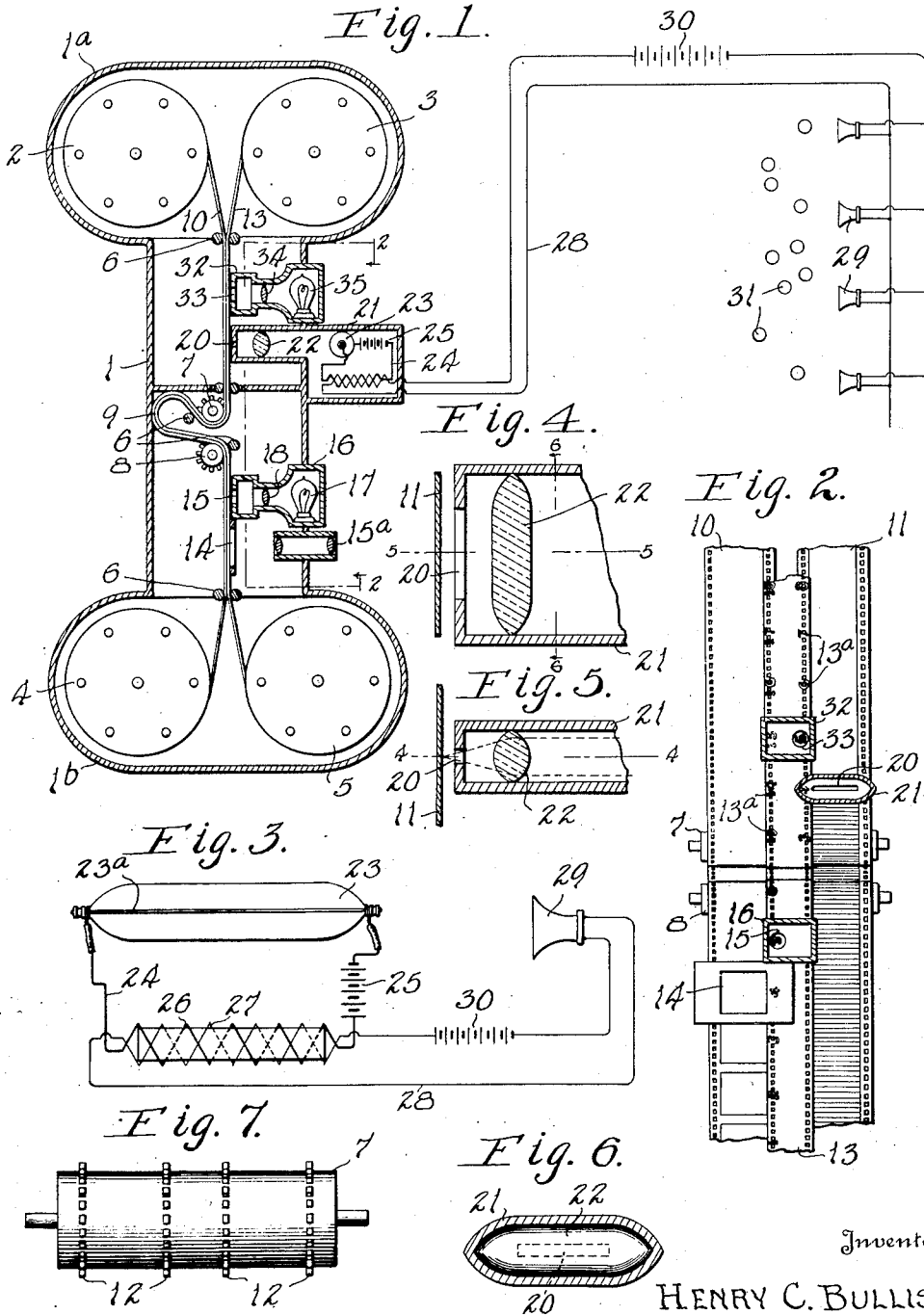


H. C. BULLIS.
TALKING PICTURE APPARATUS.
APPLICATION FILED DEC. 15, 1915.

1,335,651.

Patented Mar. 30, 1920.

2 SHEETS—SHEET 1.



Inventor

HENRY C. BULLIS-

By

N. S. Hie

Attorney

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2 SHEETS—SHEET 2.

Fig. 8.

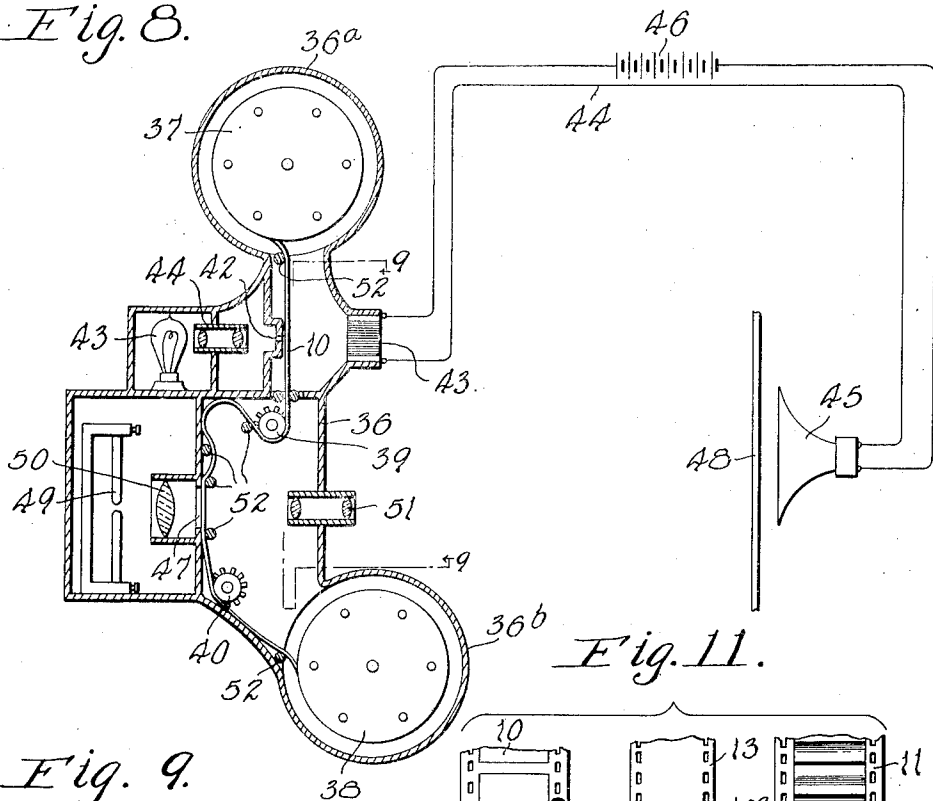


Fig. 11.

Fig. 9.

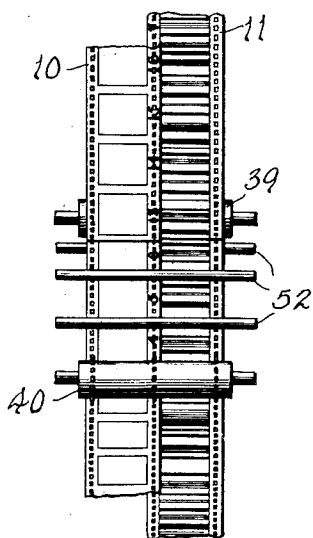
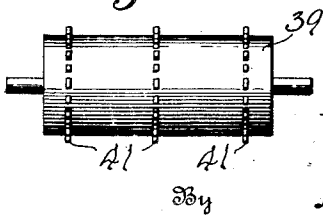


Fig. 10.



Inventor

HENRY C. BULLIS—

N.S. 1112

Attorney

UNITED STATES PATENT OFFICE.

HENRY C. BULLIS, OF REDWOOD FALLS, MINNESOTA.

TALKING-PICTURE APPARATUS.

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To all whom it may concern:

Be it known that I, HENRY C. BULLIS, a citizen of the United States, residing at Redwood Falls, in the county of Redwood, State of Minnesota, have invented a new and useful Talking-Picture Apparatus; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

The present invention relates to an apparatus for simultaneously taking and reproducing picture and sound records, there-
by producing what are commonly termed "talking pictures", the object of the invention being to provide a device of this character which embodies novel features of construction whereby the picture record and sound record can be given the necessary individual treatment for developing them in the most effective manner and then readily assembled in such a manner as to bring the picture record and sound record in proper position to produce perfect synchronism when the pictures and sound are reproduced.

Further objects of the invention are to provide a device of this character which is comparatively simple and inexpensive in its construction, which admits of different emulsions and different treatments being employed in making the picture record and sound record, which provides corresponding identification marks upon the picture record and sound record so that there will be no difficulty in assembling the two records in the proper relation for the reproducing operation, which admits of the picture record and sound record being handled separately while being developed and subsequently joined together so as to produce a single film if such is desired, and which provides for reproducing the sound from a continuously moving portion of the film and the reproduction of the picture by an intermittently moving portion of the film.

With these and other objects in view, the invention consists in certain novel combinations and arrangements of the parts as will more fully appear as the description proceeds, the novel features thereof being pointed out in the appended claims.

For a full understanding of the invention, reference is to be had to the following de-

scription and accompanying drawings, in which:—

Figure 1 is a diagrammatic view of a form of apparatus suitable for simultaneously making the picture and sound records, the casing being shown in section.

Fig. 2 is a vertical sectional view on the line 2—2 of Fig. 1, looking in the direction of the arrows.

Fig. 3 is a detail view of the microphone controlled source of light which is used for making a photographic sound record upon the emulsion of the sound record film.

Fig. 4 is an enlarged horizontal sectional view through the lens and a portion of the casing which is used in connection with the microphone controlled source of light to make the sound record upon the film.

Fig. 5 is a vertical sectional view through the same on the line 5—5 of Fig. 4.

Fig. 6 is a transverse sectional view on the line 6—6 of Fig. 4.

Fig. 7 is a detail view of one of the cog wheels which is employed for moving the films through the record making apparatus.

Fig. 8 is a diagrammatic view similar to Fig. 1, showing the reproduction apparatus.

Fig. 9 is a sectional view on the line 9—9 of Fig. 1, showing the manner of assembling the two films in the reproducing apparatus.

Fig. 10 is a detail view of one of the toothed wheels used in the reproducing apparatus.

Fig. 11 is a detail view of portions of the picture film and sound film, together with a corresponding portion of the identification mark printing film, which is employed in connection with the two films when making the records.

Corresponding and like parts are referred to in the following description and indicated in all of the views of the drawings by the same reference characters.

In carrying out the present invention the picture record and sound record are made at the same time and by the same apparatus, but upon separate and distinct films. It has been previously proposed in this art to accomplish the result by making the picture record and the sound record upon the same film, although this is open to the objection that the proper emulsion, manipulation and development for obtaining the best results in the sound reproduction differ very materially from those required to obtain the

best results for the picture records. Where the two records are made upon the same film, using the same emulsion, it must be obvious that a proper treatment or development of one record can only be obtained at the sacrifice of the other record, since the special form of development required to get the best results from the two records would ordinarily be quite different. It will thus be seen that there are very important practical reasons why the two records can not be successfully and satisfactorily made upon the same film, as has been previously proposed, and it is the object of the present invention to overcome this particular objection, by providing a construction which admits of the records being made upon different films, which may have different emulsions, and may be individually treated in the development exactly as may be required to produce the best results. These two independent films have corresponding identification marks made upon the same at the time the two records are made, so that they can be assembled without difficulty in the proper manner necessary for a synchronous reproduction of the pictures and sounds.

Fig. 1 illustrates in a diagrammatic manner a form of apparatus adapted to be employed in making the picture and sound records. The numeral 1 designates the casing which is provided at the top thereof with a chamber 1^a within which are mounted the reel 2 from which the sensitized films are unwound and the reel 3 from which the opaque printing film is unwound, a similar chamber 1^b being provided at the bottom of the casing within which are mounted the reel 4 upon which the exposed films are wound and the reel 5 upon which the opaque printing film is wound. Suitable guide means 6 are provided at the top and bottom and intermediate points of the main portion of the casing 1 for holding the films and printing strip together during the record making operation. The numeral 7 designates the usual continuously rotating toothed roller and the numeral 8 the usual intermittently rotating toothed roller, the loop between the two rollers being indicated at 9. The conventional mechanism may be employed for operating these rollers and the picture taking mechanism, the portions of the films below the toothed roller 8 having an intermittent movement, while the portions of the films above the rollers 7 have a continuous movement.

The picture film 10 and sound film 11 are made separate and distinct from each other, and may be treated with the same emulsion, or with different emulsions, as found necessary to obtain the best results. The toothed rollers 7 and 8, one of which is shown in detail by Fig. 7, are each provided with four peripheral rows of teeth 12. The picture

film 10 engages one set of the teeth 12, while the sound film 11 engages the opposite set of teeth 12, the two films being thus locked together and moved simultaneously through the machine. The printing strip 13 is arranged intermediate of the picture film 10 and sound film 11 and overlaps the adjacent inner edges of the two films, said printing strip being suitably perforated to engage the two inner rows of teeth 12 on the toothed rollers 7 and 8. This printing strip 13 is formed of opaque material, being provided at the edges thereof with transparencies 13^a in the form of identification marks. In the present instance numerals are employed, although any other suitable form of character might be substituted. These transparencies 13^a in the edges of the opaque strip 13 will, as hereinafter described, print corresponding identification marks 10^a and 11^a upon the picture film 10 and sound film 11, respectively. Inasmuch as the sound record must be made upon the continuously moving film above the loop 9, and the picture record upon the intermittently moving film below the loop 9, there will necessarily be a space between the corresponding transparencies 13^a on the opposite edges of the printing strip 13 in order that the portion of the sound record on the film 11 opposite an identification character 11^a may correspond to the picture opposite the same identification character 10^a on the picture strip. With the ordinary forms of moving picture machines, this interval would be ten spaces, so that similar transparencies 13^a on opposite sides of the printing strip 13 would be just ten spaces apart. Where numerals are employed, as in the present instance, there is a difference of ten units between those numerals directly opposed to each other on the printing strip, the numeral "7" being directly opposite the numeral "17", the numeral "8" directly opposite the numeral "18", etc.

The pictures are made in the usual manner through an aperture 14, a conventional form of lens 15^a being shown as arranged in front thereof. Immediately above the aperture 14 is an aperture 15 arranged over the edge of the printing strip 13 and formed in one end of a suitable housing 16. The rays from a lamp 17 arranged within the housing are focused by a lens 18 upon the edge portion of the printing strip 13 which moves opposite the aperture 15. The various transparencies 13^a upon that side of the printing strip 13 which overlaps the edge of the picture film 10 are thus successively printed upon the edge of the picture film as the pictures are taken and the film advanced.

At a point above the loop 9 the sound film 11 moves across an aperture 20 in one end of a housing 21. This aperture 20 is in the form of a transverse slit (see Figs. 130

4, 5 and 6) and a laterally elongated lens 22 is arranged within the housing to focus the rays from a sound controlled source of light 23 through the slit 20 upon the sound film 11. The shape of the lens 22 is such as to focus the light rays in a transverse line, instead of in a point, although the slotted aperture 20 is essential to prevent what is termed halation. The intensity of the light rays from the source of light 23 varies with the sound, so that as the sensitized film 11 is moved past the aperture 20 the intensity of the light acting thereon will be continually changing, the variance in intensity being controlled by the sound which is to be reproduced. This result may be produced in different manners, although I have shown the source of light 23 as in the form of an incandescent bulb having a long filament 23^a arranged parallel to the slit 20. The circuit 24 for the lamp 23 includes a source of electrical supply 25 and one coil of an electro-magnetic coupler 26. Surrounding the coil 26 is another coil 27 arranged in the circuit 28 of a microphone or series of microphones 29, a suitable source of energy 30 being also arranged in the said circuit. In Fig. 1, a series of the microphones 29 are shown as arranged in series and mounted at the back of the stage, the possible position of different actors in front of the microphones being indicated by the small circles 31. The sound waves will act through the microphones to produce fluctuations of the current in the microphone circuit 28, and owing to the relation of the coils 26 and 27 the intensity of the current in the light circuit 24 will be caused to fluctuate by induction. The intensity of the light will vary with the strength of the current and, with the arrangement described, this will be controlled by the microphones. The connections in the electro-magnetic coupling, constituted by the coils 26 and 27, in connection with the lamp and its source of energy, and the microphone and its source of energy, must be such that the inductive effect of the microphone circuit and its winding upon the coupling shall amplify the current flowing through the lamp and its winding in the coupling, thereby causing the loud sounds to produce dark striations upon the sound record film.

Arranged immediately above the housing 21 is a housing 32 having an aperture 33 in one end thereof and provided with a lens 34 and light 35. The rays from the light 35 are focused by the lens 34 through the aperture 33 upon that side of the printing strip 13 which overlaps the edge of the sound film 11. As the films are advanced the transparencies 13^a of that side of the printing strip are brought successively opposite the aperture 33 so that the characters will be printed upon the edge of the sound

film 11. It will be observed that the two printing apertures 15 and 33, respectively, are arranged just one step in advance of the picture taking aperture 14 and the sound record aperture 20, respectively, so that the identification characters are really printed upon the edges of the films before the picture record and sound record, although the relationship between the two films is maintained, so that the result is the same as though the identification characters were printed at the same time the records were made.

The exposed films 10 and 11 are developed separately, and each film may be manipulated and treated in the manner necessary to perfect the same to the best advantage, the identification marks printed through the transparencies in the edges of the opaque printing strip 13 appearing at intervals along the edges of the films, thereby enabling the two films to be subsequently reassembled without difficulty in the proper relation necessary to bring about a synchronous reproduction of the pictures and sounds. The pictures appear upon the picture film in the usual and well known manner, while the sound record appears in the form of a series of transverse striations of varying intensity. The result is a film with a ladder like strip of alternately dark and light zones merging into each other, as determined by the sound waves. From the original negatives positives for reproduction may be obtained in the usual manner by contact printing or otherwise.

One possible form of reproducing apparatus is shown by Fig. 8. The main casing 36 is provided at the top thereof with a chamber 36^a to receive the reel 37 from which the reels are unwound, and at the bottom thereof with a chamber 36^b to receive the reel 38 upon which the films are rewound. The toothed roller 39 engages the films and rotates continuously, while the toothed roller 40 which is arranged below the roller 39 has an intermittent movement, said rollers being actuated by the usual mechanism. One of these rollers is shown in detail by Fig. 10, and it will be observed that they have three peripheral rows of teeth 41. For reproducing purposes there is no occasion to use the printing strip 13, and the inner edges of the picture film 10 and sound film 11 are overlapped and caused to engage the intermediate row of teeth 41. At a point above the continuously rotating toothed roller 39 the sound film 11 is moved across a slit or aperture 42 through which rays of light from a lamp 43 are focused upon the film by suitable lenses 44. The light acts through the sound film 11 upon a selenium cell 43, or some similar member arranged in the circuit 44 of a telephone receiver 45, a source of electrical energy 46

being arranged in the circuit. The striations upon the developed sound film 11 are of various degrees of density, so that the intensity of the light acting upon the selenium cell 43 will vary inversely as the density of the sound record striations, the light acting strongly upon the selenium cell when a comparatively transparent striation is brought opposite the slit 42, and acting very weakly upon the selenium cell when a denser striation is brought opposite the slit. The resistance of the selenium cell, as is well known, varies with the intensity of the light acting thereon, so that the current in the telephone receiver circuit will be caused to fluctuate, these fluctuations being determined by the sound record, with the result that the original sound is reproduced.

Below the continuously rotating toothed roller 39 the films move intermittently and the picture film 10 is moved across an aperture 47, the pictures being projected upon a screen 48 by rays from a suitable source of light 49 which are preferably focused by the lenses 50 and 51. Suitable guide members 52 may be provided for cooperation with the rollers 39 and 40 to carry the films through the machine in the proper manner, and the mechanism for moving the films and projecting the pictures may be of the conventional construction.

After the films have been properly developed, and positives then produced from the negatives by contact printing or otherwise, the picture film 10 and sound film 11 are brought together and assembled for the reproducing apparatus. The corresponding identification characters 10^a and 11^a on the respective films indicate corresponding portions of the picture record and sound record, so that there is no difficulty in arranging the films for a synchronous reproduction of the pictures and sounds. The sound must be reproduced from the continuously moving film, while the pictures are reproduced from the intermittently moving film, so that the portion of the sound record corresponding to any particular picture must be several steps behind the picture as the film passes through the machine. Ordinarily, ten spaces would be about the proper amount so that in assembling the two films the numeral "7" on the sound film would overlap the numeral "17" on the picture film, etc. This relation, however, can be varied, as may be required to bring about a synchronous reproduction of the sounds and pictures. The picture film 10 and sound film 11 may either be kept separate and distinct from each other, or the otherlapping edges thereof may be cemented together so as to produce in effect a single film.

The sound record is made simultaneously with the picture record, and this may be accomplished either by photographic means,

as in the present instance, or by any other suitable means, although the two records are made upon separate films or strips so that they are susceptible of having the necessary individual treatment necessary to the best results. When the sound record is made photographically, the arrangement is such that the sound controlled lamp is caused to give a more intense light for the louder sounds than for the weaker sounds, with the result that the loud sounds produce dark striations upon the master film and the weaker sounds lighter striations. The sound record employed for reproducing purposes is made by contact printing from the master sound record film, and it will accordingly be obvious that in the reproducing sound record the loud sounds are represented by light or partially transparent striations while the weak sounds are indicated by dark striations. The light thus acts strongly upon the selenium cell for a strong sound and more weakly for a weak sound. This sound record, made upon a separate strip by photographic or other suitable means, bears identification characters corresponding to other similar identification characters produced upon the picture record, so that after the two records have been completed by the special individual handling or treatment necessary to the best results for each record, they can be readily assembled in the proper relation to produce a synchronous reproduction of the pictures and sounds.

Having thus described the invention, what I claim as new and desire to secure by Letters Patent, is:—

1. A talking picture apparatus including means for simultaneously making separate and independent sound and picture records, a marking element having separate oppositely located series of corresponding identification marks, and means for simultaneously printing said corresponding identification marks upon the two records to facilitate assembly for a synchronous reproduction.

2. Talking picture apparatus including a casing, means for simultaneously moving two independent films through the casing, means for making a picture record upon one of the films and a sound record upon the other film, and a printing member movable with the films and means for cooperating with said printing member for placing a series of corresponding identification marks upon the films to facilitate assembly for a synchronous reproduction.

3. Talking picture apparatus including a casing, means for simultaneously moving two independent films through the casing, means for making a picture record upon one of the films and a sound record upon the other film, and a printing strip movable with the films and overlapping the edges

thereof, said printing strip having identification characters thereon, and means cooperating with said strip to place a series of corresponding identification marks upon the films to facilitate assembly for a synchronous reproduction.

4. Talking picture apparatus including a casing, means for simultaneously moving two independent films through the casing, means for simultaneously making a picture record upon one of the films and a sound record upon the other film, an opaque printing strip overlapping the two films and provided at the overlapping portions thereof with transparent identification characters, apertures under which the transparent identification characters are movable, and means for projecting light through the apertures to print the identification characters upon the films.

5. Talking picture apparatus including a casing, means including toothed rollers for simultaneously moving two independent films through the casing, means for simultaneously making a picture record upon one of the films and a sound record upon the other film, an opaque printing strip perforated for engagement with the before-mentioned toothed rollers and movable through the casing with the films, the edges of the opaque printing strip overlapping the edges of the films and being provided with corresponding transparent identification marks, independent apertures under which the transparent marks upon the edges of the opaque printing strip are movable, and means for projecting light through the apertures to print the identification marks upon the edges of the films.

6. Talking picture apparatus including a casing, mechanism for moving two independent films through the casing, a portion of the movement being continuous while another portion thereof is intermittent, means for making a picture record upon the intermittently moving portion of one of the films, means for simultaneously making a sound record upon the continuously moving portion of the other film, and means for simultaneously placing corresponding identification marks upon the continuously moving portion of one film and the intermittently moving portion of the other film so that corresponding portions of the picture and sound records can be readily identified.

7. Talking picture apparatus including a casing, mechanism for moving two independent films through the casing, a portion of the movement being continuous while another portion thereof is intermittent, means for making a picture record upon the intermittently moving portion of one of the films, means for simultaneously making a sound record upon the continuously moving portion of the other film, and a printing strip

movable through the casing with the films and overlapping the same, said printing strip having identification means thereon, and means cooperating with said strip for placing corresponding identification characters upon the two films so that corresponding portions of the sound record and picture record can be readily identified.

8. Talking picture apparatus including a casing, mechanism for moving two independent films through the casing, a portion of the movement being continuous while another portion of the movement is intermittent, means for making a picture record upon the intermittently moving portion of one of the films, means for making a picture record upon the continuously moving portion of the other film, an opaque printing strip movable through the casing with the films and overlapping the same, the overlapping portions of the opaque printing strip being provided with corresponding series of transparent identification characters, and means for projecting light upon the transparent identification characters for causing the same to be printed upon the films as the films and strip are moved through the casing.

9. Talking picture apparatus including a casing, mechanism for simultaneously moving two films through the casing, a portion of the movement being continuous while another portion thereof is intermittent, means for making a picture record upon the intermittently moving portion of one of the films, means for simultaneously making a sound record upon the continuously moving portion of the other film, an opaque printing strip movable through the casing with the films and overlapping the same, the overlapping portions of the opaque printing strip being provided with independent series of transparent identification characters, and the corresponding characters of the two series being at such an interval that one of them will be over the continuously moving film upon which the sound record is made while the other one is over the intermittently moving film upon which the picture record is made, and means for projecting light upon the corresponding transparent characters of the opaque strip for causing them to be simultaneously printed upon the two films.

10. Talking picture apparatus including a casing, means for simultaneously moving two independent sensitized films through the casing, a portion of the movement being intermittent while another portion of the movement is continuous, means for making a picture record upon the intermittently moving portion of one of the films, a slitted aperture being arranged opposite the continuously moving portion of the other film, a sound controlled light, means for focusing

the rays from the light through the slitted aperture, an opaque printing strip movable through the casing with the films and overlapping the same, the overlapping portions of the opaque printing strip being provided with two series of corresponding transparent identification characters, and means for projecting light upon the printing strip for causing the transparent characters to be printed upon the two films.

11. Talking picture apparatus including a casing, means for simultaneously moving two independent films through the casing, a portion of the movement being intermittent while another portion of the movement is continuous, means for making a picture record upon the intermittently moving portion of one of the films, a slitted aperture being arranged opposite the continuously moving portion of the other film, a lens for focusing light through the aperture, an electric lamp for the lens, a circuit for the light, a microphone, a circuit for the microphone, the two circuits having an electro-magnetic coupling so that the intensity of the light is controlled by the sound, and means for placing a series of corresponding identification marks upon the two films to facilitate assembly of the picture and sound records for a synchronous reproduction.

12. Talking picture apparatus including

a casing, means for simultaneously moving two independent films through the casing, a portion of the movement being intermittent while another portion thereof is continuous, means for making a picture record upon the intermittently moving portion of one of the films, an aperture being arranged opposite the continuously moving portion of the other film, a lens for focusing light through the aperture upon the film, an electric lamp for the lens, a circuit for the lamp, a microphone, a microphone circuit, the lamp circuit and microphone circuit having an electro-magnetic coupling so that the intensity of light obtained from the lamp is controlled by the microphone, an opaque printing strip movable through the casing with the films and overlapping the same, the overlapping portions of the opaque printing strip being provided with two series of corresponding transparent identification characters, and means for projecting light upon the printing strip for causing the transparent identification characters to be printed upon the two films.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

HENRY C. BULLIS.

Witnesses:

EMORY L. GROFF,
ELSIE C. SMALL.