

Feb. 27, 1940.

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2,191,691

INDEXING AND FINDING MEANS FOR SOUND RECORDING AND REPRODUCING MACHINES

Filed June 7, 1937

4 Sheets-Sheet 1

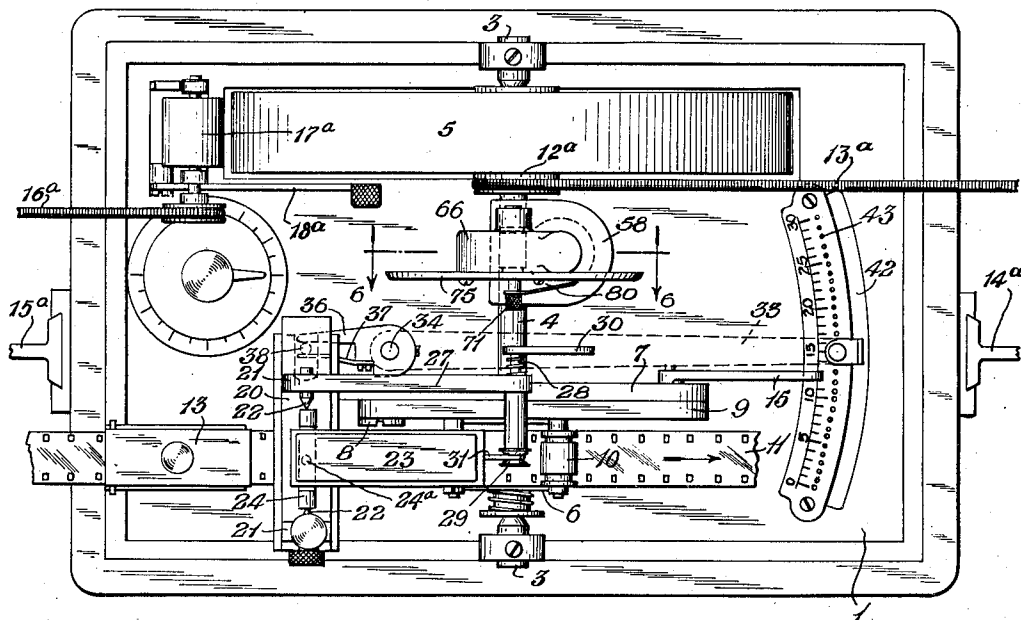


Fig. 1

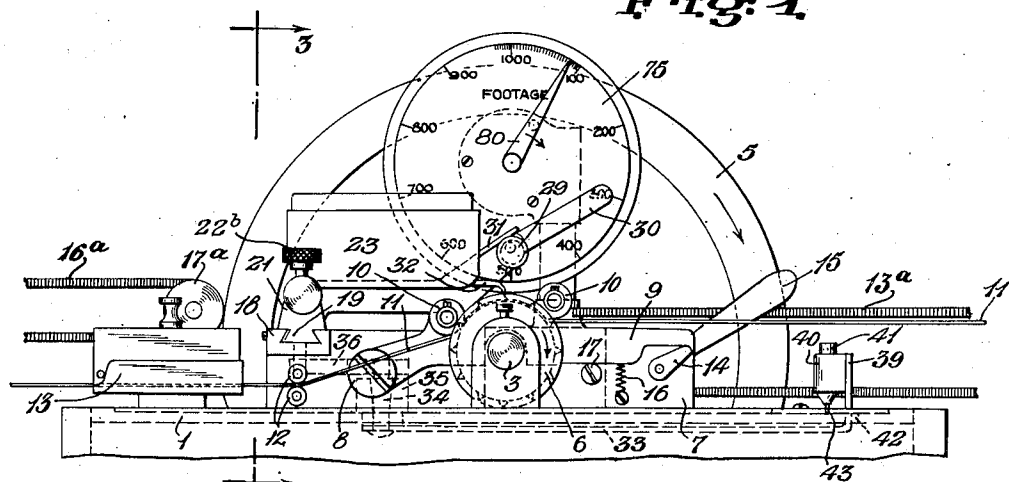


Fig. 2

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4 Sheets-Sheet 2

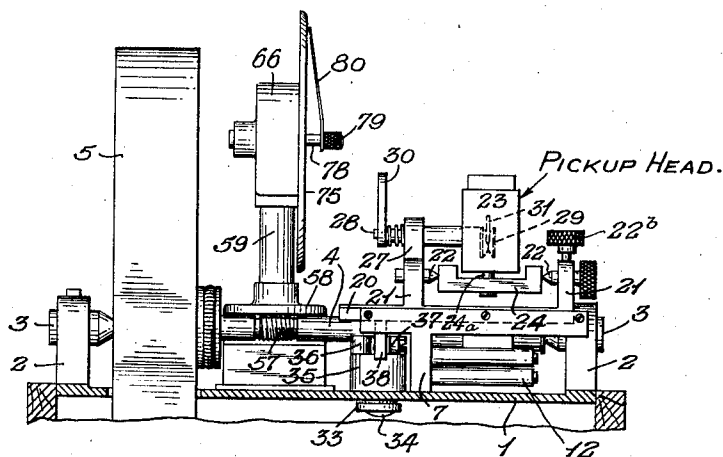


Fig. 3

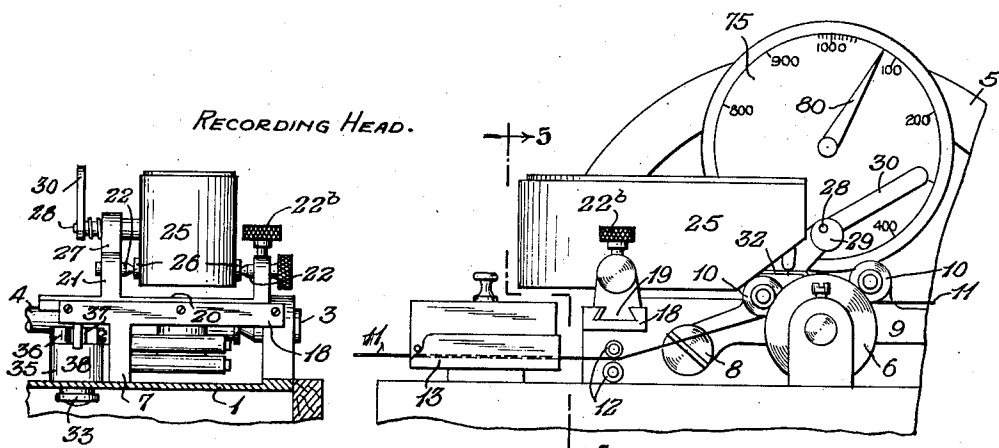


Fig. 5

Fig. 4

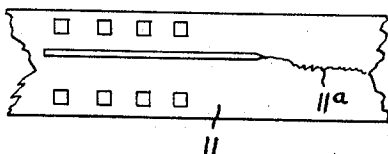


Fig. 14

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4 Sheets-Sheet 3

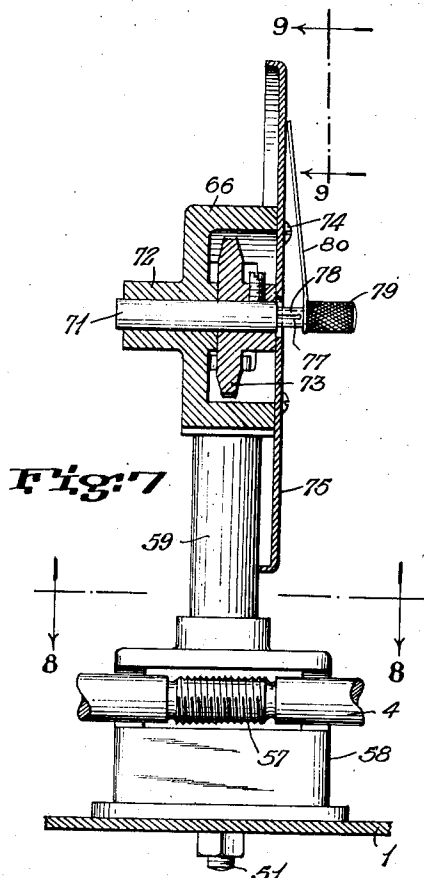


Fig. 7

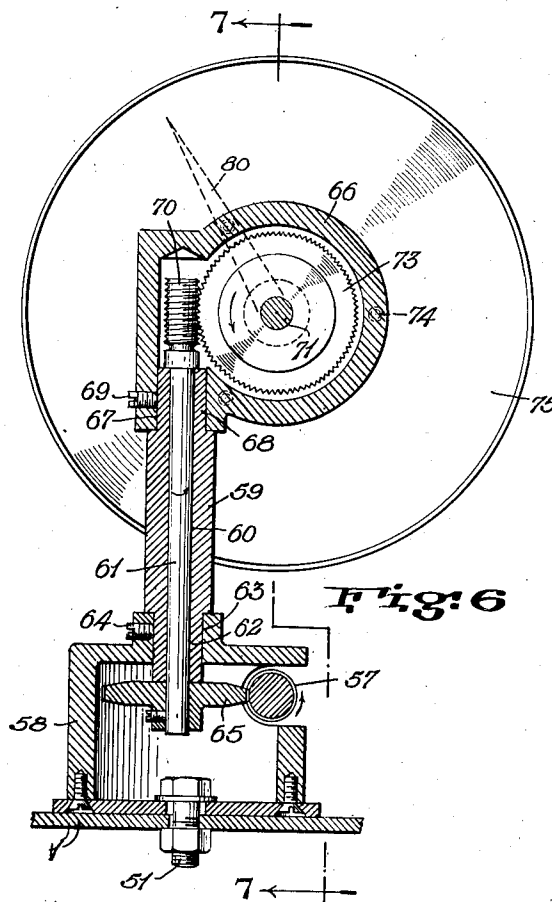


Fig. 6

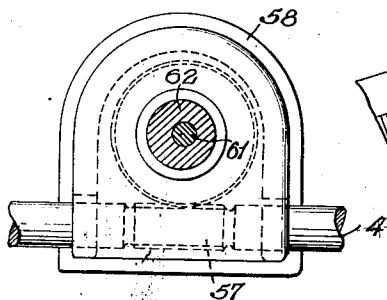


Fig. 8

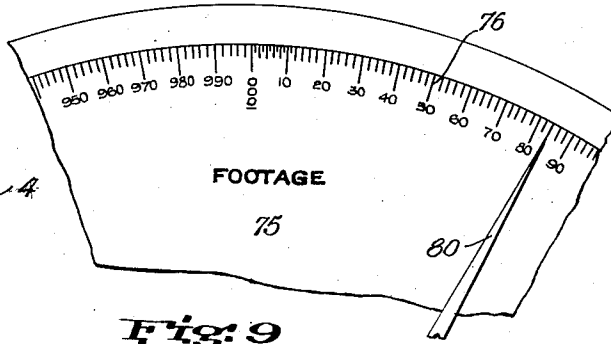


Fig. 9

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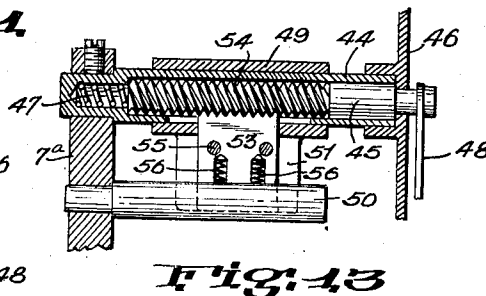
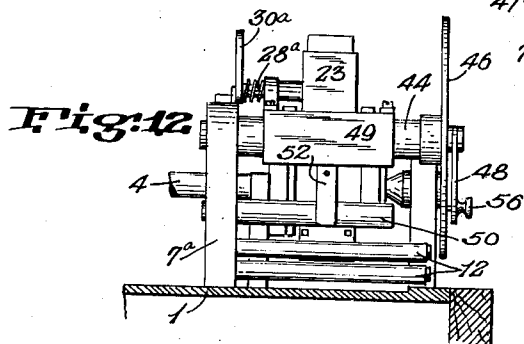
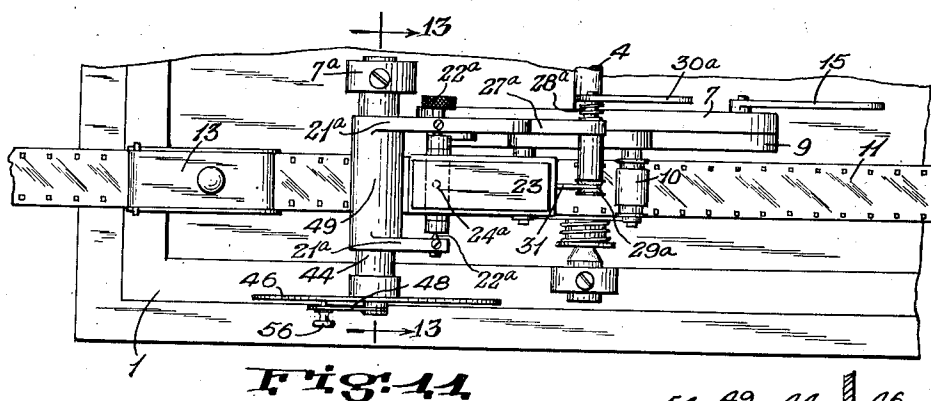
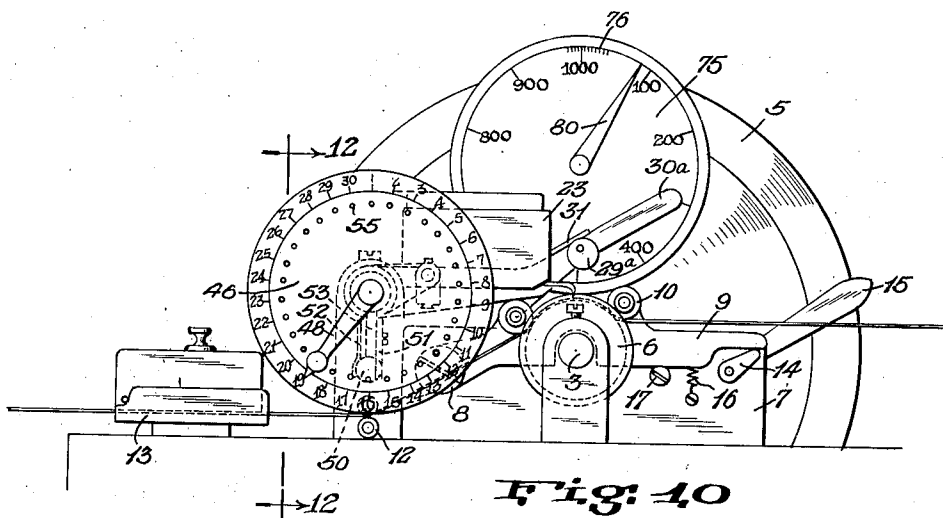
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4 Sheets-Sheet 4



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UNITED STATES PATENT OFFICE

2,191,691

INDEXING AND FINDING MEANS FOR
SOUND RECORDING AND REPRODUCING
MACHINES

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ware

Application June 7, 1937, Serial No. 146,968

5 Claims. (Cl. 274—11)

This invention relates to devices for recording and reproducing sound in connection with a record medium and more particularly to the recording and reproducing of sound in connection with a record medium having a plurality of sound records thereon in transverse relation.

Specifically, it relates to devices used in connection with a record made on a film of any desired length and one which permits a great many sound records to be placed parallel to each other.

In the copending application of Von Madaler and Woolf, Serial No. 130,400, filed March 11, 1937, a film having a number of sound records in parallel relationship is disclosed and since such a film may be of great length, sound may be continuously produced thereon or reproduced therefrom for a very great length of time. In some cases, for instance, a single film may be used for as long as twenty-four hours.

Therefore, since a single film may contain a great many independent recordings, such as individual compositions, musical numbers or speeches, the problem of properly locating the reproducing means at the proper position both longitudinally and transversely of such a film becomes of great importance.

An object of the present invention, therefore, is the production of a device both for recording and reproducing in which the position of the recording and reproducing means may be accurately and conveniently located.

Since in order properly to locate the reproducing means, at any one of a number of sound record tracks and also to locate the same at the precise longitudinal position on the particular sound track where a desired recordation is to begin, it is necessary first to note and indicate the position of the recording means relative to the recording medium during recording operations.

An important feature of the invention, therefore, relates to means for indicating both the transverse and longitudinal positions of the recording means relatively to the recording medium whether the recording medium be a stylus or some other means suitable for the purpose.

A further and equally important feature of the invention relates to the provision of means for accurately locating the reproducing means both longitudinally and transversely of the record medium for the purpose of reproducing any desired portion of the record.

Further features contributing to a desirable form of device for successful commercial re-

cording and reproducing will be apparent from the following description and claims when taken in connection with the accompanying drawings, in which:

Fig. 1 is a plan view of the machine, partly broken away;

Fig. 2 is a side elevation of the machine, partly broken away;

Fig. 3 is an end elevation, partly in section, taken on the line 3—3 of Fig. 2;

Fig. 4 is a side elevation of a section of the machine, showing the sound recording mechanism in operative position;

Fig. 5 is an end elevation of a portion of the machine, showing the sound recording head on line 5—5 of Fig. 4;

Fig. 6 is a sectional view of the footage indicator, taken on line 6—6 of Fig. 1;

Fig. 7 is a sectional view on the line 7—7 of Fig. 6;

Fig. 8 is a plan view, partly in section, taken on the line 8—8 of Fig. 7;

Fig. 9 is a sectional elevation, taken on the line 9—9 of Fig. 7;

Fig. 10 is a side elevation similar to Fig. 2, showing a modification of the machine;

Fig. 11 is a plan view of said modification, partly broken away;

Fig. 12 is an end view in section on the line 12—12 of Fig. 10; and

Fig. 13 is a section taken on the line 13—13 of Fig. 11.

Figure 14 is a plan view showing the beginning of a sound track on the film.

A suitable basic structure with which the present invention may be embodied is disclosed in said application Serial No. 130,400 and in order that the cooperation of the devices for carrying out the present invention with the mechanism disclosed in said application may readily be understood, the present invention will be described in connection with so much of the mechanism of said application as may seem desirable to show the practical utility of the improvements.

Referring to the drawings, the present device consists essentially of a casing on the upper part of which is mounted a base member 1 supporting standards 2 and passing through said standards are conical bearings 3, at least one of which is adjustable longitudinally in its standard. As in the previously referred to application, the conical bearings support a main shaft 4 carrying a flywheel 5 and a film driving sprocket 6. Vertically arranged on said base member is an upright plate or rib 7. Pivotaly mounted at 8 on

said plate is a bar or lever 9 carrying horizontally disposed, rotatably mounted rollers 10 adapted to engage the film 11 to hold the same in operative relationship with the sprocket 6, whereby the conventional holes in the film may be engaged by the likewise conventional teeth of the sprocket. On the lead-in side of the sprocket are arranged two guide rollers 12 adapted to properly lead in the film toward the sprocket. A dust removing means 13 is also provided on the lead-in side.

Application Serial No. 130,400, referred to in the foregoing, has now matured to Patent No. 2,173,048, dated September 12, 1939. In this patent mechanism is shown in detail for mounting and driving suitable reels from which the film is fed and onto which it is wound after passing beneath the stylus. This is shown especially in Figure 1 of said patent. A showing of the reels is believed unnecessary for the purposes of the disclosure of the present application, except insofar as shown in Figures 1 and 2. In these figures, fragmentary portions of reel supporting arms 14a and 15a are shown. A pulley 12a is mounted adjacent the fly wheel 5, said pulley driving a suitable elastic belt 13a which, in turn, revolves the receiving reel for the film. When it is desired to rewind the film on the supply reel, a driving wheel 17a is thrown into engagement by means of operating lever 18a with the fly wheel 5, the driving wheel in turn operating a belt 16a which revolves the supply reel. With this mechanism it will be readily seen that the film may be driven in either direction in an efficient manner.

Mechanism is also provided consisting of a pivoted cam or eccentric 14 mounted on the plate 7 to operate against the free end of the arm 9, to elevate the rollers 10 away from the sprocket by means of the handle 15. Spring means 16 are provided to maintain the free end of arm 9 against the end of the cam 14 at all times. Stop member 17 limits the lowering movement of the arm 9.

Arranged transversely of the rib or plate 7 is a guideway 18 having a dovetail groove therein for supporting the base 19 of a carriage 20, the base 19 being in the form of a truncated prism fitting into the dovetail groove in the guideway 18.

Mounted on the slide 20 are upright standards 21, which carry conically pointed spindles 22, at least one of which is adjustably mounted in its standard, and pivotally supporting therebetween either the sound producing or sound recording head. As shown in Fig. 3, proper adjustment of the spindles is maintained by a suitable thumb screw 22b, clearly shown.

The recording head 25 is thus mounted against any horizontal motion since in recording, the stylus only is vibrated relatively to the recording head.

In the case of the pick-up head 23, however, a transverse bar 24, Figure 3, is pivoted between the spindles 22, which bar 24 carries a swivel 24a, upon which the pick-up head is mounted, thereby permitting slight horizontal oscillation of the pick-up head.

Extending upwardly and horizontally from the innermost standard 21 is an arm 27, Figures 1 and 3. The upper end of said arm as shown in Figure 3, carries a shaft 28 having at one end thereof an eccentric 29, the latter being provided with a V-shaped groove about the circumference thereof. Rotation of the shaft 28 by means of the handle 30 will cause the eccentric 29

to lower or elevate the pick-up head through means of an arm or pin 31 extending centrally therefrom and engaging in the groove in the eccentric 29. Thus the stylus of the pick-up head is caused to engage or disengage the film 11 at a point substantially directly over the axis of the sprocket 6.

The mechanism so far described is all disclosed in said application Serial No. 130,400.

Another means of facilitating the engagement of the reproducing point in the proper groove is to make the beginning of the groove abnormally wide as shown in Figure 14. The sprocket which propels the film does not start at full speed and recording should be delayed until a full and steady speed state has been reached. During the interim between starting and the acquisition of full speed, while no recording is being done, it has been found advantageous to put abnormal pressure on the record needle point, forcing it further into the material and making the groove wider, and thus making it much easier to select the groove 11a desired when reproducing from the film. The additional pressure for widening the groove may be applied manually, or by any suitable mechanical means.

The dimensions of the groove in the eccentric 29 are such that when the same is in the position where the arm 31 will be lowered the greatest extent, the stylus 32 is so arranged with respect to the pickup head that the outer end thereof will engage the film before the arm 31 would reach its lowermost position as ordinarily controlled by the eccentric 29. Thus, when the eccentric is in its lowermost position, the arm 31 will be spaced somewhat from the base of the groove, whereby there will then be no contact or connection between the arm 31 and the eccentric 29.

First modification of sound track indicator and shifter

The structure of the first modification for locating and shifting the slide 20 carrying either the recording or pickup head transversely with respect to the film, consists of a lever 33 attached to one end of a pivoted shaft 34 vertically disposed in a bearing block 35 mounted on the base member 1. Lever 33 is disposed below the base plate 1, as clearly shown in Fig. 2. To the upper end of the shaft 34 is secured a short lever 36 having secured to one side thereof a leaf spring member 37. In effect, the lever 33, shaft 34 and short lever 36 constitute a single lever pivoted between its ends and having a long and short portion disposed on opposite sides of the pivoted shaft 34. A space is provided between the lever 36 and spring 37, whereby this construction resembles a fork. Engaged between the outer ends of the lever 36 and the spring 37 is a downwardly disposed pin 38 depending from the underside of the slide 20.

The shaft 34 is shown as being slightly tapered downwardly and the bearing receiving this shaft is similarly tapered, whereby as wear occurs between the moving parts, the same is automatically taken up by the shaft reseating itself further into said bearing, thus allowing no lost motion between the parts. Sufficient clearance is provided between the underside of lever 36 and the upper surface of the bearing block 35 to permit the shaft to properly seat itself in taking up such wear.

On the opposite end of lever 33 from the pivot is an upstanding member 39 having mounted thereon a block 40 carrying a spring-pressed pin 75

2,191,691

41, the pin being normally spring-pressed downwardly. Located in the base plate is an arcuate slot 42 through which the member 39 projects. Disposed along one side of this slot is a series of evenly spaced apertures 43 adapted to receive the lower end of the pin 41. Suitable indicia are disposed opposite each aperture, the same corresponding to the number of the groove or sound track being produced or reproduced in the film. Thus, any movement of the member 39 will transmit the motion correspondingly to the pin 38 and thereby move the slide transversely with respect to the film.

If it is desired to reproduce sound from a film, the pin 41 is set in the desired aperture 43, the arm 31 is centered in the groove of the pulley 29, and handle 30 is manipulated to lower the arm 31 and simultaneously, the stylus 32 is located in the desired film track.

20 Second modification of sound track indicator and shifter

An alternative structure for manipulating the above described slide and carriage mechanism for the recording and pickup heads transversely of the film consists of a horizontally arranged sleeve 44 adjustably mounted in an aperture in the upstanding post 7a. Rotatably mounted in said sleeve is a shaft 45 having a set of threads thereon of a rather steep pitch. This shaft is held within the bore of the sleeve 44 by a flat disc-like member 46 affixed to the outer end of the sleeve and the opposite end of the shaft is spring-pressed against said disc by a spring 47, thus eliminating any chatter or lost motion on the part of the shaft. The shaft is manipulated by a handle 48.

Surrounding the outer surface of the sleeve 44 and adapted to longitudinally slide thereon, is a tubular member 49 corresponding to the slide 20 in the first modification and carrying suitable supports for the recording or pickup head. Such supporting mechanism comprises suitable arms 21a to support spindles 22a which cooperate with the bearings provided in the pickup or recording head structures. A horizontally extending arm 27a, rotatably supporting shaft 28a at one end, is also mounted on sleeve 44. An eccentrically mounted pulley 29a and handle 30a are attached to opposite ends of shaft 28a and correspond to elements 29 and 30 in Figs. 1 through 5 to cooperate with arm 31 of the pickup head 23.

Horizontally extending from the upstanding post 7a is a shaft 50. Depending from the lower side of the tubular member 49 is an element 51 and a spring member 52, these elements being disposed one on each side of the shaft 50 and by such construction prevent the tubular member 49 from rotating with respect to the sleeve 44. Element 51, while shown of rigid nature, may be a leaf spring if desired. The spring member 52 also prevents any chatter or lost motion on the part of the tubular member. Though not shown in the present drawings, suitable support may be provided for the external ends of sleeve 44 and shaft 50, if desired.

Mounted between the element 51 and the spring member 52 is a block 53 having cogs or teeth disposed along the upper edge thereof. The block 53 is secured by means of suitable bolts or rivets 55, whereby the block moves as an integral part with the tubular member 49. Slots are provided in the lower side of said block containing springs 56 which bear against and slide with respect to shaft 50 when the tubular member 49 is moved.

These springs in constantly pressing the block 53 into engagement with screw threads 54 prevent any lost motion or chattering between the threads of the shaft 45 and the tubular member 49.

The disc 46 is circular and has arranged about the periphery thereof a circular row of apertures 55, corresponding to different sound tracks in the film. Suitable indicia are also located opposite said apertures. The outer end of the handle 48 carries a spring-pressed pin and handle element 56 adapted to be inserted in any desired aperture 55 corresponding to the film track desired. As an alternative structure, the handle 48 may be in the nature of a leaf spring, in which event the handle and pin 56 could be rigidly mounted in the end thereof, the handle 48 being adapted to be flexed to effect removal of the pin from the apertures. By either construction, when the shaft 45 is rotated by the handle 48, it will be seen that the tubular member 49 carrying the sound pickup and reproducing head may be accurately and efficiently moved transversely with respect to the film 11.

Footage or Linear Dimension Indicator Structure 25

Mechanism is also provided for indicating the number of feet of film that have passed from a given point on the film, whereby at any instant during the operation of the machine the exact linear location of the stylus will be known with respect to a known point on the film. This knowledge is necessary in order to determine one dimension of the position on the film of any given point such as the starting or stopping place of a selection which may consist of music, a speech, or other sounds. Knowing the linear position of such a point is necessary in addition to knowing the film track number which can be located by the two modifications of mechanism described above.

The mechanism for registering the footage of the film consists of a thread or worm 57 located on the main shaft 4 between the fly wheel 5 and the sprocket 6 clearly shown in Fig. 3. Disposed about this portion of the main shaft 4 is a housing 58, which, as may be clearly determined from Fig. 6, is adjustably secured to the base member 1, by means of a bolt passing through a suitable aperture in the lower part of said housing, the aperture being of larger diameter than the shank of the bolt, whereby small lateral motion of the housing is afforded for purposes of adjustment. This bolt also serves as a quick means of detaching or attaching the footage indicator mechanism to the machine. It will be seen that such attachment or detachment is readily accomplished by merely fitting the housing around the worm 57 on the shaft 4, a suitable opening being provided in one side of the housing to receive such shaft and worm, as is clearly seen in Fig. 6.

Upwardly extending from said housing is a standard 59 containing a bore 60 to receive a vertically disposed rotatable shaft 61. The standard 59 is adjustably mounted in the upper part of the housing 58, by means of a reduced portion 62 on the lower end of the standard 59 which extends into an aperture 63 in the upper part of the housing. The center of the reduced portion is eccentric with respect to the center of the bore 60 and shaft 61 as can readily be seen in Fig. 8 for purposes to be described. Adjustment of the reduced portion is maintained by a suitable set screw 64. Mounted on the lower end of the shaft 61 is a worm gear 65 held thereto by a

suitable set screw, said worm gear cooperating with the worm 57 on main shaft 4.

In order that the threads of the worm and worm gear 57 and 65 may be properly spaced with respect to each other, the standard 59 may be rotated in such a manner that the eccentrically disposed, reduced portion 62 may be so positioned in the aperture 63 as to bring the worm and worm gear in proper relationship. Wear between the worm and gear may also be compensated for by such arrangement.

Mounted on the upper end of the standard 59 is another housing 66, said housing having a bore 67 at one portion thereof received about a reduced portion 68 located on the upper end of the standard 59 and held thereto by a suitable set screw 69. On the upper end of shaft 61 is a worm 70. Mounted on a horizontal axle 71 rotatably mounted in a bearing 72 in the housing 66 is a worm gear 73 adapted to cooperate with the worm 70 and be rotated thereby.

Secured to one face of the housing 66 by suitable screws 74 is a circular plate 75. This plate serves the double function of being a closure for the housing 66 and also as an indicator dial face, since located on the outer face thereof are suitable indicia 76, to indicate the amount of film that has passed between a certain point thereon and the position on the film where the stylus happens to be at any instant at which a reading is taken.

The plate or dial 75 is graduated to read in any scale or number of scales desired. If the sprocket 6 which revolves with the spindle 4 is D frames in circumference, and there are A frames per foot, B teeth in worm gear 65 and C teeth in worm gear 73, the number of frames passing the sprocket 6 for each revolution of the pointer 80 will be BCD, while the number of feet passing will be

$$\frac{BCD}{A}$$

By the proper selection of the number of teeth in worm gears 65 and 73 the indicator can be made to read in any scale desired.

One end of the horizontal axle 71 is reduced, as shown at 77, and mounted on this reduced end is a split sleeve 78 having affixed to the outer end thereof a knurled knob 79. Secured to the knob 79 is an indicator pointer 80. The split sleeve construction permits the rotation of the pointer with respect to the axle 71 by means of the knurled knob 79, so that in the case, for instance, where it is desired to start a certain selection to be recorded on the film, the pointer may be rotated to zero on the dial without running the machine at all and thus the linear dimension of the selection being recorded may be accurately measured and recorded on the dial plate 75.

In using the device, let it be assumed that the recording head has been positioned by the lever 33 to record on track 1 and that the dial 75 has its pointer 80 set at zero. Recording may then proceed and after a particular recordation has been completed, note is made of the reading of the transverse indicator 43 and the longitudinal indicator 75. The reading of the indicator 75 at the beginning of the composition is also noted.

If it be assumed that the first recordation required 200 feet of film and the second recordation is to be begun at this point, the note regarding the second recordation would read "transverse position 1, longitudinal position 200", or it might read "track 1, footage 200", or any other suitable designation may be employed.

Similarly succeeding recordations will be noted and when it is desired to reproduce a particular composition, or to position the recording means for further recording, the transverse and longitudinal indicators enable the stylus and film to be relatively positioned or located at the exact point desired.

Summary

It will thus be seen that the applicant has provided a device wherein recording of sound on film in strip form is readily and efficiently accomplished and reproduction of such sound may likewise be made with the same machine, merely by substitution of a sound pickup head for the sound recording head. In conjunction with such a machine, the present invention affords a ready and accurate means to position the recording or pickup head with respect to the record medium. As has been previously set forth, where a great many different sound tracks arranged in parallel fashion on the film are situated on a single film, it is necessary that some means of accounting for and also locating various points in the various sound tracks as well as the sound tracks themselves, must be provided. It has been the primary purpose of this invention to provide such a means which has been fully described in detail above. It is to be understood that various changes and modifications may be made in the structure illustrated and described, without departing from the spirit of the invention.

I claim as my invention:

1. In a sound recording or reproducing machine, means for moving a sound sensitive mechanism transversely to the sound track of a record medium, said means comprising a rotatable worm, a slide provided with cogs adapted to pivotally support said mechanism adjacent one end, said cogs engaging said worm, whereby rotation of the worm causes motion of said mechanism transversely to said sound track, and means also carried by said slide adapted to further transversely position the mechanism with respect to said record medium comprising an arm protruding from the end of said mechanism opposite the pivotally supported end and a rotatable cam having a circumferential groove thereon adapted to cooperate with said arm to raise and lower the adjacent end of said mechanism.

2. In a sound translating machine using a record medium having a sound track associated therewith and a rotatable means to drive said record medium, means for indicating at any instant during the process of translating the length of sound track having passed the translating mechanism, said means comprising a rotatable worm driven directly from said record medium driving means, a series of reducing gears operated thereby comprising a shaft supporting a worm gear meshing with said worm and an eccentrically mounted bearing supporting said shaft and worm gear, whereby rotation of the bearing will adjustably position the worm gear and worm with respect to each other, a pointer actuated by said reducing gears cooperating with a suitable dial and indicia to indicate the length of sound track from any given starting point.

3. In a sound translating machine using a record medium having a sound track associated therewith, means for indicating at any instant during the process of translating, the length of sound track having passed the translating mechanism, said means comprising a rotatable worm mounted on a spindle, each turn of which corresponds to a predetermined length of sound track, 75

a second spindle carrying a worm and worm gear, said worm gear being in mesh with said first worm and supported on a shaft mounted in an eccentrically mounted bearing, whereby rotation of said bearing will adjustably position said worm gear and worm with respect to each other, a third spindle carrying a worm gear, in mesh with the worm of said second spindle, and also bearing a pointer adapted to rotate at the same rate as said third spindle, and indicating the length of sound track from a given point.

4. In a sound translating machine, means for indicating at any instant during the process of translating the length of sound track having passed the translating mechanism, said means comprising a rotatable worm, a series of reducing gears operated thereby, a supporting shaft, a pointer carried by said shaft and actuated by said reducing gears cooperating with a suitable dial and indicia to indicate the length of sound track from any given starting point, said pointer

being yieldably and frictionally supported on said shaft whereby it may be manually moved with respect to said shaft when desired for resetting.

5. In a sound recording and reproducing machine, suitable for use with a strip of film provided with a plurality of substantially parallel, longitudinally extending sound grooves, a stylus, means for positioning the stylus transversely with respect to the film, an indicator cooperating with and movable with the said stylus positioning means for indicating such transverse position of the stylus, means for moving the film longitudinally with respect to the stylus, a second indicator movable in a fixed relationship with longitudinal movement of the film for indicating the exact longitudinal position of the film with respect to the stylus whereby the location of the stylus with respect to a particular point in a particular sound groove is indicated.

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