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REVOCALIZED PHONOGRAPH RECORD

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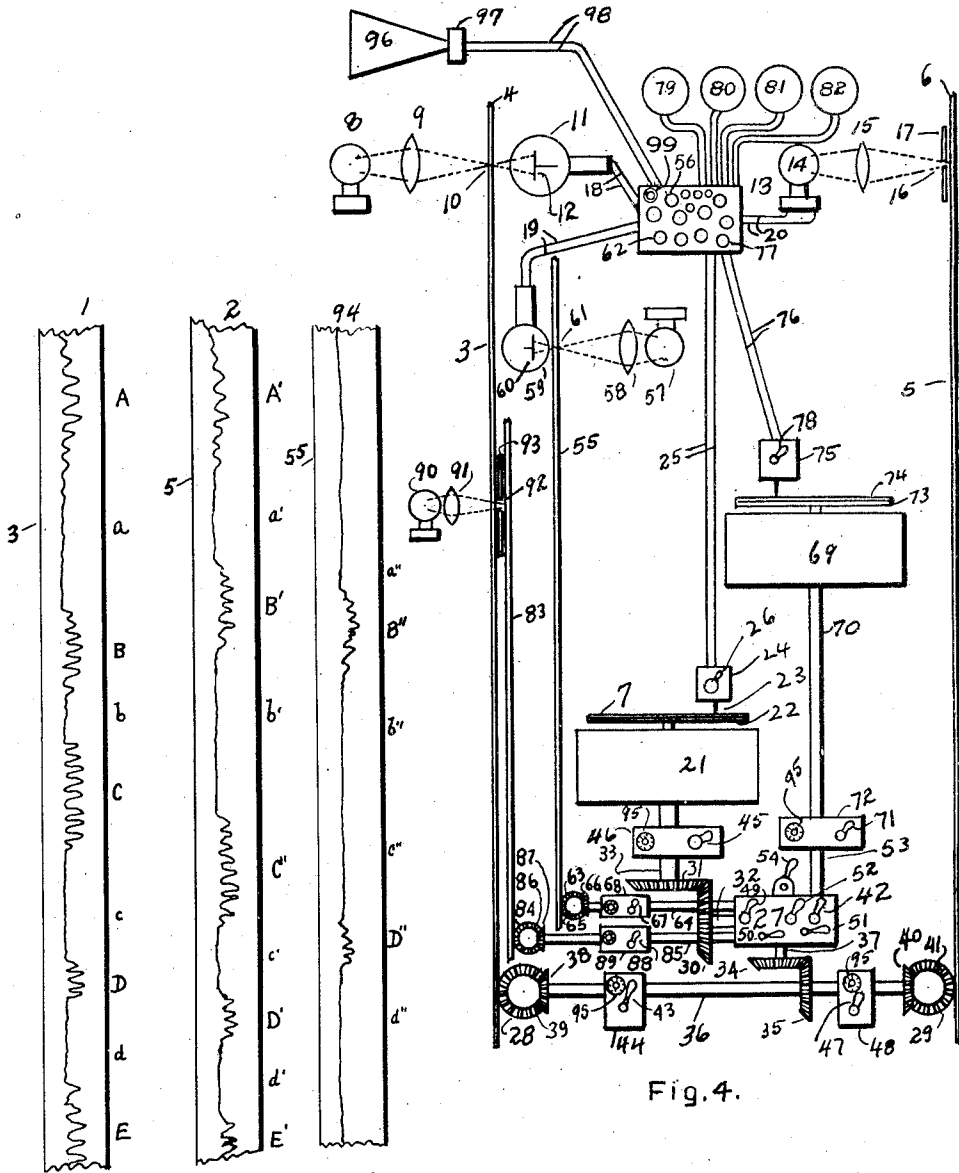


Fig. 4.

Fig. 1.

Fig. 2.

Fig. 3,

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REVOCALIZED PHONOGRAPH RECORD

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My invention relates chiefly to means for obtaining a phonographic record synchronous with a motion picture film of the same subject matter, from a prior non-synchronous phonographic record made of a repetition of the acoustical part of motion picture subject matter, but not made at the time the film was made.

By motion picture film I include all sorts of means for producing effects of motion through exhibition of a succession of photographs in sequence, and by phonograph and phonographic record I include all sorts of means for recording and reproducing sounds, such as disc and tape like records, with physical, photographic, magnetic or other modifications for recording and reproducing sound effects.

My preferred method of procedure is as follows: I first produce a motion picture film, and usually, but not necessarily, a synchronously made phonographic record at the same time, which may be termed a preliminary or original synchronous record. I subsequently have a group of actors produce a phonograph record of sounds suitable to accompany the film. They may watch the film and produce the sounds as nearly as may be in synchronism. This record may be termed the basic record. Some of its effects will be slightly ahead and some slightly behind the proper locations to synchronize exactly with the film. As a deviation of one-twelfth of a second is patent to observers, it is obvious that actors cannot reproduce sounds in exact synchronism with a film's optical effects. From this basic non-synchronous record I produce a final exactly synchronous record, which I term a vivigraphic record. Its effects along its length occupy corrected positions as compared with the basic record's effects. It will be in exact synchronous relationship to the film, and incidentally will agree with the preliminary synchronously made record.

The vivigraphic record of my invention is highly useful in a number of ways. When a film player has a voice that does not record well, a better voice may be substituted. Where American players do not speak for-

eign languages well, correctly spoken foreign languages may be provided. As the preliminary record is ordinarily not used except for purposes of comparison, the necessity of a sound-proof studio is eliminated. Odd effects may be produced of animals conversing and the like.

In carrying out my invention I find it generally desirable to employ the herein described apparatus, processes and manufactures, but it is to be understood that in carrying out the objects of my invention, less than all of the different means, mechanisms, processes and manufactures herein described may be employed for some uses, or parts only may be employed, or other means, mechanisms, processes and manufactures similar may be substituted, and while the preferred forms embodying my invention are shown, it is to be understood that many of the structural details may be varied and many changes in details and steps resorted to, without departing from the scope and spirit of my invention, nor do I limit myself to the specific means, mechanisms, processes and manufactures shown, although I believe them especially suited to the ends to be attained by my invention.

In the accompanying drawing, which is largely diagrammatical and is not to be considered as a working drawing but merely as an illustration of the principles of the invention; and which forms a part hereof, and in which the same reference letters and numerals indicate the same or corresponding parts:

Fig. 1 is an elevation of a "basic" sound record on a strip;

Fig. 2 is an elevation of a "vivigraphic" sound record on a strip.

Fig. 3 is an elevation of a supplementary "basic" sound record on a strip; and

Fig. 4 is a diagrammatical representation of a group of mechanisms and parts indicating their operative relationships, for carrying out various phases of the invention.

Referring to Figures 1, 2 and 3; strips 3, 5 and 55 have sound tracks 1, 2 and 94 respectively, the upper ends being regarded as the initial points and the direction of prog-

ress being upward. In the sound tracks sounds are indicated by waved lines and soundless spaces by straight lines; thus A, B, C, D and E on strip 3 indicate words, and *a*, *b*, *c* and *d* indicate soundless spaces. The same sounds are represented on strip 5 by A', B', C', D' and E', but at altered locations as the soundless spaces, indicated by *a'*, *b'*, *c'* and *d'* are different in length as compared with soundless spaces *a*, *b*, *c* and *d*.

The sounds A', B', C', D' and E' are thus redistributed on strip 5 as compared with their location on strip 3, and thus brought into synchronism with the motion picture film.

Word B' on strip 5 is advanced, or brought earlier in time of production than in strip 3. Word C' is retarded by the lengthening of space *b'*. This also retards D' and all the remainder of the record, unless later corrected. D' is somewhat brought forward by shortening *c'*, although it occupies a position slightly later than D on strip 3. The soundless space *d'* is not affected so that sounds D' and E' are the same distance apart as D and E, although both are slightly later on the strip 5 than on strip 3, as required by the synchronism to be attained.

By these various redistributions of the sound effects record 5 has its effects brought into exact agreement with the analogous optical effects on the film, not illustrated, and, incidentally, into agreement with the preliminary synchronously made film, if one was made.

In order to effect such redistribution, and for other purposes, to be described, I provide the combination of apparatus indicated in Fig. 4. All the individual units of this group are well known in the art, but have not previously been combined in the manner indicated, for the operations indicated nor for the purposes of my invention.

There are shown, principally, two film strip phonograph records, 3 and 55, and one disc type phonograph record 74; two film type record blanks, 5 and 83, and one disc type record blank 7, to be recorded upon; two photo-electric systems for deriving light effects from records; two light systems for impressing sensitized film record blanks; two electric needle phonograph systems, one for making records and the other for taking off vibrations; apparatus for operating the various records and record blanks; a power system for turning power on and off the various members; a set of monitors for listening in on the sounds; an electrical control box, and various controls of an electrical and mechanical nature.

When all the parts of this system are caused to function two "vivigraphic" records may be made of the strip type and one of the disc type, drawing their effects from three different records, two of the strip type and one of

the disc type. Of the three records with sound effects, for some uses one may be regarded as the preliminary, one as the basic and one as a supplementary basic. The records to be re-vocalized illustrate strip and disc records made by three different commonly employed methods, direct printing, beam printing and magnetically controlled engraving tool, for the disc type.

In Fig. 4 basic record 3 is shown of the tape or strip type, edgewise. It is assumed to progress in an upward direction, end 4 being the initial point. A vivigraphic record blank of the strip type, 5, is shown edgewise, and is assumed to progress upwardly, end 6 being the initial point. Strip 3 is a finished record whose effects are to be reproduced on strip 5, an unexposed blank, but at different locations along the phonic line. The norm to which the sounds are to be adjusted is the motion picture film or a preliminary synchronously made record which may be either 55, a strip, or 74, a disc, or another record run alongside independently or examined by hand and eye without being operated, preferably microscopically. It may be held in parallel juxtaposition to strip 5 by the hands if desired. Disc 7 is a phonograph disc blank not yet engraved. Cylindrical phonograph records, or other kinds, may be employed if desired. Strip 83 is an unexposed strip record blank, arranged for direct printing, or contact printing. If it be desired to print this record simultaneously with 5 it is desirable to have the printing point coincide with the take-off point 10, but for clearness of illustration it is indicated on the drawing in a more convenient position.

Record 3 is of the striated phonic track type, with striations more or less dense arranged across it as the rungs of a ladder. It may be of the type which carries a motion picture along its edge, if a preliminary record is used in this position, but this is unnecessary with a basic record. The vivigraphic record 5 may be made either of the striated type or the saw toothed type, and the striations may be either negative or positive compared with the track of 3, by adjusting the light system accordingly. Strip 5 may contain an undeveloped motion picture, and an undeveloped track for sound purposes, arranged to be developed either as negatives or positives.

An electric lamp 8, preferably a point source of light has its rays of light focussed by lens 9 on record 3 at point 10. A photo-electric cell 11, with electrode 12 is in the path of the light after it passes the striations of the sound track of record 3. The passage of the striations varies the amount of light striking the photo-electric cell. The photo-electric cell I prefer to use is one which also has an audion action; that is, in which the electrons emitted by the electrode 12 when

light strikes the electrode, are utilized to effect the grid potential of audion or valve tube action. The electron emission of the electrode 12 caused by the light may be hooked up to either increase or decrease the plate current of the audion members. The plate current being thus affected by the light passing through the striations of record 3 is amplified in the usual radio manner by unit 13. This unit 13 contains the various batteries and other sources of current and the various tubes and circuits customary in the amplification of faint currents for the control of larger ones.

Light source 14, which may be a photion, is caused to vary its intensity by current controlled by the photo-electric cell 11. Leads 18 go from photo-electric cell 11 to control box 13 and leads 20 from control box to light source 14. Light from 14 is focussed by lens 15 and passes through slit 16 in plate 17 onto record blank 5. When a dense striation passes point 10 and reduces light on photo-electric cell 11, the hook up may be such that light 14 is dimmed, which would make a faint striation on record 5 after development. Thus it would be negative to record 3 striation, and when printed by contact printing would produce in the duplicate a positive similar to striation in record 3. But if record 3 is itself a negative then record 5 would be a positive when developed. But if record 5 is a negative and the hook up is such that light 14 increases in brilliance when the photo-electric cell receives more light then a faint striation on negative 3 would produce a dense striation on record 5 when developed, making it a positive. But if the hook up of photo-electric cell is such that more light on the cell dims 14, then the striation on 5 will be the same in order of faintness as the striation in record 3.

The hook-ups may thus be arranged to suit the convenience of the operator and permit the use of positive or negative records at 3 and the production of positives or negatives at 5.

The production of positive and negative disc records may be controlled in the same way, as leads 25 carry amplified current to magnetic engraver 24 for engraving blank 7 by needle 23. If a negative record is engraved a positive may be cast from it. If a positive is engraved a negative matrix must be made and a positive again cast from that. Manually operated lever 26 may be used to disconnect the electrical recording action of box 24 on needle 23. Disc 7 is carried by table 22 and caused to rotate by mechanism in box 21 controlled by shaft 33.

Power control box 27 supplies power to the six units shown. Lever 54 cuts off all power simultaneously. Lever 52 controls power to shaft 37 which through bevel gears 34—35 causes shaft 36 to rotate. Shaft 36 drives feed roller 28 for record 3 through bevel gears 38—39. Power may be shut off through control box 44 by lever 43. Shaft 36 also drives feed roller 29 for strip 5, through bevel gears 40—41. Power to roller 29 may be cut off by lever 47 in control box 48. These connections enable 28 and 29 to be driven simultaneously or enable either to be driven while the other is at rest.

Lever 49 of power box 27 controls power to shaft 32, which supplies power to shaft 33 through bevel gears 30—31. Shaft 33 operates phonograph recorder 21. Power may be controlled by lever 45 in control box 46. This enables phonograph recorder 21 to be operated in synchronism with rollers 28 and 29, or to operate independently of them, or in conjunction with either one.

Phonograph reproducer 69 is operated by shaft 70 which derives power from power box 27 controlled by lever 42. Phonograph 69 may be independently cut off by lever 71 in control box 72.

Record blank 83 is driven by roller 84. Lever 50 of power box 27 controls shaft 85 which supplies power to roller 84 through bevel gears 86—87. Lever 88 of control box 89 is used to turn power on and off roller 84.

Record 55 is operated by feed roller 63. Control lever 51 of power box 27 controls shaft 64 which supplies power to roller 63 through bevel gears 65—66. Control lever 67 of control box 68 is used to cut off or turn on roller 63 through control box 68.

Any one or more of the six units 3, 83, 55, 7, 74 and 5 may thus be operated alone or in conjunction with any one or more of the other units, or all may be operated together. Differences in size of feed rollers may be either compensated for by connections in the power box, or may be required by reason of the recording speed of the different units.

Phonograph 69 with table 73 and record 74 does not supply sound directly, but has magnetic box 75, which may be turned off by lever 78. The needle and magnetic box supply electric variations through leads 76 to control box 13. These electrical variations may be used for any of the purposes mentioned in connection with the current variations of the photo-electric cell 11.

Tape record 55 is provided with a photo-electrical system similar to that for record 3. Light source 57 is used to supply constant rays of light, focussed by lens 58, the light rays passing through striations in record 55 at point 61 to photo-electric cell 59 with electrode 60 and leads 19 to electric control box 13.

Record blank 83 shown edgewise passes slit 92 in plate 93. Light source 90 is focussed by lens 91 on this slit and the light passes through striations in record 3. For some uses plate 93 need not be between the records, contact printing being used. Blank

83 when developed is negative to 3, since dense striations in record 3 shut out light and affect the photographic emulsion of 83 less, and when developed it has a faint striation where record 3 has a dense one. This plan is thus less flexible than the photo-electric cell method.

Monitor phonographs 79, 80, 81, 82 with leads to control box are provided to listen in on 3, 55, 7 and 74 if desired.

Each of the control boxes 44, 46, 48, 72, 68 and 88 is provided with means, as 95, for increasing or decreasing the speed of the feed roller as related to the speed of the power shaft where it enters such control boxes. Means 95 are supplied with markings, dials and hands to indicate the relative positions of the parts. Thus when the system is at rest any shaft to any roller may be moved forward or backwards any desired degree. During operation of the system, the manual operation of means 95 may be utilized to vary the speed of the manipulated unit as regards the rest of the system.

When it is desired to make a redistribution of acoustical effects and produce vivigraphic records, strip 5 and disc 7, or either of these members, are started into operation at the same time that record 3 is started, record 3 being a basic record with the sounds of the film subject on it, but not synchronously placed with the film. At the instant a discrepancy occurs the whole system is stopped instantly. Assuming that word B of track 1, record 3, Fig. 1, has not appeared in time to meet the film effect, the system remains dead mechanically and also electrically. There are connections not indicated for automatically turning off the electrical units coincidentally with the turning off of mechanical power, either as a whole or unit for unit. The electrical elements may also be turned off independently.

With the entire system dead mechanically and electrically, feed roller 28 is caused to function and record 3 is advanced a selected distance, decided by inspection, or otherwise, of the norm used. This has the effect of shortening the path a' as compared with the path a . Word B is then produced with the system again in operation, assuming that only records 3 and 5 are included in the system for this operation. Word B thus produces B' in the proper location and operation of space b is then begun. But word C soon appears much before the proper effect is ready on the film. The whole system is again stopped. A greater interval of blank space is needed between words B and C than appears on the basic record 3. Two alternatives are then possible. Either record 3 may be retracted to the rear end of word B while record blank 5 remains at rest, or else record blank 5 may be advanced creating b' enough longer than b to secure synchronism

with the film. In this case it is easier to move record 5 forward than record 3 backward.

A forward movement of one or the other is usually the more desirable, for if the disc recording is taking place a backward movement of the disc is not readily accomplished unless the needle be lifted out of the groove temporarily.

Having secured the proper length for b' , the word C then produces C' on record blank 5. Proceeding to make soundless space c' , word D lags behind and does not appear to match the film effect. The system is again stopped. Record 3 is moved forward until D is in the proper position. Then the system is turned on and word D produces D'. The soundless space d' is then proceeded with and word E appears at the proper time and produces word E' on the record blank 5. It is to be noted, however, that E is too early on the basic record. The net result of the previous changes has been to retard its appearance to the proper location. The remainder of basic record 3 is accordingly so retarded, and the operations proceed, it being brought up or retarded in effect or actually from time to time to bring about exact synchronization with the film, at the moment the several words are being transferred to record blank 5.

If it be not desired to stop the system on every occasion, operation of means 95 of the various control boxes may take place and the relative speeds of the record and record blank may be changed during operation, but this should only be done during the passage of blank spaces, unless it be desired to eliminate or change the pitch of a sound. If the basic record is slowed down the sound will be a growl and if speeded up a screech, if this be done when a sound is passing. By the method of starting and stopping an entire word may be wholly eliminated if desired. Humorous effects may be produced in this way.

If included in the operations disc record blank 7 may be engraved at the same time that record blank 5 is being made by light effects. Record 74 may be utilized, if desired, as a preliminary synchronously made record, and the norm to which record blank 5 is being made.

But when desired to add to sound effects, or subtract from them in the final performance, some of the effects on the basic record 3 may be entirely omitted from disc 7. Thus when 5 and 7 are run coincidentally for producing sound later on the portions on disc 7 will reinforce those on strip 5, while in the blank spaces of 7 no reinforcement will occur. Music alone may be used on record 7, so that it may be utilized to accompany the film even if the speech on record 5 be omitted.

In case record 74, a disc, contains only the music and is a basic record non-synchronously made instead of a preliminary record, the music may be transferred to 7 and become

synchronous on 7, while interpolations from record 3 may be added, merging in the electrical impulses received over leads 25 or else put on at separate locations.

5 As record 3 and blanks 5 and 7 may be operated in unison or separately in any combination, any parts of record 3 may be recorded on 5 or on 7 or on both or on neither, parts being entirely omitted. In this way all the
10 words of a single voice on record 3 may be omitted, if the words do not overlap other words of other speakers. It will not ordinarily be desired to eliminate a voice from a basic record, as none need be put on such record if not desired. But in the case of a preliminary record synchronously made in a sound proof studio, it may be desirable to remove a voice, as an attractive film player may not have a trained voice.

20 In this case the preliminary record is used in place of the basic record 3 in the system, taking the place of 3. All the other voices may be recorded and the defective voice omitted, word by word, stopping the preliminary
25 record for this purpose and moving the record 5 past that spot. This should be done with the electrical system off, and the preliminary record then moved an equal distance. Or no stoppage need occur, the electrical system merely being turned off when
30 a word is to be eliminated, although this is difficult in practice to accomplish.

However, it will be desirable to insert some other voice in place of the one being omitted.
35 This is best done at the time the voice is being left out, and the apparatus may readily be utilized for the purpose.

A supplementary basic record 55 is provided, with sound track 94. This contains
40 only the words of the one actor, but is approximately synchronous with the film and other voices. If B'' and D'' are the words to be inserted and B' and C' are the words to be omitted, since Fig. 2 represents a synchronous record and the words have the same
45 location on it as on a synchronously-made preliminary record, supplementary basic record 55 is operated in position shown in Fig. 4, its striations affecting photo-electric cell
50 59, while the striations of the preliminary record now affect photo-electric cell 11; but this is a detail as the units are interchangeable.

The words of supplementary basic record
55 55 have not only to be inserted in place of the same words on the preliminary record but must be synchronized in addition.

With the records and blank 5 in place operations are started. Word A' records properly
60 as it is in synchronous position. Word B'' on the supplementary basic record, however, is retarded. Word B' is to be omitted. The system is dead at the beginning of word B'. Record 55 is moved so that B'' comes into
65 proper position. Photo-electric cell 11 is

then turned off and photo-electric cell 59 turned on. Either of these cells is hooked up to affect light source 14 when the other is not used. Records 3 and 55 are then advanced in unison with record blank 5. Word
70 B' passing point 10 does not affect dead cell 11, but word B'' passing live cell 59 at the same moment affects it and light source 14 and the record blank 5 is re-vocalized with the new word while the old word is omitted.
75 Cell 59 is then switched off and cell 11 is switched on and the other voices proceed to record normally, no synchronization being required as they are already in synchronous position. Word D'' on the supplementary
80 basic record 55 arrives in advance of its proper location. D', which is to be removed, lags, relatively speaking, although its position is the correct one. With the system dead record 55 may now be retracted until word D''
85 is drawn back to the proper position. Or 55 alone may be held still while record 3 and blank 5 are normally advanced until D' is about to be recorded. The system is then stopped and D'' is recorded in place of D'
90 by the method just previously described. Cell 11 is controlled by knob 56 and cell 59 by knob 62 of control box 13, while knob 77 controls box 75. The smaller knobs control the
95 monitor phonographs 79, 80, 81, and 82 while the other knobs control batteries and power sources.

In the case where but one voice is to be retained of those appearing in the film and on the synchronously-made preliminary record,
100 the best procedure is to make a basic record of all the other voices, and use the preliminary synchronously-made record as a supplementary basic record for operation in position 55. In this instance the basic record will have soundless spaces where the
105 voice is to be inserted on the vivigraphic record 5, so that there is no voice to leave off of record 3. All the undesired voices are omitted from the preliminary record when
110 used as a supplementary basic record by merely cutting out photo-electric cell 59 when they are passing. When the retained voice is reached the cell 59 is turned on, but cell 11 need not be turned off for at this point it has no work to perform, there being no
115 striations on the basic record 3 at that point. No synchronization is necessary as regards the retained voice, as it is already in synchronous position.
120

When foreign language voices are used for the basic record, the English speaking players must speak the foreign language, as well as may be, when making the film, so that the
125 lip movements will be correct. As the preliminary synchronously-made record with the English speaking voices speaking foreign words is used for reference only their poor accent will not matter, if the lip movements
130 are sufficiently approximate to the correct

movements. Foreign voices are then put on and synchronized in the manner before described for re-vocalizing with all new voices and a basic record. Where one player
 5 speaks the foreign language correctly on the preliminary synchronously-made record his voice may be retained in the manner indicated. The re-vocalization may be accomplished in the foreign country if desired instead of at the scene of the making of the
 10 film.

It is also within my invention to insert on the vivigraphic record sounds made concurrently and derived from natural sources and
 15 not from phonographic sources, either at the time the vivigraphic record is made from the other record or subsequently before the photographic emulsion is developed, preferably on spaces left unimpressed by light
 20 effects from the basic record.

For this purpose phonographic receiver 97 is provided with horn 96 and leads 98 to box 13, controlled by knob 99. The electric variations received over leads 98 are then
 25 amplified and caused to affect light source 14 or magnetic engraver 24 of sound record 7 or both as may be desired, and all the other elements may be switched off while this is taking place, or for some uses these sound
 30 effects may merge with those from the basic record and be recorded simultaneously.

What I claim is:

1. The process of making synchronous with a motion picture film which is non-synchronous with a primary phonographic
 35 sound record, a modified copy of said primary record, said primary record being of analogous subject matter with said motion picture film but having certain or all of its particular analogous effects in disproportionate linear arrangement as compared with
 40 the corresponding effects of the motion picture film, i. e. non-synchronous in time effect or succession when exhibited, said process comprising deriving variations in light effects from the sound track of the primary
 45 record; in utilization of said variations in the production of a similar sound track in the modified copy record, their linear location modified however to such an extent and in such manner that the particular effects of the modified copy bear the same proportionate relationship to each other in the
 50 length of the sound track as are borne to each other by the analogous particular optical effects in the length of the motion picture film, whereby to make said modified copy synchronous with said motion picture film.

2. The process of making synchronous a
 60 cinematographic film and a secondary phonographic sound record of analogous subject matter which comprises providing a cinematograph film and a primary phonographic sound record of analogous subject matter,
 65 said primary record having certain or all of

its particular analogous effects in disproportionate linear arrangement as compared with corresponding particular effects of said film, i. e. non-synchronous in succession or time effect when coincidentally exhibited; and in
 70 making from said primary record said secondary record by deriving from said primary record's sound track light variations; in utilizing said light variations in producing a similar sound track in the secondary record,
 75 the linear location, however, of the particular acoustical effects of the secondary record so altered at selected locations to selected extents so that the particular acoustical effects of the secondary record bear the same proportionate relationship to each other in the
 80 length of the sound track thereof as are borne to each other by analogous particular optical effects in the length of the cinematograph film, whereby to make said secondary record
 85 synchronous with said cinematograph film in operation.

3. The process of making a secondary modified copy of a primary phonograph record synchronous with a cinematograph film which comprises deriving said secondary record from a primary phonographic record having acoustical effects of analogous subject matter to the optical effects of said cinematograph film but with certain or all of its particular analogous acoustical effects in disproportionate linear arrangement along its sound track as compared with corresponding particular optical effects of said film,
 100 i. e. non-synchronous in succession or time effect when exhibited co-incidentally, said secondary record derived from said primary record by producing from the sound track of said primary record variations in light effects corresponding to sounds recorded
 105 thereon, in utilizing said variations to produce a sound track on said secondary record, the linear locations, however, of the successive particular acoustical effects of the secondary record so modified or altered at selected locations to selected extents as to cause
 110 said effects of said secondary record to bear the same proportionate relationship to each other along the length of the sound track thereof as are borne to each other by analogous particular optical effects in the length of the said cinematograph film, whereby to make
 115 said secondary modified record synchronous with said cinematograph film in operation.

4. A secondary or modified copy of a primary phonographic record, said primary record having acoustical effects analogous to but not synchronous with the optical effects of a cinematographic film, said secondary record derived from said primary record by means
 120 of variations in light effects corresponding to sound recorded on said primary record, said phonic track of said secondary record thereby produced being re-arranged linearly as respects its individual acoustical effects in
 130

agreement with the linear arrangement of the analogous optical effects of said cinematographic film and in the same proportion, whereby to make said modified copy record synchronous with said cinematographic film in operation.

5. A secondary or modified copy of a primary phonographic record which has a succession of particular acoustical effects analogous to but not synchronous with a cinematograph film which has a succession of particular optical effects, said acoustical and optical effects being disproportionately disposed in linear succession in their respective tracks, said modified copy adapted to be derived from said primary record by variations in light effects corresponding to sound recorded on said primary record, the succession of particular acoustical effects in the phonic track of said secondary record being re-disposed as compared with the primary record's effects and arranged linearly in proportion to the linear succession of analogous optical effects of said cinematograph film, whereby to make said secondary or modified copy record synchronous with said cinematographic film in operation.

6. The process of making a secondary or modified copy of a primary phonographic record synchronous with a cinematographic film which comprises deriving said secondary record from a primary phonographic record having acoustical effects of analogous subject matter to the optical effects of said cinematographic film but with certain or all of its particular analogous acoustical effects in disproportionate linear succession along its sound track as compared with corresponding particular optical effects of said film, i. e. non-synchronous in succession or time effect when exhibited co-incidentally, said secondary record derived from said primary record by producing from the sound track of said primary record variations in electrical effects corresponding to sounds recorded thereon, in utilizing said variations to produce a sound track on said secondary record, the linear locations, however, of the successive particular acoustical effects of the secondary record so modified or altered at selected locations to selected extents as to cause said effects of said secondary record to bear the same proportionate relationship to each other along the length of the sound track thereof as are borne to each other by analogous particular optical effects in the length of the said cinematograph film, whereby to make said secondary or modified record synchronous with said cinematograph film in operation.

7. A secondary or modified copy of a primary phonographic record which has a succession of particular acoustical effects analogous to but not synchronous with a cinematograph film which has a succession of particu-

lar optical effects, said acoustical and optical effects being disproportionately disposed in linear succession in their respective tracks, said modified copy adapted to be derived from said primary record by variations in electrical effects corresponding to sound recorded on said primary record, the succession of particular acoustical effects in the phonic track of the secondary record being, as compared with the effects of the primary record, re-disposed to selected extents at selected locations and arranged linearly in proportion to the linear succession of analogous optical effects of said cinematograph film, whereby to make said secondary or modified copy record synchronous with said cinematograph film in operation.

8. The process of making a modified copy of a plurality of original or primary phonographic sound records synchronous with a cinematographic film of the same subject matter which consists in deriving variations in effects from the sound tracks of the originals, in producing from said variations in effects a sound track of similar effects in the copy and in said producing so selecting effects from the different originals and so altering the location of selected effects to selected extents along the sound track of the copy that they bear the same proportionate relationship to each other in the length of the said sound track as are borne to each other by the analogous optical effects of the cinematograph film along its length.

9. A secondary or modified copy of a plurality of primary phonographic records having successions of acoustical effects analogous to but not synchronous with a cinematograph film which has a succession of particular optical effects, said acoustical and optical effects being disproportionately disposed in linear succession in their respective tracks, said modified copy adapted to be derived from said plurality of primary records by variations in effects from the sound tracks of the primary records, the succession of particular acoustical effects in the phonic track of the secondary record being, as compared with the plurality of primary records, re-disposed to selected extents at selected locations and arranged linearly in proportion to the linear succession of analogous optical effects of said cinematograph film, whereby to make said secondary or modified copy record synchronous with said cinematograph film in operation.

10. The process of making a modified copy of selected portions of a plurality of original or primary phonographic sound records synchronous with a cinematograph film of subject matter analogous to said selected portions of said primary records but non-synchronous therewith, which consists in deriving variations in effects from selected portions of the sound tracks of the primary

- records, in producing from said variations in effects a sound track in the copy of effects similar to the portions selected from the plurality of primary records, and in said producing so selected effects from the different originals and so altering the location of selected effects to selected extents along the sound track of the copy that they bear the same proportionate relationship to each other in the length of the said sound track as are borne to each other by the analogous optical effects of the cinematograph film along its length.
11. A secondary or modified copy of selected portions of a plurality of primary phonograph records having successions of acoustical effects analogous to but not synchronous with a cinematograph film which has a succession of particular optical effects, said acoustical and optical effects being disproportionately disposed in linear succession in their respective tracks, said modified copy adapted to be derived from selected portions of said plurality of primary records by variations in effects from said selected portions of the sound tracks of said primary records, the succession of particular acoustical effects in the phonic track of the secondary record being, as compared with the selected portions of the primary records, re-disposed to selected extents at selected locations and arranged linearly in its track in proportion to the linear succession of analogous optical effects of said cinematograph film, whereby to make said secondary or modified copy record synchronous with said cinematograph film in operation.
12. The matter of claim 8 when the variations in effects are variations in light effects.
13. The matter of claim 9 when the variation in effects are variations in light effects.
14. The matter of claim 8 when the variations in effects are variations in electrical effects.
15. The matter of claim 9 when the variations in effects are variations in electrical effects.
16. The matter of claim 8 when the variations in effects are variations in mechanical effects.
17. The matter of claim 9 when the variations in effects are variations in mechanical effects.
18. The matter of claim 8 when the variations in effects are variations in light effects adapted to produce variations in electrical effects adapted to produce variations in mechanical effects.
19. The matter of claim 9 when the variations in effect are variations in light effect derived from the primary records adapted to produce variations in electrical effects in turn adapted to produce variations in mechanical effect adapted to be impressed upon the secondary record.
20. The matter of claim 10 in which the variations of effect are variations in light effects.
21. The matter of claim 11 in which the variations in effect are variations in light effects.
22. The matter of claim 10 in which the variations in effect are variations in electrical effects.
23. The matter of claim 11 in which the variations in effect are variations in electrical effects.
24. The matter of claim 10 in which the variations in effect are variations in mechanical effects.
25. The matter of claim 11 in which the variations in effect are variations in mechanical effects.
26. The process of making a secondary or modified copy of a primary phonographic sound record synchronous with a cinematograph film which comprises deriving said secondary record from a primary phonographic record having acoustical effects of analogous subject matter to the optical effects of said cinematograph film but certain or all of its particular analogous acoustical effects in disproportionate linear arrangement along its sound track as compared with the corresponding particular optical effects of said film, i. e. non-synchronous in succession or time effect when exhibited co-incidentally, said secondary record derived from said primary record by obtaining from the sound track of said primary record variations in light corresponding to sounds recorded thereon, in impressing upon the copy said effects, said copy adapted to be altered photographically thereby, the linear locations, however, of the successive particular acoustical effects of the secondary record so modified or re-located at selected locations to selected extents as to cause said effects of said secondary record to bear the same proportionate relationship to each other along the sound track thereof as are borne to each other by the analogous particular optical effects in the length of the cinematograph film, whereby to make said secondary or modified record synchronous with said cinematograph film in operation.
27. A secondary or modified copy of a primary phonographic record, said primary record having acoustical effects analogous to but not synchronous with the optical effects of a cinematograph film, said secondary record derived from said primary record by variations in light corresponding to sound recorded on said primary record, said variations in light being adapted to be recorded on said secondary film photographically, the succession of particular acoustical effects in the phonic track of said secondary record being re-located at selected locations to selected extents as compared with the primary record's effects and arranged linearly in proportion

to the linear succession of analogous optical effects of said cinematograph film, whereby said secondary or modified copy record is made synchronous with said cinematograph film in operation.

28. The process of making a secondary modified copy of a primary phonograph record synchronous with a cinematograph film which comprises deriving said secondary record from a primary record having acoustical effects analogous to the optical effects of said cinematograph film but with certain or all of its particular analogous acoustical effects in disproportionate linear arrangement or succession along its sound track as compared with corresponding particular optical effects of said film, i. e. non-synchronous in succession or time effect when exhibited co-incidentally, said secondary record derived from said primary record by the derivation of effects of a variable nature from the primary record corresponding to sounds recorded thereon, in utilizing said effects to produce a sound track on the copy record, the linear locations, however, of the successive particular acoustical effects of the secondary record so modified or re-located at selected locations to selected extents as to cause said effects of said secondary record to bear the same proportionate relationship to each other along the length of the sound track thereof as are borne to each other by analogous particular optical effects in the length of said cinematograph films, and in inserting in said copy at selected locations selected sound producing effects derived from a source other than the primary phonographic record, whereby to cause said copy record to synchronize with said film in operation as respects the sound effects of the primary record and the additional sound effects.

29. A modified copy of a primary sound record having a succession of particular acoustical effects, said modified copy comprising selected effects derived from said primary record artificially altered in location along its sound track as compared with the linear location of the effects on the primary record, and additional sound effect portions interlarded or overlaid or substituted for omitted portions of the sound effects of the primary record, said additional effects derived from a source independent of the primary record.

30. A secondary or modified copy of a plurality of primary phonograph records having successions of acoustical effects analogous to but not synchronous with a cinematograph film, said copy comprising effects selected from one or more of said primary records simultaneously merged in recording the copy from the primaries and its effects artificially re-located linearly along the sound track of said copy as compared with the locations of said effects on the primaries to selected extents in selected locations, whereby

to effect synchronization with the said cinematograph film.

31. The process of making synchronous with a cinematograph film a secondary or modified copy of a primary phonographic record of the tape type, said primary record of analogous subject matter to the said film but not synchronous therewith, which consists in deriving light effects from the primary record; in producing corresponding variations in electrical effects from said light effects; in amplifying said electrical effects; in producing corresponding secondary light effects from said amplified electrical effects, in utilizing said secondary light effects to record said modified copy, the succession of effects in the phonograph track of said secondary record being re-located to selected extents at selected locations linearly along its track as compared with the location of said effects in the primary record so that they bear the same proportionate relation to each other as are borne to each other by the analogous optical effects of the cinematograph film, being thereby made synchronous.

32. The matter of claim 31 when the secondary record is in the form of a photographic tape.

33. A secondary or modified copy of a primary phonographic record of the photographic tape type which has a succession of particular acoustical effects analogous to but not synchronous with a cinematograph film which has a succession of particular effects of an optical nature, said modified copy adapted to be derived from said primary copy by means of light effects derived from the primary record, said light effects transformed into electrical effects, said electrical effects amplified, said amplified effects transformed into secondary light effects and said secondary light effects utilized to copy said copy record, the succession of particular acoustical effects in the phonic track of the secondary record being re-located to selected extents at selected locations as compared with the locations of their originating effects on the primary record, whereby to make said secondary record synchronous with said cinematograph film.

34. The matter of claim 33 when the secondary record is of the photographic tape type.

35. In the art of making re-vocalized phonographic records of the class described the procedure of recording the modified or re-vocalized record from a plurality of primary records, non-synchronous with but of the same subject matter as a cinematograph film, and recording said re-vocalized record while all the said records are in motion, recording on said re-vocalized records subject matter of selected extent at selected locations from one or more of said primary records, and altering the speed or velocity of the

various records to selected extents at selected locations, whereby to render said re-vocalized record synchronous with said motion picture film.

- 5 36. In apparatus for the production of re-vocalized phonograph records of the class described means adapted to record a secondary or re-vocalized record from one or a plurality of primary records, and means adapted to
10 change to selected extents at selected locations the velocity or angular attitude of the record driving means when the recording of the secondary record is accomplished by a succession of means comprising light variations
15 derived from the primary record, means adapted to transform said light variations into electrical variations and means adapted to transform said electrical variations into light variations and means to record the secondary record therewith.
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