaced between the perforations which involves, advancing a printing picture film and a perforated light sensitive sound picture film in printing relation, optically projecting pictures of the printing film as pictures of the same size at the light sensitive film as the films advance, off-setting the longitudinal axis of the projected pictures with respect to the axis of the light sensitive film whereby one longitudinal edge portion thereof overlap one row of the perforations of the film and also provides a sound track space between the printed pictures and the other row of perforations, masking off the overlapping portion of the projected pictures for moving the margin of the printed pictures inwardly of the perforations, and utilizing the sound track space for recording records corresponding to sound thereonto.

2. The method of printing sound picture films from printing picture films having the printing pictures substantially equally spaced between the perforations which involves, advancing a printing picture film and a perforated light sensitive sound picture film in printing relation, optically projecting pictures of the printing film as pictures of the same size at the light sensitive film as the films advance, off-setting the longitudinal axis of the projected pictures with respect to the axis of the light sensitive film whereby one longitudinal portion thereof overlaps one row of perforations of the film and also provides a partial sound track space between the projected pictures and the other row of perforations, masking off longitudinal portions at each edge of the projected pictures for moving the margin of the over-lapped portion inwardly of the perforations and also providing a full sound track space between the printed pictures and the other row of perforations, and utilizing the sound track space for recording records corresponding to sound thereonto.

3. In apparatus for printing sound picture films, a perforated printing film having the printing pictures substantially equally spaced between the perforations thereof, a perforated light sensitive sound picture film, means engaging the perforations for advancing the films in printing relation, means including a light source for projecting substantially full size projected pictures of the printing pictures at the light sensitive film as the films advance, the longitudinal axis of the projected pictures being off-set with respect to the axis of the light sensitive film whereby a partial sound track space is formed between one row of perforations and one edge portion of the pictures, and the other edge portion thereof overlaps the other row of perforations, means for masking off the overlapping edge portion of the projected pictures

whereby the margin of the printed pictures will be inwardly of the perforations, and means for masking off a portion of the projected picture at the opposite edge thereof for providing a full width sound track between the printed pictures and the other row of perforations of the film.

4. In apparatus for printing sound picture films, a printing film having the printing pictures substantially equally spaced between the perforations thereof, a perforated light sensitive sound picture film, means engaging the perforations for advancing the films in printing relation, means including a light source for projecting substantially full size projected pictures of the printing film at the light sensitive film as the films advance, the longitudinal axis of the projected pictures being off-set with respect to the similar axis of the light sensitive film whereby a partial sound track space is formed between one row of perforations and one edge portion of the projected pictures, and the other edge portion thereof overlaps the other row of perforations, means for masking off the overlapping edge portion of the projected pictures whereby the margin of the printed pictures on the film will be inwardly of the perforations, means for masking off a portion of the projected picture at the opposite edge thereof for providing a full width sound track space on the film, and means for photographically recording records corresponding to sound onto the sound track space.

5. In apparatus for printing sound picture films, a perforated printing picture film having the printing pictures thereof substantially equally spaced between the perforations therein, a perforated light sensitive sound picture film, means engaging the perforations for advancing the films in printing relation, means including a light source for projecting substantially full size projected pictures of the printing pictures onto the light sensitive film as the films are advanced, the longitudinal axis of the projected pictures being off-set with respect to the axis of the light sensitive film whereby a sound track space is formed between one row of perforations and one edge portion of the projected pictures and the opposite edge portion thereof overlaps the other row of perforations of the film, and means for masking off the overlapping portion of the projected pictures for printing the margin of the printed pictures inwardly of the perforations.

6. In apparatus for printing sound picture films, a printing picture film having the printing pictures thereof substantially equally spaced between the perforations thereof, a perforated light sensitive sound picture film, means engaging the perforations for advancing the films in printing relation, means including a light source for projecting substantially full size projected pictures of the printing pictures at the light sensitive film as the films are advanced, the longitudinal axis of the projected pictures being off-set with respect to the axis of the light sensitive film whereby a sound track space is formed between one edge portion of the projected pictures and one row of perforations of the film and the opposite edge portion of the pictures overlaps the other row of perforations of the film, means for masking off the overlapping portion of the projected pictures for printing the margin of the printed pictures inwardly of the perforations, and means for photographically recording records corresponding to sound onto the sound track of the light sensitive film.