Nov. 16, 1943. D. A. ESPER 2,334,547

SYNCHRONIZED SOUND AND PICTURE SEQUENCE PROJECTOR

Filed Oct. 19, 1940 6 Sheets-Sheet 1

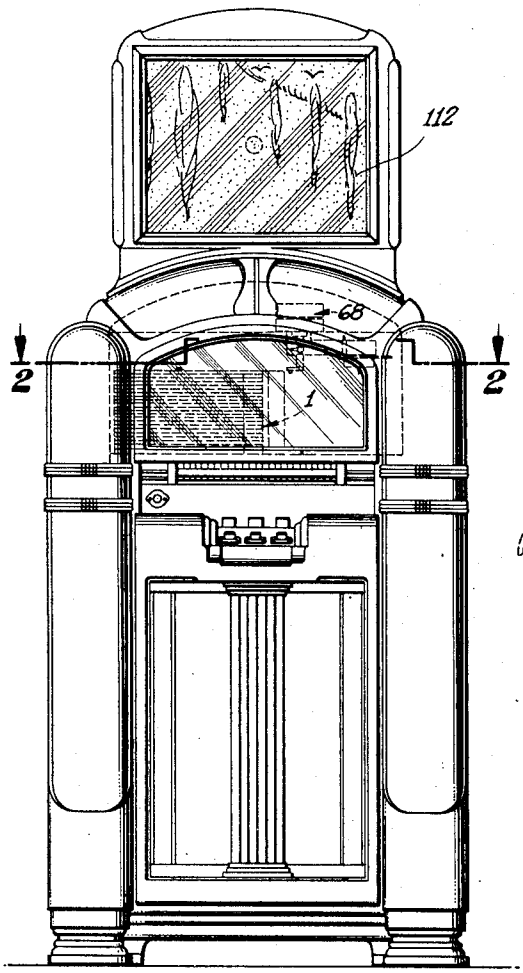

Fig. 1.

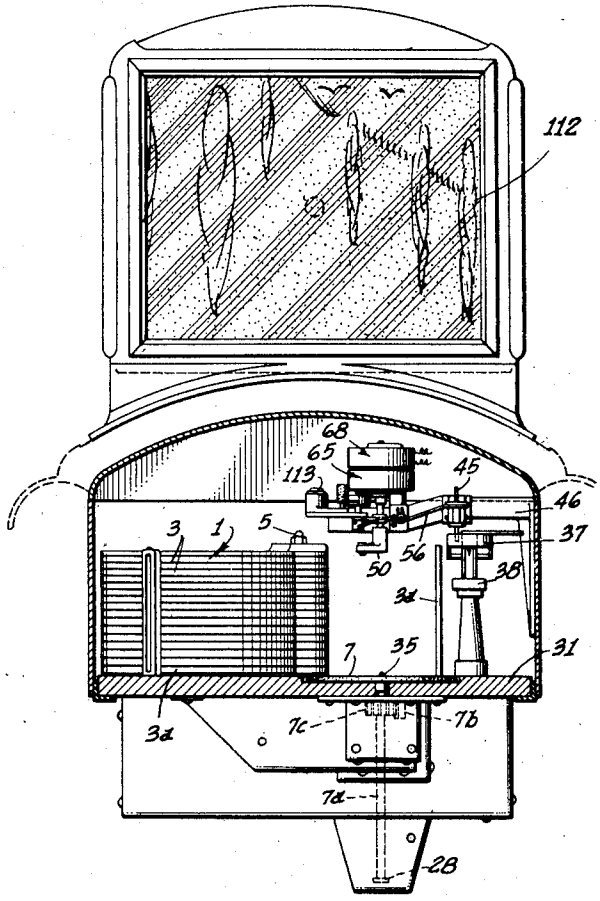

Fig. 3.

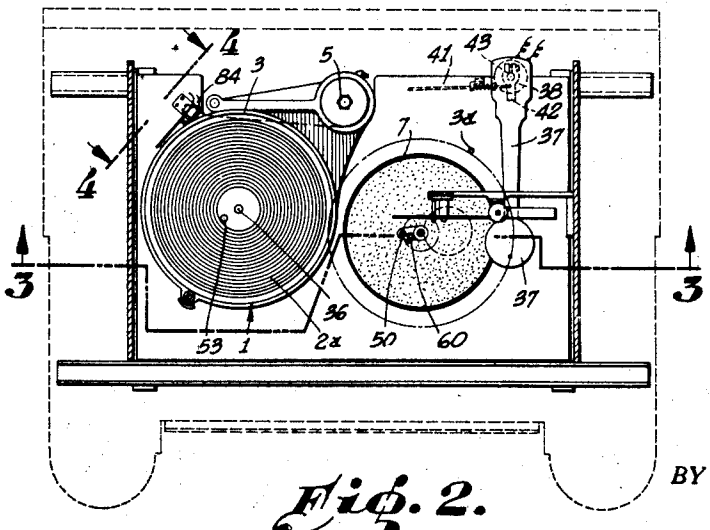

Fig. 2.

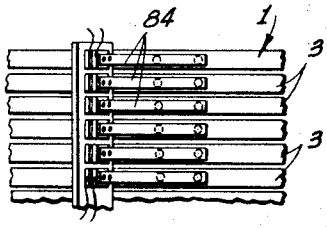

Fig. 4.

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SYNCHRONIZED SOUND AND PICTURE SEQUENCE PROJECTOR

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Fig. 5.

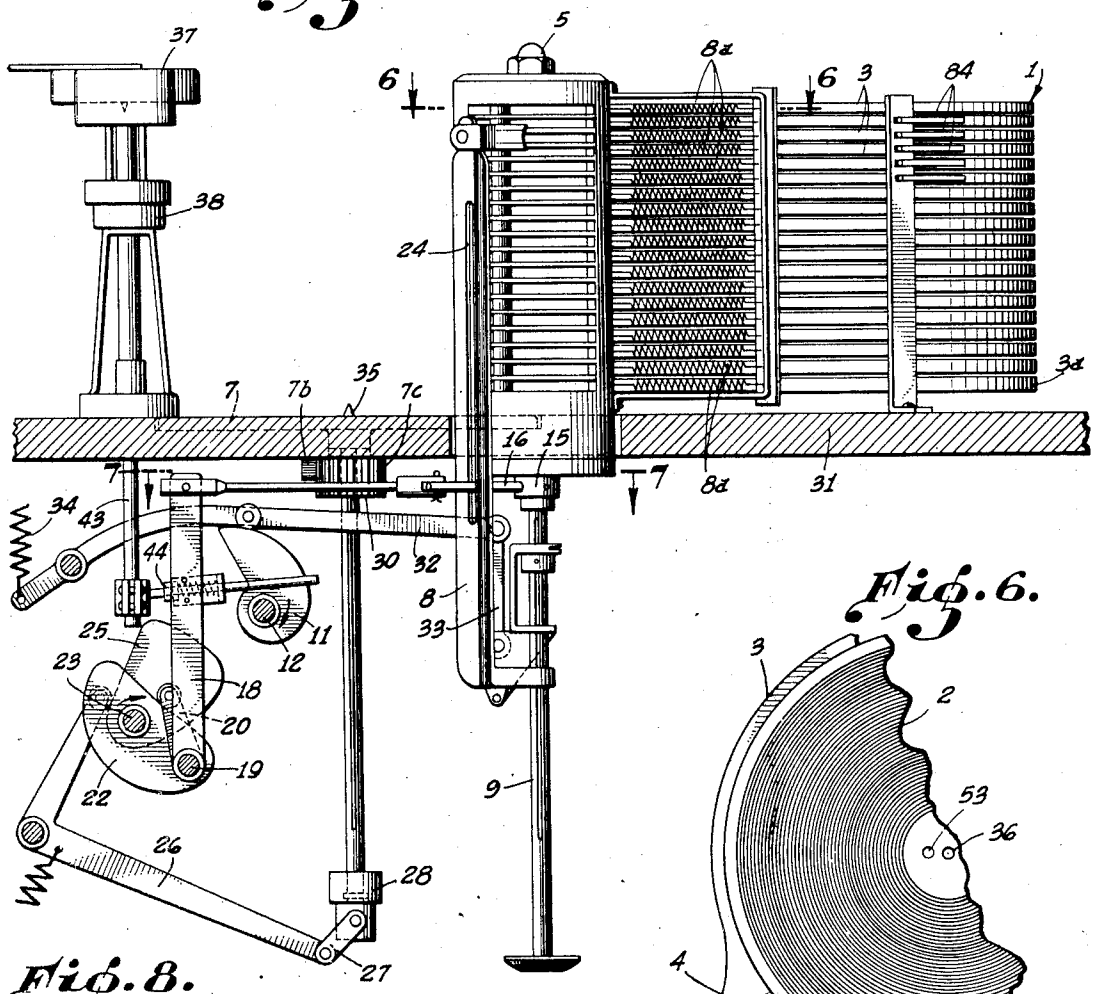


Fig. 6.

Fig. 8.

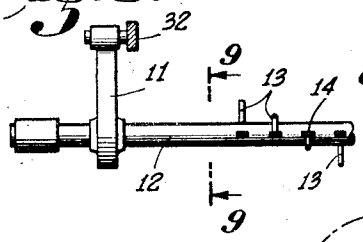
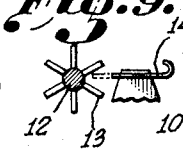


Fig. 9.



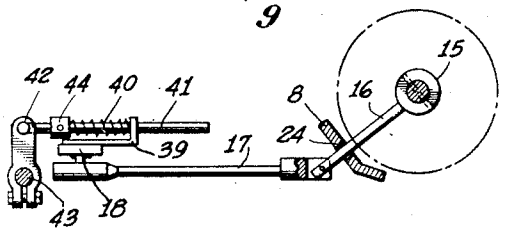


Fig. 7.

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SYNCHRONIZED SOUND AND PICTURE SEQUENCE PROJECTOR

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Fig. 10.

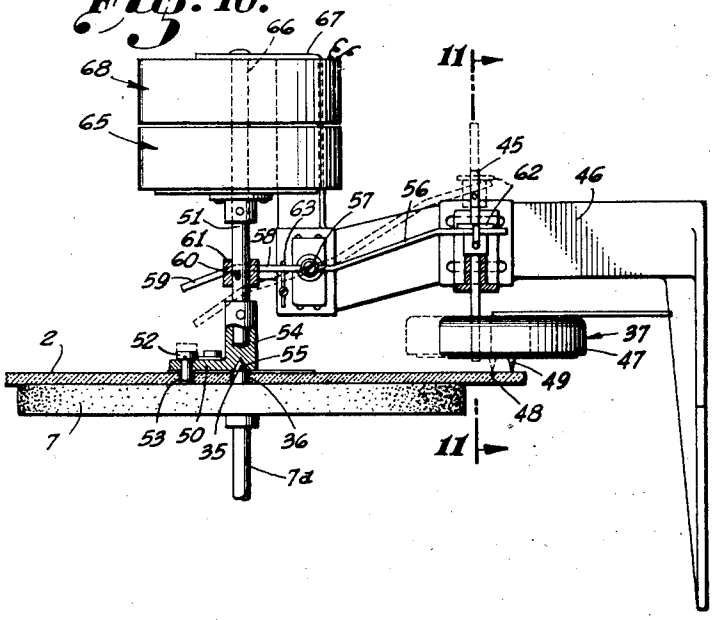


Fig. 11.

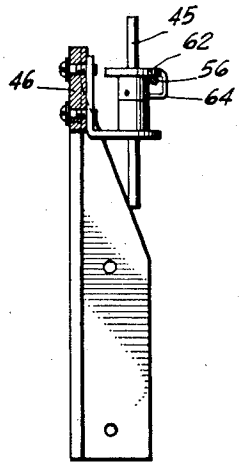


Fig. 12.

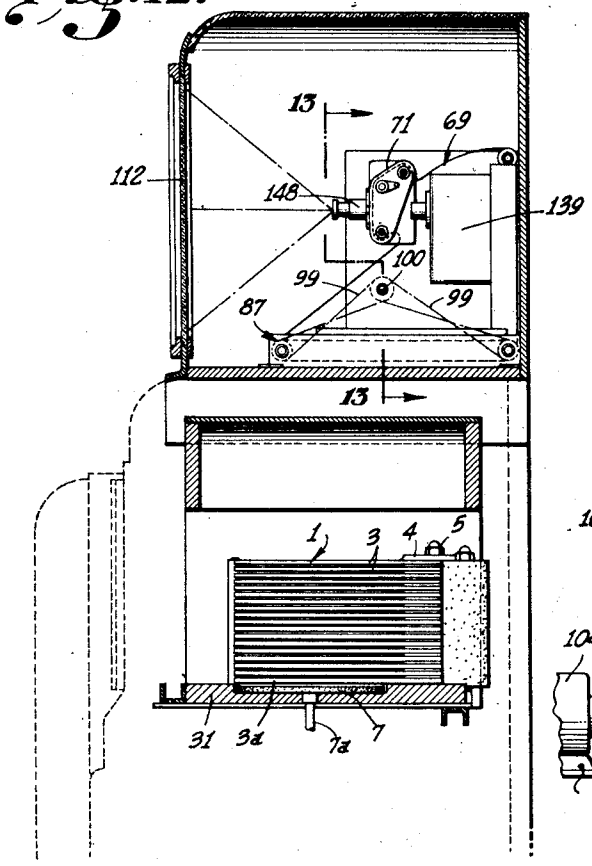


Fig. 17.

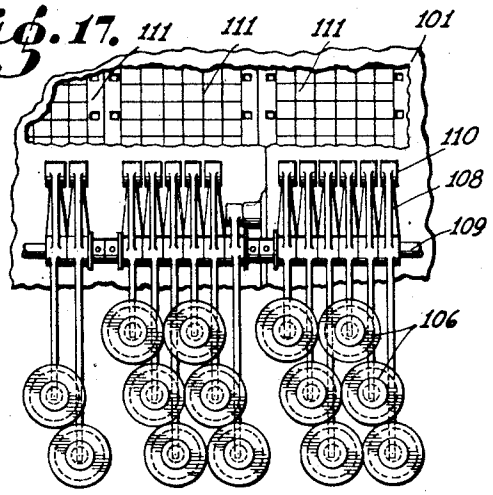
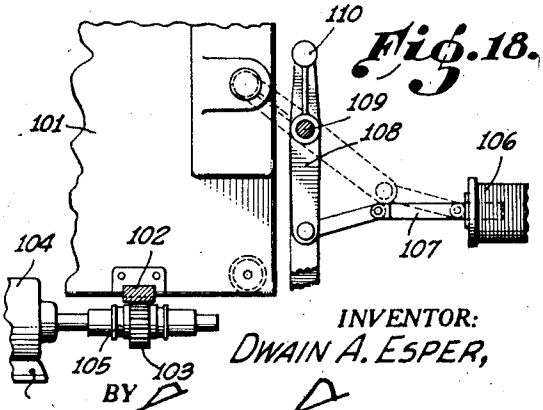


Fig. 18.



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Nov. 16, 1943. D. A. ESPER 2,334,547

SYNCHRONIZED SOUND AND PICTURE SEQUENCE PROJECTOR

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Fig. 13.

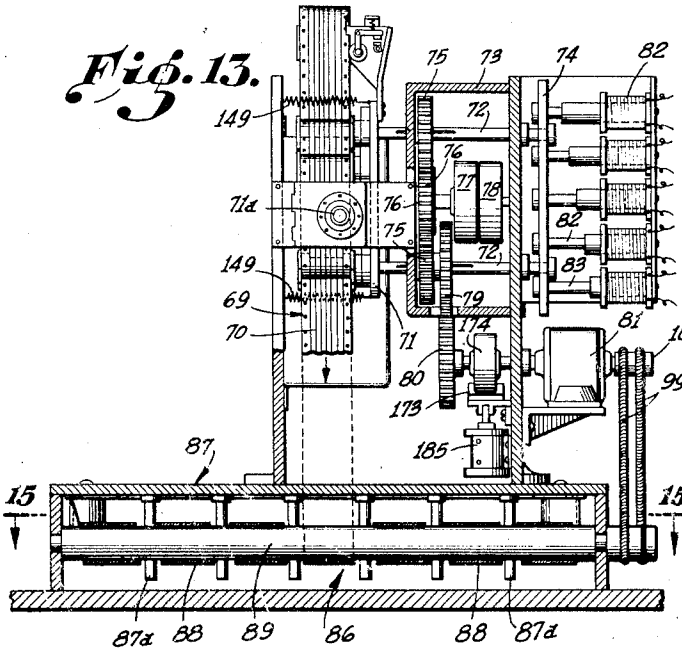


Fig. 14.

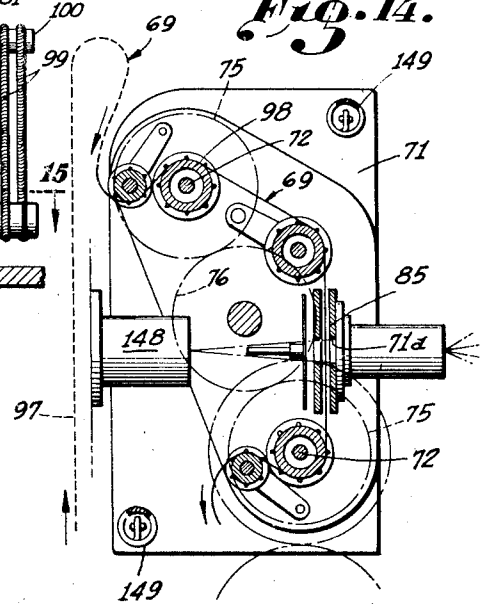


Fig. 15.

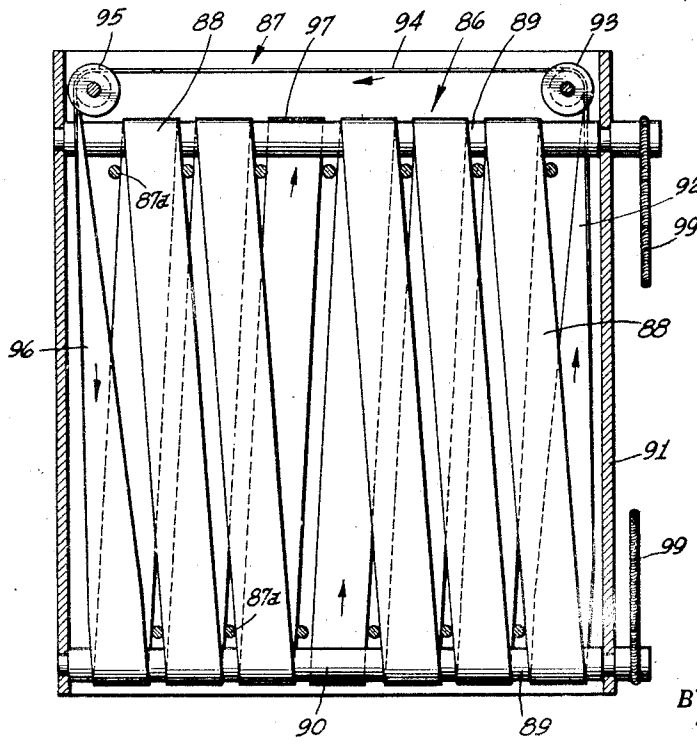
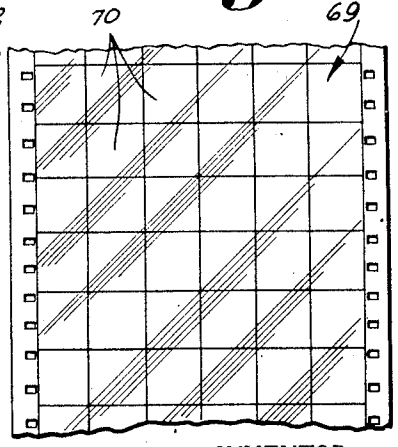


Fig. 16.



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Nov. 16, 1943. D. A. ESPER 2,334,547

SYNCHRONIZED SOUND AND PICTURE SEQUENCE PROJECTOR

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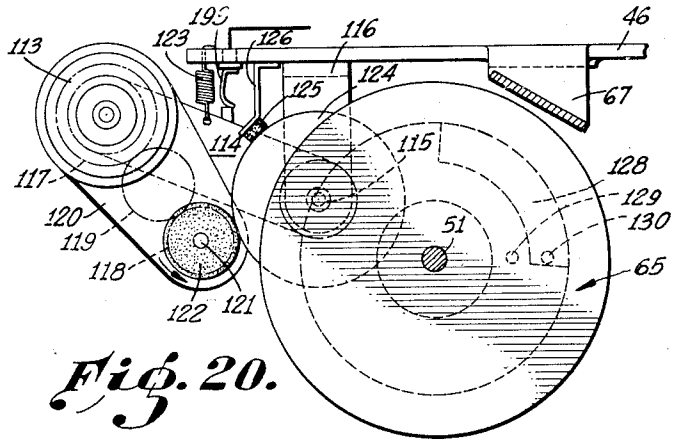

Fig. 20.

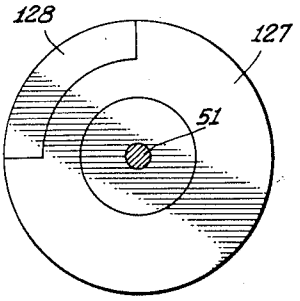

Fig. 22.

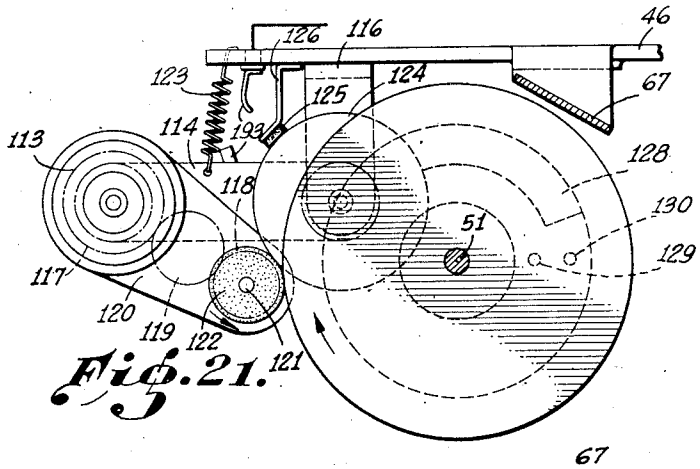

Fig. 21.

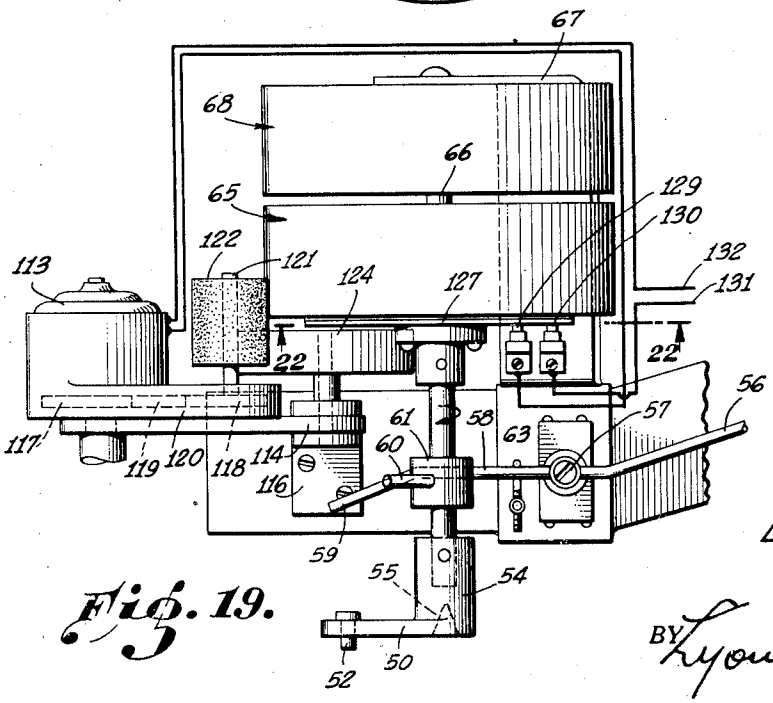

Fig. 19.

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SYNCHRONIZED SOUND AND PICTURE SEQUENCE PROJECTOR

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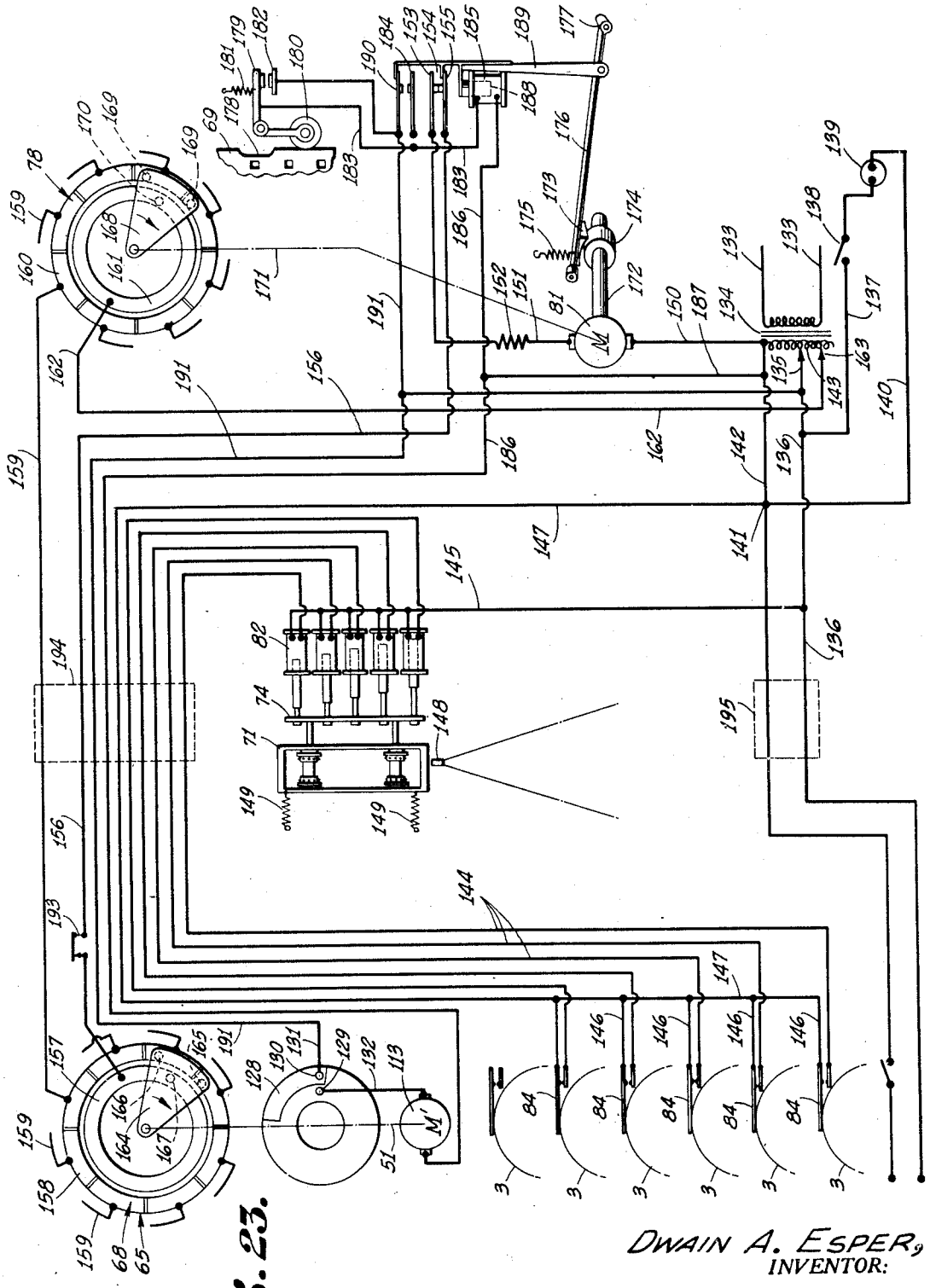

Fig. 23.

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Patented Nov. 16, 1943 2,334,547

UNITED STATES PATENT OFFICE

2,334,547

SYNCHRONIZED SOUND AND PICTURE SEQUENCE PROJECTOR

Dwain A. Esper, La Crescenta, Calif.

Application October 19, 1940, Serial No. 361,924

18 Claims. (Cl. 88—16.2)

This invention relates to the projection of motion pictures with their accompanying sound, and is particularly useful in connection with coin controlled machines. While a machine embodying this invention may be constructed as an original design, the invention is intended particularly as an attachment for a type of coin controlled sound reproducing machine which is now produced commercially. In the type of machine referred to, the operation of the machine is coin controlled, but before the machine goes into operation the person inserting the coin selects the musical piece or record which he desires the machine to play. After the machine plays the record, the record is restored to its normal position and the machine sets itself automatically for operation by the insertion of another coin.

My invention involves the use of film-means composed of a picture sequence corresponding to each sound record of the machine. One of the objects of my invention is to provide automatic means for selecting the corresponding picture sequence for any selected record.

In a machine of this type involving the use of a rigid sound record such as a record cylinder or a record disc, of course it is necessary to provide perfect synchronization between the picture sequence and the sounds reproduced from the record. One of the objects of my invention is to provide means for accomplishing this.

In the machine to which I have applied my invention, the sound records are of disc type and when the machine is at rest they are disposed together in a bank or "magazine." When a certain record is selected and the proper coin inserted, the machine will automatically advance one of the records out and place it on the turntable or platen of the machine preparatory to playing a record. The automatic mechanism for effecting the playing of the record involves, of course, a tone arm with a needle which is automatically set to run in the sound groove of the record. If there is no accompanying projection of pictures, of course it is immaterial at what point on the record the needle engages the record groove and commences to reproduce the sound. One of the objects of the present invention is to provide means whereby the oriented position of the record with respect to its axis of rotation and with respect to the sound record groove on the disc, controls the time of releasing of the needle to the sound groove. In this way perfect synchronization is assured at the start of the display of the picture sequence. A further object is to provide means for continuing the synchronizing of the film drive to the rotation of the record disc.

In the preferred embodiment of my invention, the film means consists of a relatively wide film divided longitudinally into different picture sequences. One of the objects of my invention is to provide means for supporting such a film adjacent to the axis of the projection lens, and then to provide automatic means controlled by the sound record which is selected to effect a lateral and relative shift of the film and the projection lens so as to enable the picture sequence corresponding to the particular sound record selected, to be exhibited.

In the preferred embodiment of my invention, particularly as applied to an automatic record selecting, coin controlled machine, I provide means controlled by the oriented position of the record disc on its axis of rotation for tripping the tone arm to permit the same to commence playing the sound record. One of the objects of this invention is to provide means for insuring that this trip mechanism will be restored to its normal position after each operation of the machine. In other words, I provide means which will insure that the tripping member or arm which engages other parts for determining the point at which the needle will be applied to the disc, will stop in a position clear of these parts which it actuates.

A further object of the invention is to provide means for carrying the film in such a way that it can be used continuously, and so that it will be maintained in a cool condition and without being wrapped in layers on sheaves or pulleys. This insures that the film can be maintained in a cool condition regardless of the fact that it may be repeatedly selected and subjected to the light of the lamp, with the consequent heating effects.

In the preferred embodiment of this invention as applied to a coin controlled disc playing machine of a type in which the disc is laid upon a rotary turntable or platen, I provide means for effecting a driving connection to the record itself. One of the objects of the invention is to provide a drive connection which will insure the starting of the playing of the record when a record is in a definite oriented position with respect to the point at which the sound reproducing needle is applied to the record.

Further objects of the invention will appear hereinafter.

The invention consists in the novel parts and combination of parts to be described hereinafter,

all of which contribute to produce an efficient synchronized sound and picture sequence projector.

A preferred embodiment of the invention is described in the following specification, while the broad scope of the invention is pointed out in the appended claims.

In the drawings, Figure 1 is a front elevation of a machine of commercial type now in use, in which the selection of the record to be played is coin controlled.

Figure 2 is a horizontal section taken about on the line 2—2 of Figure 1, indicating the outline of the housing of the machine in dotted lines. This view illustrates the record magazine in plan and illustrates the tone arm and connections which I employ in this type of machine for insuring that the record will be in the proper oriented position with respect to the time of application of the sound reproducing needle to the groove of the record.

Figure 3 is a vertical section taken about on the line 3—3 of Figure 2, and further illustrating the details of the means which I provide for effecting a driving connection to the record for controlling the tone arm.

Figure 4 is a fragmentary elevation taken about in the plane of the line 4—4 of Figure 2, and particularly illustrating the manner in which the advance of a record automatically closes a circuit to effect the selection of the picture sequence that corresponds to the selected sound record.

Figure 5 is a vertical section passing through a shelf within the housing which supports the tone arm and the magazine for the sound record discs. This view is to illustrate the mechanism used in this type of machine for effecting the selection of the sound record disc and advancing the same out into position over the platen or turntable.

Figure 6 is a diagrammatic plan view in partial section taken about on the line 6—6 of Figure 5, and further illustrating the means for effecting the swinging of the selected record disc out into position over the platen.

Figure 7 is a horizontal section taken about on the line 7—7 of Figure 5, and particularly illustrating the connection to the tone arm shaft for normally holding it in its off position or position of rest through the agency of a part of the mechanism which swings the individual record holder out into position to effect a deposit of the record disc on the platen.

Figure 8 is a fragmentary view, and particularly illustrates a means for controlling the selecting means to select the desired record.

Figure 9 is a vertical section taken about on the line 9—9 of Figure 8, and further illustrating the means whereby the selection of the desired record is effected.

Figure 10 is a vertical section upon an enlarged scale taken on the axis of the platen or turntable and passing through a disc record on the platen. This view illustrates the driving connection which is effected to the record disc when it comes up with the platen to the tone arm to be played. This view particularly illustrates the means associated with this drive from the record for controlling the tone arm and determining the instant when the tone arm is brought into position for insuring that the needle will engage the proper sound groove in the disc. This view omits restoring mechanism for restoring this control mechanism to its normal position which is illustrated in other views.

Figure 11 is a vertical section taken about on the line 11 of Figure 10, and further illustrating the means for controlling the stop for the swinging head of the tone arm to permit the same to come into position over the record disc.

Figure 12 is a vertical section through the casing of the projection mechanism which is located in the present instance directly above the regular housing for the coin controlled sound record player. This view particularly illustrates the arrangement of the continuous film and the means for holding the body of the film and for guiding the same past the projection lens.

Figure 13 is a vertical section upon an enlarged scale, taken substantially along the line 13—13 of Figure 12, and particularly illustrating a means for supporting the film and also the means for shifting the film to select automatically the picture sequence which corresponds to the disc record that is to be played.

Figure 14 is a vertical section taken at the location of the film guide and illustrating the manner in which the film is guided past the projection lens and shutter so as to cooperate with the film holding means illustrated in Figures 13 and 15.

Figure 15 is a horizontal section taken about on the line 15—15 of Figure 13, and particularly illustrating the means for supporting and guiding the film below the projection lens and where the principal length of the film is held stored without necessitating the wrapping of the film in coils on a reel or pulley.

Figure 16 is a fragmentary view showing a short portion of film of the type which I prefer to employ in this machine.

Figure 17 is a fragmentary view illustrating a modification of the means which I may employ for enabling a considerable number of picture sequences to be used where there might be considerable resistance to the shifting of the film carriage in aligning the same with the projection lens.

Figure 18 corresponds to Figure 17 and is a fragmentary view, showing the parts illustrated in Figure 17 as viewed from the right of this figure. Figure 17 is in the nature of a plan, while Figure 18 shows the parts in elevation with the adjusting rack in section.

Figure 19 is a view corresponding to Figure 10 but particularly illustrating the side elevation of the restoring mechanism for restoring the shaft which is driven by the record disc to its normal position of rest.

Figure 20 is a plan of the mechanism shown in Figure 19 and showing this restoring mechanism in its normal position, that is to say, when it is not in operation.

Figure 21 is a view similar to Figure 20 but showing the restoring mechanism in operation to restore the shaft which is driven by the record disc, to its normal position.

Figure 22 is a plan of the circuit breaking disc illustrated in Figure 19. This view is taken about in the plane of the line 22—22 of Figure 19.

Figure 23 is a diagrammatic general view illustrating the controlling and driving parts of the mechanism, including the means for effecting the shifting of the film carriage to align the different picture sequences with the projection lens.

In the machine to which my invention is applied, the mechanism includes a bank or "magazine" 1 of individual rigid records, preferably of

disc form, indicated generally by the reference numeral 2, the uppermost record illustrated in Fig. 2 being indicated by the reference numeral 2a. Each of these records 2 is mounted in a corresponding annular holder 3 (see Fig. 6) and each of these holders has a substantially radial arm 4 projecting out from it. These arms 4 are all mounted for rotation on a vertical standard or post 5. Each arm 4 has an actuating extension or tail arm with a shoulder 6. Whenever a certain record is selected the shoulder 6 of the arm 4 corresponding to that record is engaged by means which will be described hereinafter, and the record is then swung out into position over a rotary turntable or platen 7. The platen shaft 7a is rotated by a rack 7b and splined pinion 7c.

In an original design of a machine embodying my invention, any suitable means may be provided for selecting the disc record which is to be played. In the machine illustrated in the accompanying drawings, a selector bracket 8 is provided (see Fig. 5) which is guided to slide up and down on a vertical guide post 9. The upper end of this bracket carries a dog 10 which, when the bracket 8 is raised, will align itself directly opposite the shoulder 6 (see Fig. 6), and after this occurs the selecting bracket 8 is rotated on the axis of the guide post 9 so as to swing the record out into position over the platen 7. In the present machine the selector bracket 8 is pulled up to the proper extent through the agency of a cam 11 rigidly mounted on a cam shaft 12 (see Fig. 5). This cam shaft 12 carries a series of radial pins 13 (see Fig. 8), and when the person operating the machine selects a certain record he pushes forward a slide or stop, such as the stop 14, which lies opposite a certain one of the radial pins 13. When the machine is operated, one of these pins 13 and its cooperating stop 14 will stop the rotation of the cam 11 in the proper position to determine the proper elevation for the selecting finger or dog 10. Of course this cam 11 has a spiral form such as that shown in Fig. 5.

After the record disc 2 has been swung out into alignment with the platen 7, the holder 3 rests against a stop 3a. Then the platen rises and lifts the record out of the record holder 3. In the machine illustrated the swinging movement of the record holder 3 is accomplished through the agency of a collar 15 that is loose on the guide post 9 and which carries a radial arm 16, the end of which is connected with a link 17 pivotally attached to an arm 18 carried on a shaft 19. The arm 18 is really the arm of a bell crank lever, the other arm 20 of which has a roller 21 running on a cam 22 and carried on another cam shaft 23. At the proper moment in the operation of the machine, this cam shaft 23 will rotate and its cam will rock the arms 20 and 18 to swing the arm 16 in a direction to actuate the selector bracket 8. The selector bracket 8 has a longitudinal slot 24 in it to permit the selector bracket to be raised to any necessary position to advance the record. In Fig. 5 the selector bracket is indicated in a raised position, but normally it is in a depressed position with the dog 10 located opposite to the bottom record which is carried in the bottom record holder 3d. A coil spring 8a returns each record holder.

When the platen 7 must rise to carry up the record 2, it is actuated in the present machine through the agency of a cam 25 on the cam shaft 23, which actuates a bell crank lever 26 the long arm of which is connected through the medium of a link 27 and a swivel collar 28 to the lower end of the shaft 7a of the platen. In this way the shaft 7a will be shifted upwardly longitudinally through a guide 30 carried by the under side of the frame member or shelf 31 which supports these parts.

The selector bracket 8 is raised through the agency of the cam 11, already described, and a cam lever 32 which is connected by a link connection 33 to the lower end of this bracket. The roller of this cam lever 32 is normally held on the face of the cam by a spring 34 attached to the tail arm of this cam lever.

The platen 7 is provided with the usual tapered center pin 35 which passes into the center opening 36 of the record disc carried in the holder 3 that is presenting the record to the platen. This of course centers the record.

In accordance with my invention, I provide means to enable the record to control the usual tone arm 37 of the instrument. This tone arm is mounted for rotation on a nearly vertical axis on a post 38 (see Figs. 2 and 3), and it is normally held in a position displaced toward the right of the platen as indicated in Fig. 2. It is evenly held in this position in machines of this type by a construction such as shown in Fig. 5, in which the vertical lever arm 18 carries a small bracket 39 (see Figs. 5 and 7), and in the normal position of the arm 18 this bracket thrusts against a coil spring 40 which is carried on a stem 41 that runs freely through the bracket, the end of the stem being pivotally attached to the short arm 42 on the shaft 43 which carries the hub end of the tone arm 37. In other words, when the arm 18 moves to the right as illustrated in Fig. 7, there will be no compressing force on this spring 40 exerted against an adjustable car 44, and hence the shaft 43 is left free. In machines of this kind the shaft is weighted in such a way, or else is disposed slightly out of vertical line so that when it is left free in this way the tone arm 37 will gravitate in a direction to cause it to swing toward the center of the platen, in other words, toward the left as illustrated in Fig. 2.

In accordance with my invention I provide a small stop, preferably in the form of a pin 45 (see Figs. 3 and 10), which pin is guided to slide vertically on a fixed bracket 46 (see Fig. 10). The side of the tone arm 37 rests against this pin. This aligns the needle 49 with the groove 48 in which the sound record starts. And I provide automatic means brought into operation by the disc 2a to effect the raising of this stop pin at the proper moment so as to fill the pick-up head 47 of the tone arm to enable it to swing in and follow the sound groove 48 as the record rotates.

In order to effect the withdrawal or raising of this stop pin 45 at the proper instant, and also in order to provide synchronizing control of the film driving mechanism, I provide a part directly over the record disc 2a which effects a connection to the record disc when the platen 7 rises. In doing this I provide a single means on the record disc located at a certain definite oriented point with respect to the point on the record disc at which the needle 49 is to be applied when the record starts to play. For this purpose I prefer to provide a synchronizing arm 50 which is attached to a synchronizing shaft which I employ to drive the synchronizing device, which will synchronize the driving mecha-

nism for the film to the record 2ª and the platen 1. This synchronizing arm carries a small driving pin 52 which is guided to slide vertically in the arm 50 and which is capable of entering a driving hole or socket 53 in the central part or nave of the record within the inner limits of the zone of the record which carries the record groove (see Fig. 2). The hub 54 of this synchronizing arm 50 is preferably provided with a conical socket 55 to receive the tapered pin 35 at the center of the platen. When the record disc comes up into place this small driving pin 52 engages in the driving socket 53 so that the record disc 2 will commence to drive the synchronizing arm 50. When the synchronizing arm starts to rotate, it immediately and automatically raises the pin 45 so that the tone arm is permitted to travel in toward the center of the record, being controlled by the groove 48 acting on the needle 49 in the usual manner. For this purpose the shaft 51 is provided with a cam or similar means operating as the shaft rotates to lift a lever 56 which is pivotally mounted at 57.

This lever is provided with an actuating tail arm 58 with a downwardly bent end 59, and this downwardly bent end is in the path of a radially projecting pin 60 whch projects out from a collar 61 carried on the shaft 51. When this radial pin 60 strikes the inclined end 59, it rides up on it and pulls the lever 56 up to the position such as that indicated in the dotted lines in Fig. 10. This raises the release pin 45 through the agency of a collar 62 having a flange underneath which the end of the lever 56 extends (see Fig. 11). An adjustable stop 63 (see Fig. 10) is provided for adjusting the position of the bent tail 59 of this lever 56. If desired, the collar 62 may be swiveled on the pin 45 and the operating end of the lever 56 arranged to project through a wire loop 64 on the collar which prevents the end of the lever 56 from getting out of operative connection with the collar.

The driving mechanism for the film and the means for synchronizing same will now be described. For this purpose I provide a suitable synchronizing means driven by the shaft 51 to synchronize the film drive to the record 2. This synchronizing device preferably includes a rotary synchronizer head 65 which is supported for rotation on a central shaft 66, which in turn is supported on an upper bracket 67 on which the fixed member 68 of this synchronizing device is supported.

Referring particularly to Figs. 13 to 15, I provide film means 69 which in the present instance consists of a relatively wide film (see Fig. 16) having a plurality of picture sequences 70, each of which corresponds to a particular record of the group of records in the machine. In other words, these picture sequences 70 which are indicated diagrammatically in Fig. 16 extend longitudinally along the film and are disposed side by side with each other. In accordance with my invention, when a particular record is selected, a shift is effected between the projection lens and the film so as to bring the proper picture sequence 70 into line with the projection lens. Of course this could be effected by shifting either one of these elements in relation with the other, but in the present instance I support the film 69 on a shiftable carriage 71, said carriage being supported on horizontal shift bars 72 (see Fig. 13), and these shift bars 72 are mounted to slide freely through their supporting frame 73, their heads being attached to a shift plate 74. This shift plate is actuated automatically to shift the proper distance to bring the different picture sequences 70 into line with the light aperture 71ª which is in line with the projection lens. The shift bars 72 also operate as rotary shafts for driving the film 69, and this is effected through the medium of a gear train, including two gears 75 splined on the shaft 72 and connected by a synchronizing gear 76. The synchronizing gear 76 carries a rotary synchronizing head 77 which operates with a fixed synchronizing head or commutator head 78 which is connected up by means to be described hereinafter to the segments of the synchronizer head 68 illustrated in Fig. 10. The lower gear 75 is rigid with a gear 79 which meshes with a driving gear 80 driven by an electric motor 81.

In order to pull the carriage 71 over to align the different picture sequences 70 with the light aperture 71ª, I provide a plurality of electromagnets 82 (see Fig. 13). These magnets have cores 83 of different lengths that extend into them, the said cores being attached to the shift plate 74. When a certain solenoid 82 is energized it will pull the shift plate 74 over a distance corresponding to the length of the core 83. In the present construction shown in Fig. 13, there are five of these magnets. This corresponds to a film 69 having six picture sequences, because in one position of the film 69 one of the picture sequences 70 can be in line with the light aperture. It is therefore only necessary to make five shifts of the carriage to line up the other picture sequences with the light aperture. The electromagnets 82 are all in circuit respectively with switches 84 (see Fig. 5) which correspond respectively to the different record holders 3. These switches are held open by the record holders when they are in their normal position, but as soon as a record holder moves forward the switch closes and closes the circuit to its corresponding electromagnet 82. It is not necessary at this time to describe this circuit arrangement in detail. This will be done in connection with the diagrammatic view, Fig. 23.

Referring again to Figs. 13 to 15 inclusive, the film 69 is guided over suitable driving pulleys or idlers supported on the carriage 71, which operate to guide the film through the film guide 85 (see Fig. 14) and past the light aperture 71ª. The film that passes on this carriage 71 is formed as a large loop extending up from a film carrier 86 (see Fig. 13) which is located below the carriage 71 mounted in a suitable housing 87. In this housing 87 the body of the film is carried in a series of loops 88 supported on two parallel shafts 89 disposed apart. After the film 69 passes downwardly from the light aperture 71ª, it passes on to the adjacent shaft 89 at about the point 90 near the middle of this shaft. The film then forms the right-hand portion of the series of loops 88 until it arrives over adjacent to the right-hand wall 91 of the film housing 87, and at this point there is a half twisted run 92 of the film that passes over and around a guide pulley 93, from which a straight run 94 passes over to another similar pulley 95 at the left. At this point a half twisted run 96 of the film passes over to the opposite shaft 89, and from this point on the left series of loops 88 are formed, disposed toward the left of the middle plane of the housing 87; and after completing these left-hand loops the film passes upwardly in the run 97 as indicated by the dotted lines in Fig. 14, so as to be re-

ceived by the uppermost film pulley 98 of the pulleys that guide the film through the film guide 85. Guide pins 87a separate the loops 88.

The two shafts 89 are driven in the same direction by two round belts 99 which pass over a long driving pulley 100 on the shaft of the motor 81 (see Fig. 13).

Although in Fig. 16 I have illustrated a film 69 carrying only six picture sequences, my invention is also adapted to use in a machine of this general character in which more than one film, such as the film 69, is provided. In other words, two or three films could be provided alongside of each other, each film carrying six or more sequences. In this case, however, it might be necessary to provide more powerful means than electromagnets for effecting the shifting of the film carriage and for giving the film carriage a relatively greater possible movement. A construction such as this is illustrated in Fig. 17, in which 101 indicates the film carriage which is provided with a rack 102 meshing with a pinion 103 driven by a motor 104 through a friction drive 105. An electromagnet 106 would be provided corresponding to each record, and to be energized by one of the switches 84 (see Fig. 5). Each one of these electromagnets would have a core 107 connected to a rotary stop 108. These rotary stops would be mounted on a fixed bar 109 and when the electromagnet was energized, the upper end 110 of the proper stop would be swung over as indicated by the dotted lines in Fig. 18 into the path of the carriage. In this way a selected stop would permit the carriage to have the proper amount of movement to align any one of the picture sequences of the different films 111 (see Fig. 17) with the light aperture.

In the mode of operation of the machine it should be understood that after the record has been played and the synchronized film exhibited as moving pictures on the screen 112 which is mounted above the housing of the machine (see Figs. 1 and 3), it is necessary to restore the synchronizer shaft 51 to its normal position of rest. This is particularly necessary in order to be certain that the stop pin 45 will always be left in its depressed position to operate as a stop for the tone arm and stop it in the proper position until the playing of the record is to commence. For this reason I provide a restoring mechanism, illustrated in Figs. 19 to 22 inclusive. This mechanism is normally at rest, and performs no function while the machine is in operation. However, as soon as the machine ceases to operate this restoring mechanism comes into operation and rotates the shaft 51 back to its proper oriented position of rest. This can be accomplished in any suitable manner but is preferably accomplished by providing a motor for rotating this shaft and automatically cutting out the motor circuit by an insulated spot in a rotary circuit breaker disc. In order to accomplish this I prefer to provide a small electric motor 113 which is mounted on the end of a lever 114 pivotally supported at 115 on a fixed bracket 116.

A gear wheel 117, indicated by a dotted line in Fig. 20, drives a gear wheel 118 through an idler 119. These gears are all mounted in an arm 120 and the gear 118 has a shaft 121 which extends upwardly and carries a roller 122 with a flexible covering, such as rubber. The arm 114 is normally held in a position of rest by a coil spring 123, and at this time the rubber tire of the roller 122 is out of contact with the periphery of the synchronizer head 65, which is of course of circular form. The roller 122 is a long roller, and its lower end is always in contact with a drag wheel 124 which is mounted to rotate on the same axis as the pivot 115 for the arm 114. The periphery of this drag wheel 124 is engaged by a brake block 125 which is pressed lightly against its periphery by a light spring 126. Below the lower end of the synchronizer head 65 a contact disc 127 is provided, the end face of which is illustrated in Fig. 22. The body of this disc is of a conductive metal but the disc is provided with a segment 128 of insulating material.

The circuit which goes to the motor 113 for driving it, must pass through two brushes 129 and 130 which touch the under surface of the disc 127. The brush 129 is always in contact with the metal of the disc but the brush 130 is further out and can be cut out of circuit by the insulating segment 128. By an automatic switch arrangement which will be described hereinafter, when the running of the film is terminated, the circuit through the wires 131 and 132 which lead to these brushes is closed, and when this occurs the motor 117 is driven. This will cause the motor to drive the pulley 122 in the direction of the arrow indicated in Fig. 20. By reason of the drag on the drag wheel 124, the pulley 122 will roll around on the outer surface of the drag wheel 124 until the surface of the roller comes against the outer surface of the synchronizing head 65, and as soon as this happens the synchronizing head 65 will commence to rotate and this will rotate the shaft 51 in the direction of the arrow shown in Fig. 19. However, the insulating segment 128 is placed in a certain position with reference to the cam pin 60 on the shaft 51 so that when the insulating segment 128 breaks the circuit at the brushes 129 and 130, the cam pin 60 will be left out of contact with the bent end 59 of the lever 56. The closing of the circuit through the wires 131 and 132 is controlled automatically by the film 69, and preferably by means of a notch, and in the manner which will now be described.

In Fig. 23 I illustrate some of the apparatus, together with the wiring diagram. Referring to Fig. 23, the operating current from the commercial line comes in on the commercial circuit wires 133 through a switch, not illustrated, and this commercial circuit is connected up to a transformer 134, including an adjustable contact 135 which employs the secondary coil of the transformer as a rheostat. A circuit wire 136 leads off from this contact and connects with a branch wire 137 leading through a switch 138 which may be a hand switch or a coin-controlled switch. Beyond this switch the current flows through the projection lamp 139 which is employed in the machine, and thence back over a return wire 140 to connect up at 141 to a conductor 142 which connects to the other end of the secondary coil 143 of the transformer.

At the left of this diagram the numeral 3 indicates the different disc records which have been referred to as carried in the record magazine 1. All except one of these record holders have the switches 84 associated therewith, and when the record holder swings over, this switch is permitted to close. Each of these switches has its own individual branch wire 144 which leads over and is connected to a corresponding one of the electromagnets 82 illustrated in Fig. 13. The other ends of the coils of these electromagnets 82 are connected up to a return wire 145 which leads over to the other side of the circuit; that is, it connects to the line wire 136 just described.

The relatively movable contacts are connected up by corresponding branch wires 146 to a trunk main 147 which may also connect up to the conductor 142 at the point 141 already described. With this arrangement it will be evident that when any one of these coils 82 is energized, the film carriage 71 will be pulled over a distance corresponding to the movement that is possible for the core of the particular solenoid which has been energized. This of course lines up the corresponding picture sequence 70 on the axis of the projection lens 148. The film carriage is normally held in its position of rest by coil springs 149, and these springs of course return the carriage to its normal position after being actuated. In this position of rest, of course, the extreme right-hand picture sequence 70 is in line with the lens.

At the right of the diagram in Fig. 23 the motor 81, already described, is indicated, and marked also with the symbol M for convenience in reading the diagram. The operating circuit wires 150 and 151 carry current through this motor from one end of the secondary coil 143 through a resistance 152, and thence to the contact 153 of an automatically controlled motor switch 154, said contact 153 being a fixed contact and cooperating with a movable contact 155, as will be described hereinafter. From the movable contact 155 the current passes on a conductor 156 over to the inner contact ring 157 of the fixed synchronizer head 68, illustrated in Fig. 10. This synchronizer head is constructed as a commutator, and includes a plurality of insulated segments 158 which are connected up individually by wires 159 to corresponding segments 160 of the fixed synchronizer head 78 described in connection with Fig. 13.

The center contact ring 161 of this synchronizer head 78 is connected by a wire 162 to the lower end of the secondary coil 143 at the contact 163, as illustrated in this diagram.

The driven synchronizer head 65 includes a brush carrier 164 of sector form which is sufficiently wide at its outer end to bridge two of the segments 158 simultaneously, and this part of the brush carrier carries two brushes 165 and 166 which ride on these segments 158. The brush carrier also carries an inner brush 167 which rides on the inner contact ring 157. This brush carrier 164 is fixed in the driven synchronizer head 65 which is attached to the shaft 51 and driven thereby from the record disc 2 which is being played on the revolving platen 7.

The driven synchronized head 77 (see Fig. 13) which is on the shaft of the gear wheel 76 is also provided with a brush carrier 168 similar to the brush carrier 164, already described, and provided with two segment brushes 169 disposed on the carrier like the brushes 165 and 166; and this brush carrier also carries an inner brush 170 to run on the center contact ring 161.

In connection with this diagram, it should be stated that the long dotted line 171 leading from the brush carrier 168 down to the motor 81 diagrammatically indicates the driving connection between the motor 81 and the driven synchronizer head 77.

The shaft 172 of the motor 81 carries an electrically controlled brake shoe 173 to cooperate with a brake drum 174, and this brake is normally held off by a coil spring 175. The brake shoe is most conveniently carried on a brake lever 176 pivotally supported at 177, and this brake is automatically applied when the display of the film is completed, by a means to be presently described.

When the display of the film 69 is completed, means carried on the film, such as a notch 178, arrives at the switch member 179, which has a roller 180 lightly pressed against the edge of the film by a spring 181. When the roller arrives at the notch this contact 179 engages a fixed contact 182. The movable contact 179 is connected by a wire 183 to a relatively fixed switch member 184, and beyond this point connects to a solenoid coil 185, the other end of which coil is connected by a wire 186 and wire 187 back to the line wire 142. When the notch controlled switch 179—182 is closed, the coil 185 is energized and pulls down upon the solenoid core 188, and this core is carried on a link 189 pivotally attached below to the brake lever 176, already described. This immediately applies the brake shoe 173 to the brake drum 174. At the same time the upper end of the link 189 engages the movable contact 155 and pulls it down away from the fixed contact 153, thereby breaking the motor circuit through the motor 81.

Cooperating with the relatively fixed contact 184, already described, I provide a movable contact 190 which is also actuated by the upper end of the link 189. This contact 190 is pulled down against the relatively fixed contact 184 to close a restoring circuit through the restoring motor 113, already described. For convenience in reading the diagram this motor, which is indicated at the left of the diagram in Fig. 23, also carries the symbol M' to indicate that this part 113 is a motor. The controlling circuit to the restoring motor 113 is carried through a wire 191 from the contact 190 over to a lead-in wire 131, already described, which connects up to the brush 130 (see Fig. 21). The other brush 129 is connected to the wire 132, already decribed, which leads current through the restoring motor 113, the other side of the motor being connected by a wire 192 back to the wire 186 so that the current from this point is carried to the wire 187, already described, back to the main wire 142.

It will be evident that the solenoid 185 therefore not only breaks the motor circuit for the motor 81 but it also establishes a running circuit for the restoring motor 113, and this restoring circuit is maintained until the insulating contact 128, already described, comes under the brush 130. When this occurs the motor circuit through the restoring motor is broken. When this circuit through the restoring motor is broken, this also breaks the circuit through the solenoid 185, and the spring 175 will pull the brake lever 176 up and restore the switches at 153 and 184 to the condition in which they are indicated in Fig. 23.

In order to prevent any possibility of any one operating the machine while the parts are being restored to their normal starting position by the restoring motor 113, I prefer to provide a special switch 193 in the wire 156 (see Fig. 23, where this switch is indicated diagrammatically). This switch is opened automatically when the arm 114 carrying the motor 113 swings forwardly toward the position illustrated in Fig. 21. When this switch 193 is open, it is evident that the motor switch 154 cannot carry any current to the motor 81.

In the diagram, Fig. 23, dotted lines 194 indicate diagrammatically that all of the wires passing through this line are carried in a cable. Likewise, the dotted line 195 indicates that the wires 142 and 136 are carried in a cable.

The general mode of operation of the entire machine will now be briefly described. When the selecting means for selecting a record 2 to be played, is operated, the machine will then automatically operate the cam shaft 12 (see Fig. 5) to raise the lever 32, and through the medium of the link 33 also raise the selector bracket 8. The upper end of this selector bracket will move up to a point opposite the record which has been selected and bring the dog 10 (see Fig. 6) into position behind the shoulder 6 of the record holder 3 which is to be operated. The cam shaft 23 will then rotate and operate the cam 22 to advance the lever arm 18 and thereby impart movement to the link 16 to swing the selector bracket 8 on the axis of the guide post 9. This will swing the record holder out into position over the platen. The cam 25, also on cam shaft 23, will then come into operation and operate the bell crank lever 26 so as to raise the swivel head 28 and shift the platen shaft 29 upwardly. When this occurs, the center pin 35 of the platen will enter the center opening 36 of the record and will carry the record upwardly out of the record holder 3. Toward the end of the upward movement of the record on the platen, the upper face of the record will contact the driving pin 52 and this pin will drop easily into the driving socket 53 for it, in the record (see Fig. 10), as the rotation starts.

When the arm 18 moved to the right to swing out the record holder, it will have moved the bracket 39 (see Fig. 7) toward the right so as to relieve the shaft 43 of the tone arm 37 of pressure upon it through the spring 40. The tone arm will then gravitate or swing under light spring pressure (if a spring is employed) over against the stop pin 45 which will be still in its depressed position indicated by the dotted lines in Fig. 10. As soon as the record 2 has sufficiently rotated the synchronizing arm 50, the shaft 51 will have rotated so that the projecting finger or pin 60 will move around and strike the inclined tip 59 of the pin actuating lever 56, which will then rock on its pivot 57 and raise the pin 45. The needle 49 will have already seated itself in the sound groove 48 and the playing of the record will commence. As soon as the shaft 51 commences to rotate the brush holder 164 in the synchronizer head, the motor 81 will commence to rotate through the agency of current supplied to it through the synchronizer brush carrier 168.

When a selected record swings out into position, the departure of its record holder 3 will effect a closing of the corresponding record switch 84, and this will close a corresponding circuit through a corresponding solenoid 82, thereby pulling the film carriage 71 over to the proper point to align the corresponding picture sequence 70 with the projection lens 148. The display of the picture and the simultaneous reproduction of the sound on the sound record will then occur. Their synchronism is originally established by reason of the fact that the synchronizing arm 50 has a definite oriented position with respect to the point on the record groove 48 over which the needle 49 is located, and of course after the performance commences, the motor 81 for driving the film is synchronized to the speed of rotation of the platen 7. After the performance is completed and the end of the picture sequence on the endless film is reached, the notch 178 will come under the roller 180, whereupon the switch 179—182 will close. This closes a circuit through the solenoid 185 which pulls down the link 189, thereby pulling down the movable contact 155 and thereby opening the motor switch 154. Pulling down the link 189 also applies the brake 173 to the brake drum 174 of the motor 81 and stops the motor immediately. When the coil 185 pulls down the link 189, it also brings the movable contact 190 against the relatively fixed contact 184, thereby maintaining and holding circuit through the coil 185 so as to maintain this circuit closed, in spite of the fact that the notch 178 has ridden out from under the roller 180. The closing of the contacts 190 and 184 also closes the restoring circuit through the restoring motor 113, and this motor will rotate the shaft 51 regardless of what position it is left in when the platen 7 descends. This restoring motor will rotate the shaft 51 until the insulating segment 128 engages the brush 130, whereupon the circuit through this restoring motor 113 will be broken and the restoring motor will return to its normal position of rest, indicated in Fig. 20.

When the restoring circuit is established through the restoring motor, the rotation of the restoring motor drives the gears 119 and 118, the latter of which carries the long roller 122 which is always in engagement with the drag wheel 124. When the roller 122 starts to rotate, it will exert a traction effort on the periphery of the drag wheel 124 and will pull the arm 114 of the motor away from its normal position, and eventually bring it over to the position in which it is indicated in Fig. 21. The roller 122 will then engage the face of the synchronizer head 65 and give it the desired rotation that eventually brings the insulation segment 128 over the brush 130 to break the circuit.

Of course in the normal position of the machine, the springs 149 keep the film carriage 71 in the normal position in which the first set of picture sequences at the right of the film 69 are in line with the projection lens 148. To project this set of pictures no movement of the carriage is necessary.

The mode of operation of the carriage and associated mechanism, illustrated in Figs. 17 and 18, has been described in detail hereinabove. At this point it may be said, however, that the type of carriage illustrated in Figs. 17 and 18 is one which is adapted to carry a considerable number of films, for example, three films 111, as illustrated. As this type of carriage requires more force to operate it, this is accomplished through the medium of the motor 104, circuits through which would be automatically established by means not illustrated, when the machine is operated. The motor, through the friction drive 105, would drive the pinion 103 so as to exert a force upon the rack 102 which would shift the carriage 101 along its guide. The carriage would be stopped by one of the movable stops 110 whose solenoid 106 has been actuated by the corresponding record holder, to cause the stop to move over into the path of the carriage.

What I claim is:

1. In a motion picture and sound apparatus, for reproducing the action of actors with accompanying sound effects reproducing the speech of the actors accompanying their action, the combination of a plurality of disc-form sound records exceeding two in number, means for selecting and playing any one of the same, film-means independent of the said sound records including a film with a plurality of picture sequences disposed alongside of each other and corresponding respectively to the different records, and depict-

ing actions of the actors timed to accompany their speech as reproduced by the sound records, automatic means brought into action by the selection of one of the sound records, respectively, for selecting the picture sequence corresponding to the record to be played, and automatic means for displaying the film sequence in synchronism with the played record.

2. In a motion picture and sound apparatus for reproducing the action of actors with accompanying sound effects reproducing the speech of the actors accompanying their action, the combination of a plurality of sound records, means for selecting, advancing to a playing position, and playing any one of the same, a projection lens, a shiftable carriage, film-means independent of the sound records, mounted on the carriage including a plurality of picture sequences disposed alongside of each other and corresponding respectively to the different records, and depicting actions of the actors timed to accompany their speech as reproduced by the sound records and automatic means controlled through the agency of the movement of the selected record when the same is advanced to the playing position, for effecting the shifting of the carriage to bring the film corresponding to the selected record in line with the projection lens, and means for synchronizing the sound records and the film sequences to time the actions of the actors with the speech that accompanies their action.

3. In a motion picture and sound apparatus, for reproducing the action of actors with accompanying sound effects reproducing the speech of the actors accompanying their action the combination of a plurality of rigid sound records, a projection lens, means for selecting and advancing the selected record to be played, to its playing position, film-means independent of the sound records, including a plurality of picture sequences disposed alongside of each other and corresponding respectively to the different records, and depicting actions of the actors timed to accompany their speech as reproduced by the sound records, electro-mechanical means including circuits controlled by the advancing movement of the record that is to be played, to its playing position for effecting a corresponding lateral movement of the film-means to bring the selected picture sequence into line with the lens, and means for synchronizing the sound records and the film sequences to time the actions of the actors with the speech that accompanies their action.

4. In a motion picture and sound apparatus, the combination of a plurality of sound records, means for selecting one of the same, means for reproducing the sounds from the selected sound record, film-means including a picture sequence corresponding to each of the different records, a driven member for driving the record, driving means for the film-means, a driving arm located adjacent the said driven member, each sound record having means located in a predetermined circumferential position for effecting a connection with the driving arm when the sound record is in playing position, for synchronizing the driving of the film-means with the sound record, and automatic means for effecting relative axial movement of the record and the said driving arm to bring the record into engagement with the driving arm before the playing of the record commences.

5. In a motion picture and sound apparatus, the combination of a plurality of disc-form sound records, a rotatable platen for carrying any one of the records to play the same, means for selecting any one of the records and depositing the same on the platen, film means including a picture sequence corresponding to each of the different records, driving mechanism for the film-means including a synchronizing arm adjacent the rotary platen, and rotatable substantially on the axis of rotation of the platen, each of said sound records having a single means for engaging the synchronizing arm in the playing position of the sound record, means for effecting relative axial movement of the platen and the arm to engage the same together, and synchronizing means controlled by the synchronizing arm to drive the film-means in synchronism with the sound record.

6. In a motion picture and sound apparatus, the combination of a substantially horizontal platen for receiving a disc-form record with a sound groove on its upper face, a substantially vertical driven shaft carrying the platen an capable of shifting vertically, means for raising the platen shaft and the platen with the record lying thereon, a synchronizing arm mounted for rotation on an axis substantially in axial alignment with the axis of the platen shaft and located above the same, a tone-arm having a needle for engaging the upper face of the record to reproduce the sounds recorded thereon, each record having a single driving means located in a predetermined oriented position on the same with reference to the sound groove to engage the synchronizing arm for driving the same, means associated with the synchronizing arm to effect a driving connection between the synchronizing arm and said last-named means when the platen rises, means controlled through a part driven by the said synchronizing arm for controlling the position of the needle of the tone-arm, mechanism for driving a film with a picture sequence corresponding to the sound groove on the record, and rotary synchronizing means driven through the said synchronizing arm for maintaining the projection mechanism and the sound record disc in synchronism.

7. In a motion picture and sound apparatus, the combination of a substantially horizontal platen for receiving a disc-form record with a sound groove on its upper face, a substantially vertical driven shaft carrying the platen and capable of shifting vertically, means for actuating the platen shaft and the platen with the record lying thereon, a synchronizing arm mounted for rotation on an axis substantially in axial alignment with the axis of the platen shaft and located above the same, a tone-arm having a needle for engaging the upper face of the record to reproduce the sounds recorded thereon, each record having a driving hole located in a predetermined oriented position on the same with reference to the sound groove to engage the synchronizing arm for driving the same, a pin associated with the synchronizing arm to effect a driving connection between the synchronizing arm and the driving hole when the platen rises, means controlled through a part driven by the said synchronizing arm for controlling the instant at which the tone-arm is freed to follow the groove in the record, mechanism for driving a film with a picture sequence corresponding to the sound groove on the record, and rotary synchronizing means driven through the said syn-

chronizing arm for maintaining the film driving mechanism and the sound record disc in synchronism.

8. In a motion picture and sound apparatus, the combination of a substantially horizontal platen for receiving a disc-form record with a sound groove on its upper face, a substantially vertical driven shaft carrying the platen and capable of shifting vertically, means for rotating the platen shaft, and for raising the platen shaft and the platen with the record lying thereon, a synchronizing arm mounted for rotation on an axis substantially in axial alignment with the axis of the platen shaft and located above the same, a tone-arm having a needle for engaging the upper face of the record to reproduce the sounds recorded thereon, each record having a single driving means located in a predetermined oriented position on the same with reference to the sound groove to engage the synchronizing arm for driving the same, means associated with the synchronizing arm to effect a driving connection between the synchronizing arm and said last-named means when the platen rises, a rotary synchronizing device controlled through the agency of the synchronizing arm for controlling the instant at which the tone-arm is freed to follow the groove in the record, driving mechanism for driving the film to display a picture sequence corresponding to the sound groove of the record, and a rotary synchronizing device associated with the driving mechanism for the film for maintaining the film driving mechanism synchronized to the synchronizing arm and the sound record.

9. In a motion picture and sound apparatus, the combination of a plurality of different sound records, record selecting means for selecting and advancing any one of the said records to be played, film-means independent of the sound records including a picture sequence corresponding to each of the said sound records, film selecting means, driving means for the film-means including an electric motor, a motor circuit for the motor, including a branch corresponding to each record, an electrically controlled brake for the motor, a switch in each branch circuit operating to close when the selected sound record is advanced to be played, each branch circuit having means therein for controlling the film selecting means, and automatic means driven from a point on the sound record for starting the drive through the motor circuit.

10. In a motion picture and sound apparatus, the combination of a plurality of different rigid sound records, record selecting means for selecting and advancing any one of the said records to be played, film-means including a picture sequence corresponding to each of the said records, driving means for the film-means including an electric motor, a motor circuit for the motor, an electrically controlled brake for the motor, a switch in the motor circuit corresponding to each of the said sound records and operating to close when the sound record is advanced toward its playing position, a circuit closed by said switch with means therein for controlling the record selecting means, a switch operating to open the motor circuit and apply the said brake, controlled by a notch on the edge of the film, a rotary platen for receiving the record that is to be played, means for raising the platen to lift the record to its playing position, and a rotary synchronizing device associated with the platen, with means located above the platen for effecting a driving connection to the rotary synchronizing device for driving the same from a point on the record that is being played on the platen, and means associated with the rotary synchronizing device to return the same to its same oriented position that it had when the connection of the record to it was to be effected.

11. In a motion picture and sound apparatus, for reproducing the action of actors with accompanying sound effects reproducing the speech of the actors accompanying their action, the combination of a plurality of rigid sound records, means for selecting and playing any one of the same, a projection lens, a shiftable carriage, film-means on the carriage including a plurality of picture sequences disposed alongside of each other and corresponding respectively to the different rigid sound records, and depicting actions of the actors timed to accompany their speech as reproduced by the sound records, a motor for shifting the shiftable carriage to align any picture sequence with the projection lens, a plurality of movable stops, and means controlled by the selection of the record to be played, for advancing a corresponding stop into the path of the shiftable carriage, and means for synchronizing the sound records and the film sequences to time the actions of the actors with the speech that accompanies their action.

12. In a motion picture and sound apparatus, the combination of a plurality of sound records, means for selecting one of the same, means for reproducing the sounds from the selected sound record film, film-means including a picture sequence corresponding to each of the different records, with driving means for driving the same, a rotary driven member for supporting and driving the record, a synchronizing device for the film-driving means, adapted to be driven by the said rotary driven member and including a driving arm for driving the same, said record having a single means in a predetermined position with respect to the sounds produced on the record for engaging the driving arm, and means for effecting relative movement between the driven member carrying the record and the said driving arm to effect the driving of the synchronizing device by the record.

13. In a motion picture and sound apparatus, the combination of a bank of different sound records, record-selecting means for selecting and advancing any one of the said records from the bank to the playing position, film-means independent of the sound records, including a picture sequence corresponding to each of the said records, film selecting means therefor, driving means for the film-means, including an electric motor, a motor-circuit for the motor, an electrically controlled brake for the motor, a branch circuit with its corresponding switch for each of the said sound records, automatic means operating when the record advances from the said bank to its playing position for closing its corresponding branch circuit, and means controlled by each branch circuit for controlling the film selecting means to select the film sequence corresponding to the selected record.

14. In a motion picture and sound apparatus, the combination of a bank of different sound records, record selecting means for selecting, and record advancing means for advancing any one of the selected records that is to be played, to its playing position, record driving means, film-means independent of the said records including a picture sequence corresponding to each of the

said records, film selecting means therefor controlled through the medium of the selected record when advanced to its playing position, driving means for the film-means including an electric motor, a motor-circuit for the motor, a synchronizing device, automatic means for effecting a driving connection from a single predetermined oriented point on the record to the synchronizing means, an electrically controlled brake for the motor, and a switch means controlled by the film for opening the motor circuit and closing a circuit through the electric brake.

15. In a motion picture and sound apparatus, the combination of a film having a set of picture sequences depicting the action of the actors, a record carrying a sound track on which the speech of the said actors accompanying their action is recorded, a platen for carrying the sound record and for rotating the record, means for rotating the platen, a motor for driving the film simultaneously with the rotation of the record, a synchronizing device above the platen for maintaining synchronism between the record driving member and the film, means for lifting the platen to raise the record to the level of the synchronizing device, said record having a single driving means for the synchronizing device located in a predetermined oriented position with respect to the commencing point of the recorded sounds on the record, means associated with the synchronizing device for effecting connection to the said single driving means of the record, and means connecting the synchronizing device and the motor for synchronizing the motor.

16. In a motion picture and sound apparatus, the combination of a film having a set of picture sequences depicting the action of actors, a record carrying a sound track on which the speech of the said actors during said action is recorded, a rotary platen for carrying the sound record and for rotating the same, means for rotating the platen, a motor for driving the film simultaneously with the driving of the record, a synchronizing device, said record having a single driving means for connecting the record to the synchronizer device for driving the latter, located in a predetermined oriented position with respect to the commencing point of the recorded sounds on the record, automatic means for effecting a connection between the synchronizing device and the said single driving means for driving the synchronizing device when the record is about to be played, and means connecting the synchronizing device and the motor for synchronizing the latter to the rotating platen.

17. In a motion picture and sound apparatus, the combination of a bank of different sound records, record-selecting means for selecting and advancing any one of the said records from the bank to the playing position, film-means independent of the sound records, including a picture sequence corresponding to each of the said records, film selecting means therefor, driving means for the film-means, including an electric motor, a motor-circuit for the motor, an electrically controlled brake for the motor, a branch circuit with its corresponding switch for each of the said sound records, means whereby each record when located in the bank, holds open its corresponding switch so that when the selected record is advanced from the bank, its corresponding branch circuit closes, and means controlled by each branch circuit for controlling the film selecting means to select the film sequences corresponding to the selected record.

18. In a motion picture and sound apparatus, the combination of a sound record with a sound groove, a film having a picture sequence corresponding to the record, means for driving the record to reproduce the recorded sounds, independent driving means for the film, synchronizing means associated with the record for synchronizing the driving of the film to the driven sound record, and having a driving member, said record having a single means located in a predetermined oriented position with respect to the commencing point of the recorded sound on the sound groove of the record, automatic means for effecting a driving connection from said single means to the said synchronizing driving member, automatic means controlled by the film for stopping the driving of the film, the aforesaid parts cooperating to effect the disconnection of the record from the synchronizing driving member after the record has been played; and means for restoring the synchronizing driving member thereafter to its normal oriented position of rest.

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