Oct. 31, 1933. H. E. HARKIN 1,933,057

PICTURE AND TALKING MACHINE

Original Filed Feb. 28, 1927 2 Sheets-Sheet 1

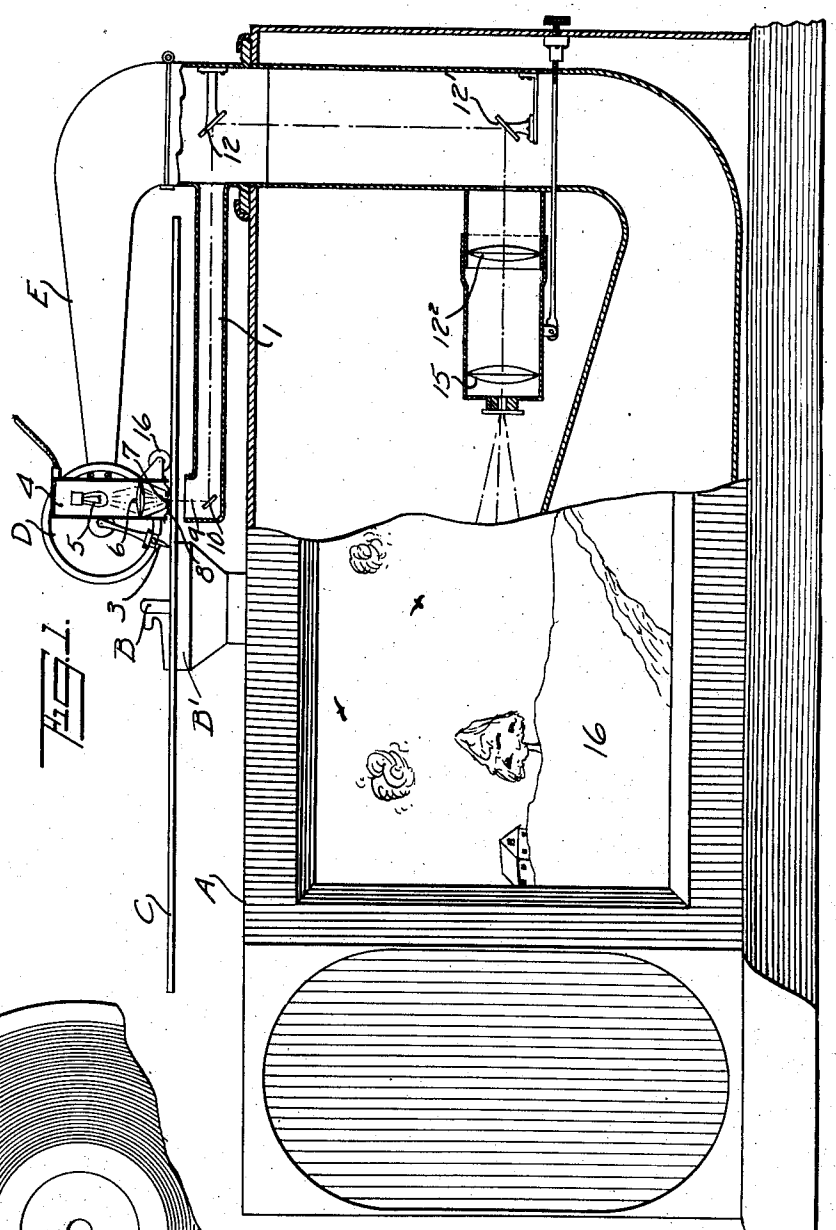


FIG. I.

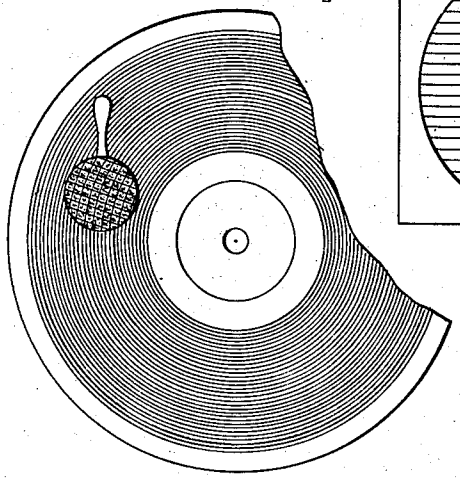


FIG. II.

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PICTURE AND TALKING MACHINE

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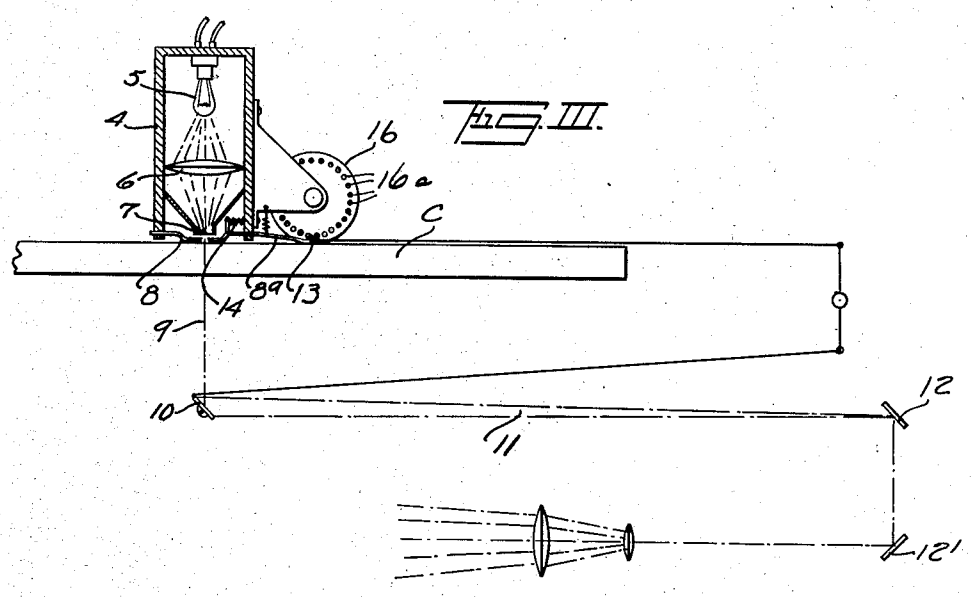


FIG. III.

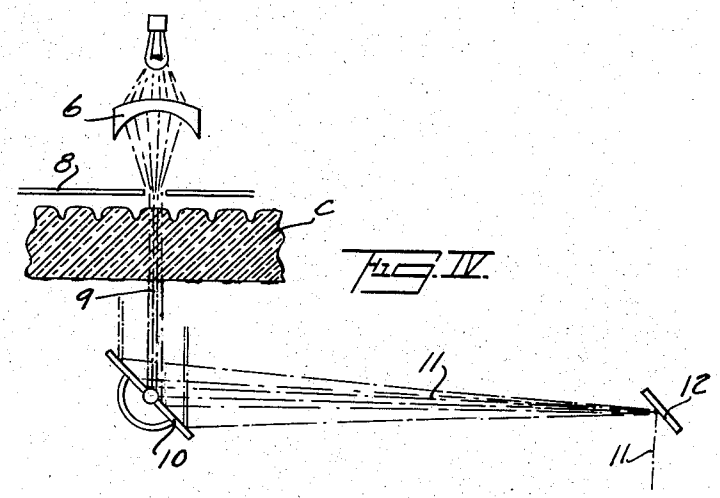


FIG. IV.

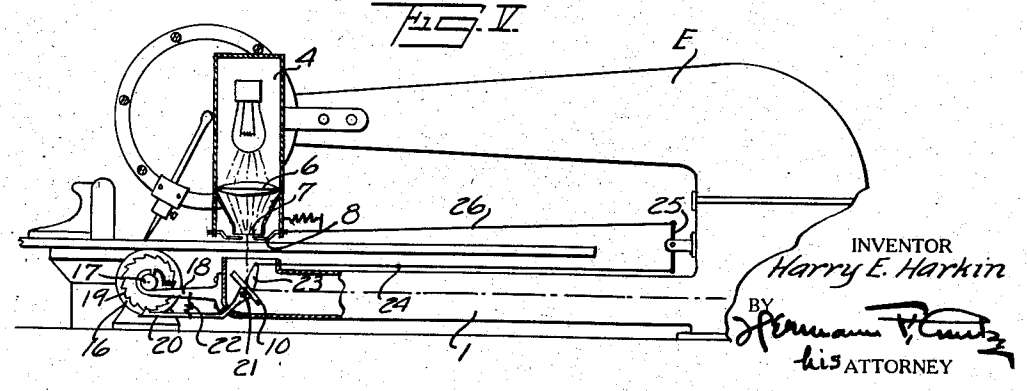


FIG. V.

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UNITED STATES PATENT OFFICE

1,933,057

PICTURE AND TALKING MACHINE

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Application February 28, 1927, Serial No. 171,450
Renewed March 24, 1933

4 Claims. (Cl. 88—16.2)

This invention relates to what may be generally called combined picture and talking machines, that is a single machine in which music, speech, or any other sounds are synchronously reproduced with a progressive reproduction of the picture co-ordinated with the sounds. In its simplest form this is the reproduction of persons or animate objects on a screen synchronously with their speech and sounds as originally coupled with the action.

More particularly my machine provides a permanent record that may be like a phonograph disc which embodies both the sound records as well as progressive pictures in permanent relation. In one form it comprises a phonograph record made of transparent material upon one side of which are the convolutions formed for sound reproduction by a needle or sapphire in the usual manner with the amplifying and sound distribution, while on the other side of the disc is a continuous series of momentary pictures or negatives very much reduced in size, so that in effect the continuous series of pictures cover an annular surface on one side of the transparent disc in fixed relation to the sound convolutions corresponding to the picture period in exact register. Such disc has for reproduction the associated needle or sapphire and also a light projector in definite relation to the needle, so that the reproduction of the pictures is simultaneous with reproduction of the sound.

It will be understood that slight variations of needle position would be adjusted to register always with the picture, and in particular that for this combination the pictures or negatives must be of a very small size, and therefore in their reproduction they must be magnified greatly, but the intended use of this instrument is in general for a screen display with the music in a size vastly smaller than the moving picture theatre screen, so that from the negative to the small screen for household use, or for close observation the magnification ratio from negative to screen is not very much greater than from an ordinary film band to the dimensions of a large theatre screen. With the rotation of the disc producing the sound, the continuous movement of the negative band illuminated by the concentrated light through the material of the disc, reflects each successive image by a suitable oscillation of a mirror in order to convert the continuous uniform motion into a hesitation. This I accomplish by regulated oscillation of a mirror so that each individual picture on the disc moving on an adjacent mirror is centered stationary on another mirror by slight oscillation of the first mirror, then a quick return oscillation picks up the successive negative and concentrating that through the series of mirrors it is finally passed through the magnifying lenses as successive stills and projected in enlarged form on the screen with the necessary frequency so that the series of pictures with the usual persistency of vision now well known in moving pictures, results in usual reproduction to the human eye as a moving picture.

The picture reproduction and sound reproduction sources cooperate with the motion of the disc and cooperate with each other in a manner permitting the entire mechanism to be simply and conveniently arranged on a base with the disc driving machine, so that the entire sound amplification and picture screen display may be embodied in an instrument such as approximately the size and form of the usual phonograph cabinet. Suitable means are provided for avoiding any interfering vibration in the picture rectifying train, while the means for magnifying and final projecting of the images are preferably solidly supported on a suitably rigid base.

In commercial production of my invention and in its simplification and refinement for increased durability and reliability, as well as economy of production, various modifications may be made, while in the accompanying drawings I have illustrated one particular embodiment of the invention omitting such details as are foreign to the particular features of invention, but showing as to detail of the essential parts one manner of operation, which it will be understood may be variously changed.

In the accompanying drawings:

Fig. I is a side view of an assembled machine partly broken away to show interior parts.

Fig. II is a plan fragmentary view of a novel form of disc viewed from the picture side with a small zone of the surface magnified.

Fig. III is an enlarged view of the light source and reflecting hesitation-arrangement.

Fig. IV is an enlarged section in part perspective, explanatory of the method of concentrating the image for picture production without the convolutions with dwells, etc., interfering.

Fig. V is an elevation of an alternate mechanism from that shown in Fig. III.

The particular embodiment of my invention which serves to illustrate, is in this case a cabinet A having a shaft B rotated with suitable control by a spring motor or the like, in the

manner usual for a phonograph, and having a table B' to support a disc C. The usual sound-box D is connected with an arm E to carry the sound emanating in the usual manner from the top surface of a phonograph record, so as to amplify the sound and project it from the cabinet A.

Connected with the tone-arm base I have a tube 1, which turns on the axis of oscillation of the tone-arm E so that a mirror 10 maintains a fixed relation to the needle 3 reproducing sound. This arm 1 supports mirror 10 underneath the disc C at a control point so that a projector 4 synchronously provides the picture reproduction with the sound,—in the manner hereinafter described.

This projector 4 has a source of light 5, lens 6, or a series of lenses which intensify and concentrate the light at the orifice 7. At this orifice 7 I prefer to locate a gate 8, so that the concentrated light momentarily and stey-by-step moves along what is practically a pinhead area of the disc, and by this gate 8 the concentrated rays step back and pick up each successive image on the record. The ray of this intermittent hesitating light 9, passes through the transparent body of the disc C onto the mirror 10. In this manner the concentrated light following each individual image of the "moving" picture, negative or otherwise, on the underside of the record, is projected on the mirror 10 a major portion of the time-element of the transition of each image by the movement of the record. The quick return of the gate 8 immediately picks up that is causes the aperture in the gate to register with the next image and moves exactly with the speed of the record so as to concentrate for another interval the light on the next image. Suitable mechanism is provided to adjust a perfect coordination of the gate with individual images with the speed of movement of a record, but it will be noted that the original production of the record assures the general synchronism of the images of pictures with the sound convolutions. This particular synchronization is accomplished first by a friction roller 16 supported with the projector 4, so that the roller 16 is turned with the record, and pins or other suitable stops 16^a on this roller 16 engage a claw 13, or its equivalent, on an extension 8^a of the gate,—so that the movement of the record, rolling the member 16 trips the claw or the like 13, synchronously with the movement of each individual picture, negative or positive, on the underside of the record. The quick return of the gate 8 is accomplished by a spring 14, or other suitable means, so that the roller 16 provides a positive uniform movement synchronous with the record surface, and the spring 14 provides a quick return to enable the roller 16 to pick up the movement for the next picture. It will be understood that instead of a reciprocating gate or shutter, a disc may be used reproducing the desired hesitation motion.

Thus the image, or successive images on the bottom of the record, in the form illustrated, will have a persistency of uniform concentrated light, each and successively projected onto the mirror 10. With the movement of the record and the gate, each successive concentrated ray 9 will move over the mirror 10 so that if the mirror were stationary it would be reflected as in motion, but the mirror 10 therefore is moved and this motion is minute, so that the motion of the mirror 10 projects the rays 11 to a mirror 12 as a concentrated reflection of each individual image over a minute period, but as a permanent reproduction during that minute period, then the step to the next image takes place and again the next image is concentrated on the mirror 12. Any slight angular projection from mirror 10 on mirror 12 is corrected so that a direct projection reaches mirror 12' and any necessary minor corrections are provided in the usual optical way. Beyond mirror 12' the projection is a constant axial projection to the lenses 12^2, 15 where the enlargement in this or any suitable system of lenses provides for the magnification and focusing of the reproduction on a screen 16. This screen may be ground glass or any suitable material best adapted for the purpose.

In Fig. V the alternate mechanism for controlling the projection, comprises a roller 16 mounted to engage the underside of the disc. A shaft 17 carries the roller 16 and supports it with the pressure of the disc regulated suitably to assure the proper turning of roller 16 in unison with the disc. This shaft 17 extends radially underneath the disc, but preferably with one end supported for oscillation, and the other end of this shaft 17 free in order that the roller may be held in fixed relation with the swinging light-arm 1.

Arms 18, preferably two, extend from the end of the light-tube 1 and engage the shaft 17 so as to hold it always a fixed distance from the mirror 10 as the roller 16 slides along its shaft with the movement of the tone-arm and the light-arm. On one side of the roller 16 teeth or studs 19 are provided to give motion, synchronized with each picture negative on the disc, and this motion is transmitted by arm 20 to the mirror 10 to oscillate it on an axis 21. A spring 22 assures a quick return of the lever 20 as its end trips off each successive tooth,—thus providing a gradual movement of the mirror 10 in one direction corresponding to the speed of the image, and a quick return to pick up the next image. Suitable shape of teeth and the proper ratios of parts are provided to assure the desired cooperation of these various parts. In this form of the mechanism the oscillating mirror 10 has a suitable arm 23 at one side which connects with the link 24 and the lever 25, with a return-link 26 which engages the gate 8, and in this manner the proper amplitude of motion of the shutter with a quick spring return and properly timed, synchronizes the light projection from projector 4 with the motion of the mirror after the disc has been suitably adjusted, so that each individual picture will be properly rectified in its final reflection and magnification to the screen. As in the other form, the mirror 12 may also be minutely oscillated in coordination with the motion of the pictures, in order to concentrate each image properly for the ultimate magnification.

It will be understod that the drawings in many respects are diagrammatic, as, for example, the exact lense formula would be selected in accordance with well known knowledge of optics, and the form of linkage and detailed parts will be designed with due regard to lightness, rigidity, and in all to compensate for any question of inertia of motion or rest of the parts, and thereby to assure their functioning in the manner as described.

It will thus be seen that the practice of my

invention may in its usual form be a small talking moving picture machine of a size in the order of the usual phonograph, but operated by a disc having sound record on one side and picture record on the opposite side. Such discs are produced by taking the pictures synchronously with the music or other sounds, and I prefer that the pictures be taken on a greatly enlarged sensitized disc so that the first record may be suitably inspected and retaken if necessary as a matter of practical operation in providing my invention commercially. After the master and much enlarged disc with its pictures in series as a spiral band, corresponding to the spiral convolutions of the sound record simultaneously taken on a master disc, then the entire picture side of the commercial disc is made by reducing the original spiral of pictures to the exact size to correspond with the master sound disc.

It will be understood that the material of the disc is carefully selected in order to provide the necessary transparency for clearness and light efficiency, and also with the proper rigidity in order that the reproduction will properly function. While in one form of mechanism I provide the roller on the top surface and in the other form as in Fig. V, a synchronizing roller for picture reproduction engages the picture side of the record disc, whichever form is used it must be with due respect to the surface of the roller being such as not to mar either the sound record or the picture record, because in the preferred form the light-controlling roller must move with the tone-arm and light-arm so that its speed of mirror and gate hesitation corresponds to the exact position at which the mirror as well as the needle happen to be at any time in the course of reproduction. While the initial production of the record involves first separately producing the sound and separately the pictures, these may be also reproduced as individual discs and fastened together, but in the preferred form, when the master records have been made, their reproduction for commercial use is on a single disc, because in each case the pictures and the sound must be permanently tied together. As a complete machine or instrument, it will be understood that the needle may be dislocated so that the entire machine then functions as a moving picture machine alone, and for certain purposes such picture discs with the suitably cooperating reflecting and projecting mechanism will serve the purposes of my invention without the sound reproduction. Likewise, in case of derangement of the picture production, the machine still is in effect a perfectly functioning phonograph or sound reproducer.

It will be realized that the picture reproduction involves not only miniature negatives compared with an ordinary moving picture film size, but in reality each individual image is extremely minute, and for the usual functioning may be even as small as one or two hundredths of an inch square. However pictures in this order of size are capable of production with present day apparatus, as it is known that even much smaller images have been made by projecting through the individual facets of a fly's eye. For general commercial use, material and apparatus of great accuracy will be required until the reproduction from the master records. Slight adjustment between the picture and sound may be readily made, although the general synchronizing is accomplished by putting the sound and picture record permanently on the same material.

Many variations may be made both as to parts and the mechanism from that herein particularly shown and described,—but what I claim and desire to secure by Letters Patent is:

1. A picture-talking machine comprising a rotatable disc, a sound record integrally formed with and on one side of said disc, a picture record integrally formed with and on the other side of the disc at a transparent portion of the disc between the successive convolutions of the sound record, sound reproducing means functioning with the sound record on one side of said disc, a light source supported on one side of the disc by means permitting intermittent limited reciprocation in its relation to the disc to transmit through the transparent portion of the disc to the picture record on the other side, a reflecting train of mirrors receiving a projection in registration with the light source and picture record and extending to a magnifying projector and having a coordinated intermittent reciprocating motion, and synchronized means in said train intercontrolling the reciprocations of the light source and the reflecting train mirrors whereby a continuous moving picture is projected on a screen synchronously with the sound reproduction.

2. A picture talking machine having picture and sound records integrally formed side-by-side on a single rotatable disc and means for projecting the continuously moving picture images successively from said fixedly related areas of the record while constantly moving to display on a fixed area with uniform light intensity on a screen synchronously with a continuous sound reproduction.

3. A moving picture talking machine, comprising a record having permanently formed and integrally impressed on a single disc coordinated sound record and fixedly related series of miniature pictures, means for continuously transmitting sound upon the rotation of said disc, and means for projecting pictures successively from spots of said disc immediately adjacent the sound record reproduction, having coordinated reciprocating projecting means to deliver the projected images uniformly on a fixed area of a screen.

4. A motion picture talking machine comprising a fixed record of sound and pictures spirally arranged on a disc, means to rotate the disc at a constant speed, a light source and mirror projection on opposite sides of the disc adapted to project a series of motion pictures always from an image immediately adjacent the sound section of the record being reproduced, means for intermittently slightly reciprocating the light source in coordination with the image projection intermittently reciprocating a mirror or reflector train, whereby simultaneous with sound recorded adjacent each image on the record, uniform light is projected during the exposure of each image on the record, and uniform projection of successive images are projected on the identical area of a display screen.

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