June 6, 1933. H. E. CHIPMAN 1,912,887

METHOD OF MAKING RECORDS FOR REPRODUCING SOUNDS

Original Filed March 12, 1924 2 Sheets-Sheet 1

Fig. 1.

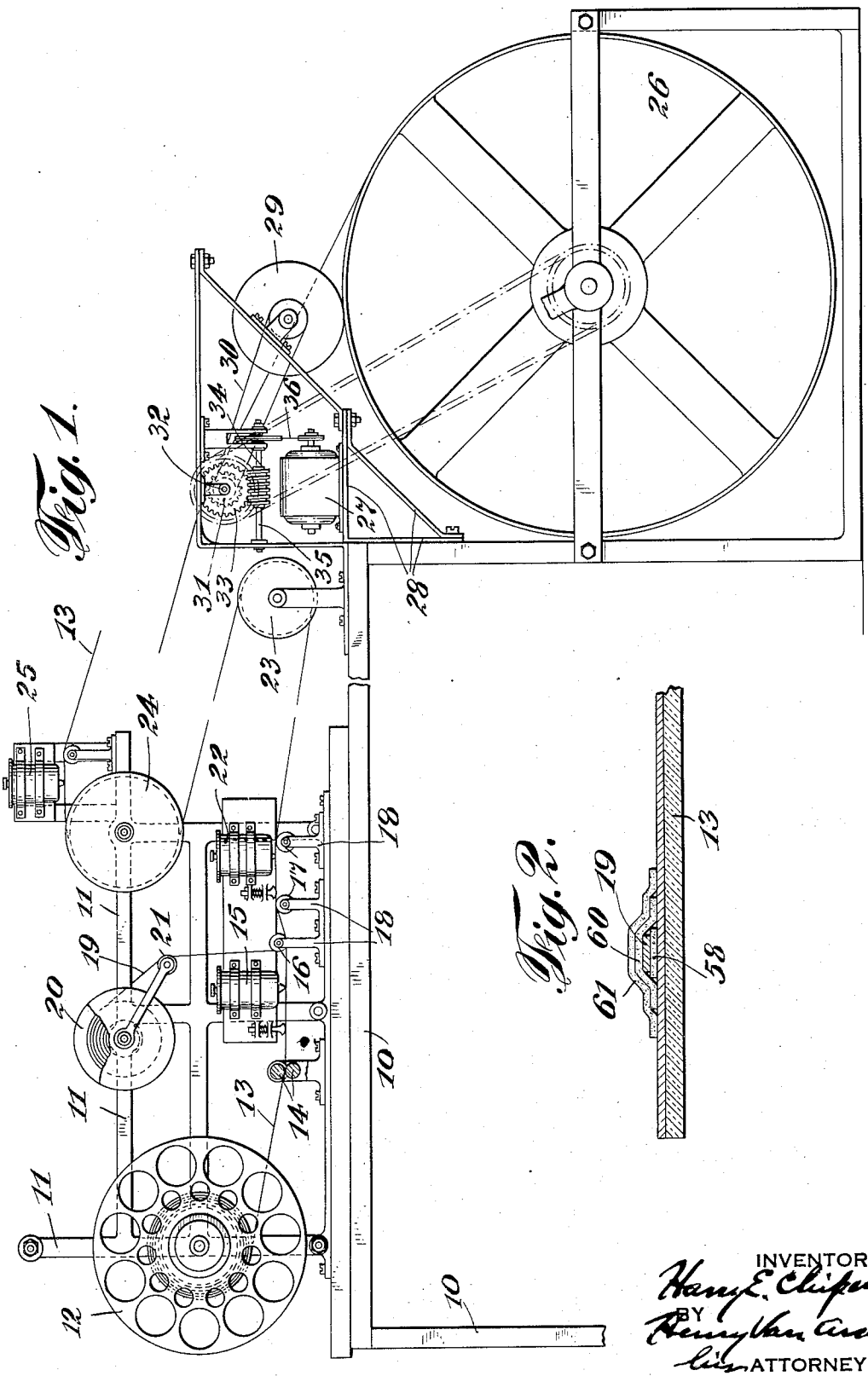


Fig. 2.

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Fig. 3.

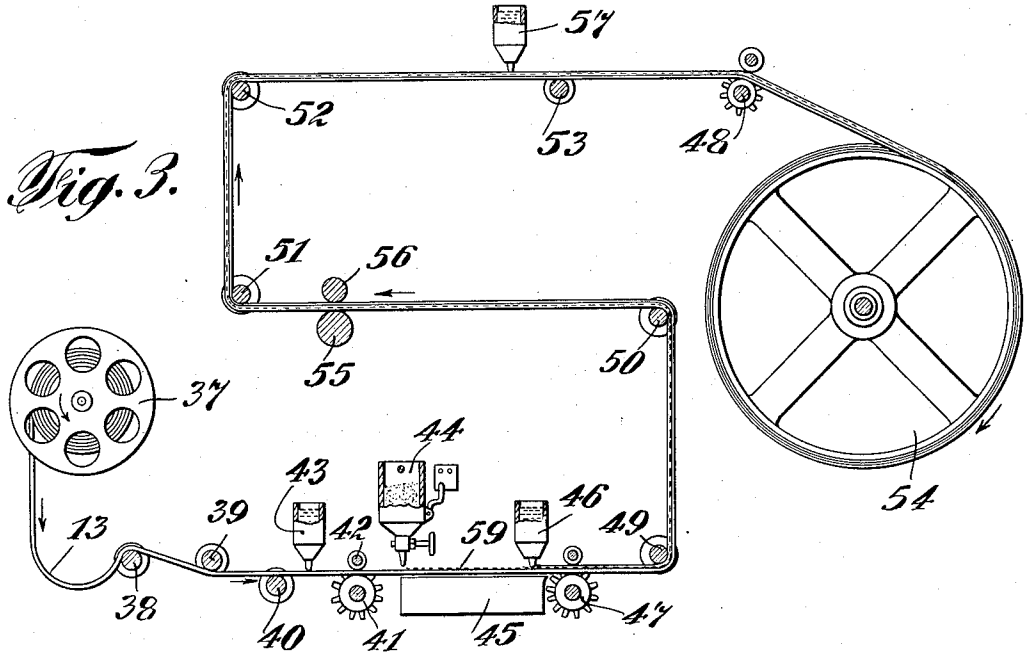


Fig. 4.

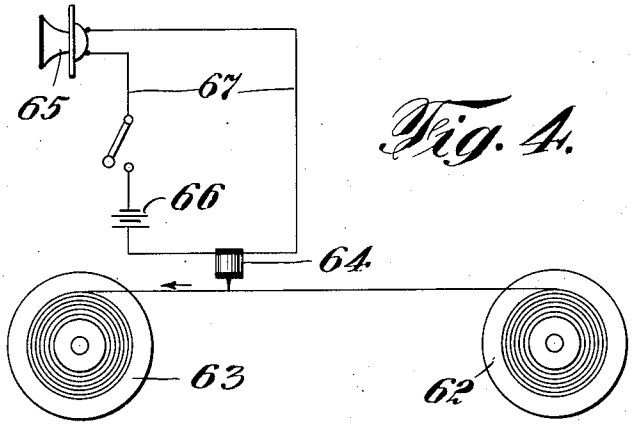
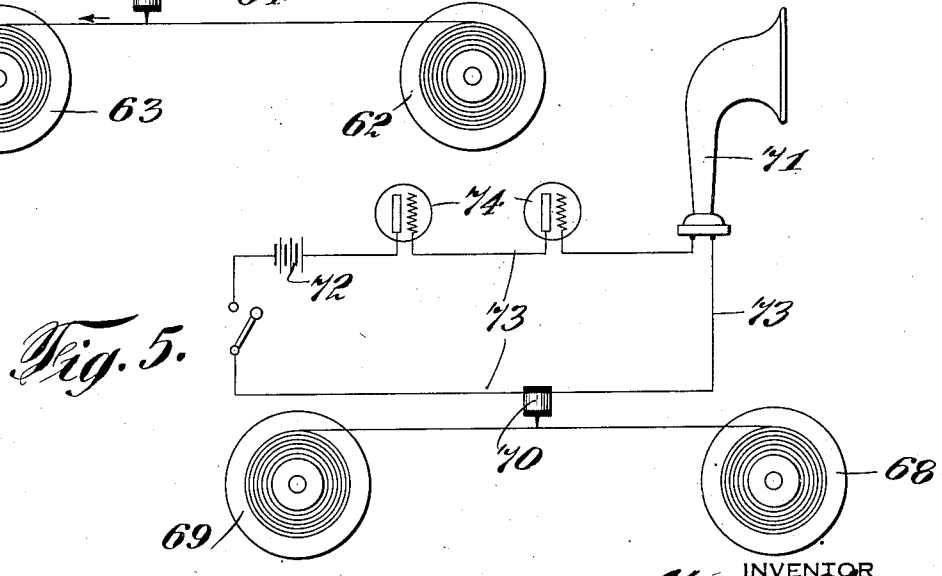


Fig. 5.



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UNITED STATES PATENT OFFICE

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METHOD OF MAKING RECORDS FOR REPRODUCING SOUNDS

Continuation of application Serial No. 698,588, filed March 12, 1924, now Patent No. 1,841,595. This application filed December 18, 1929. Serial No. 414,838.

This invention relates to methods of making records for reproducing sounds and is a continuation of an application filed by me March 12, 1924, Serial No. 698,588, for Method of and apparatus for making talking motion picture film.

In said prior application, I disclosed an apparatus for affixing magnetic material, such as a metal ribbon, on a strip of flexible non-magnetic material, such as ordinary motion picture film.

The object of the present invention is to provide a method of making records for reproducing sounds, utilizing magnetic material deposited on a strip of flexible non-magnetic material.

Other objects of my invention will be in part obvious and in part pointed out hereinafter.

In accordance with my invention, I provide a strip of flexible non-metalic material, which may be motion picture film, on which is deposited and secured a line of magnetic material, which may be in the form of small metal particles secured to the non-magnetic material by means of a suitable binder or cement, or the magnetic material may take the form of a metal ribbon, which may be held in place on the film by means of cement or other suitable binding material or securing means. The method contemplates progressing this record strip past the core of a recording head or magnet which is included in an electrical recording circuit, so that the record strip will be polarized locally in accordance with variations in the recording circuit corresponding with the sounds affecting said circuit. When the finished record is passed in the same direction under a reproducing head or magnet included in an electrical reproducing circuit, a reproduction of the original sound tone will be obtained.

In order that a clearer understanding of my invention may be had, attention is hereby directed to the accompanying drawings, forming a part of this application and illustrating certain possible embodiments of my invention.

Referring to the drawings, Fig. 1 is a side view of an apparatus, illustrated somewhat diagrammatically, for applying the line of magnetic material to the flexible strip of non-magnetic material.

Fig. 2 is a transverse sectional view on a greatly enlarged scale, showing a fragment of one possible manner of attaching a magnetic line of material to a flexible non-magnetic strip;

Fig. 3 is a diagrammatical view, showing apparatus for securing a line of magnetic filings to a strip of flexible non-magnetic material;

Fig. 4 is a diagrammatic side elevation, showing one possible method of making a sound tone record in accordance with this invention; and

Fig. 5 is a diagrammatic side elevation, showing one possible method of reproducing sound tones from the sound tone record.

Similar reference characters refer to similar parts throughout the several views of the drawings.

Referring to the drawings, a suitable apparatus for applying magnetic ribbon to a strip of flexible non-magnetic material is shown in Fig. 1. As shown, the apparatus includes a suitable table or supporting structure 10. On this table is a framework 11, provided with means for removably and rotatably supporting a reel 12 on which is wound a strip 13 of flexible non-magnetic material, such as ordinary motion picture film. The film is adapted to pass between two positioning rollers 14 mounted on the table 10, thence under the nozzle of a container 15, which is secured to the framework 11 and deposits a line of cement or other suitable adhesive material as the film is moved under this container. The film then passes under a roller 16 and over guide-rollers 17, these rollers 16 and 17 being carried on suitable brackets 18 secured on the table 10.

A ribbon of magnetic material 19, which may be high carbon spring steel, passes from a reel 20 secured on the framework 11 over a tension roller 21 and beneath roller 16, where this ribbon becomes positioned on the film strip 13. From this point, the film strip 13 and the magnetic ribbon 19 pass through the apparatus together and the metallic ribbon becomes affixed and secured to the film.

When the metal ribbon 19 meets the film 13 at the roller 16, the metal ribbon is laid on the line or trail of cement, or other binder, which has been placed on the film as it passes beneath the receptacle 15. A little further on in the apparatus, a dispensing tank 22, which is suitably supported on the framework 11, lays another layer of cement, or other suitable binder, over the metal ribbon 19, covering this ribbon and flowing upon the film 13 on both sides of the ribbon. Thereafter the film and ribbon so secured thereon pass around a guide-roller 23 supported on the table 10 and a guide-roller 24 supported on the framework 11. From thence the film and magnetic ribbon pass beneath a container 25, which is supported on the framework 11 and which covers the metal ribbon 19 with a second coat of cement or other suitable binder, this layer of cement preferably also covering the layer applied by the container 22 and flowing sidewise upon the film 13 itself. From thence the film 13, with the metal ribbon 19 so secured thereto, is led to a drum 26, on which the film is wound to permit the cement or other binder to dry.

The apparatus may be driven by a suitable source of power, such, for instance, as motor 27, which is carried on a bracket 28 secured to the table 10. This motor may be connected to drive the drum 26 through any suitable operating mechanism. For instance, as shown, the drum is driven by a friction-roller 29, which is driven by a belt 30 from a pulley 31 affixed to a shaft 32 which carries a gear-wheel 33 driven by a worm 34 secured to a shaft 35 which has a pulley and belt connection 36 with the motor 27.

With this apparatus, the film 13 and ribbon 19 are drawn through the apparatus by the rotation of drum 26.

As aforestated, instead of affixing a metallic magnetic ribbon, such as 19, upon the flexible non-magnetic strip, such as film 13, magnetic particles may be deposited on and affixed to the film strip 13. Any suitable apparatus may be used for this purpose. One possible embodiment of such apparatus is diagrammatically shown in Fig. 3. The film strip 13 is fed from a reel 37 and is drawn through the guide-rollers 38, 39 and 40 by suitable mechanism, such as sprocket-wheel 41, which is driven by any suitable source of power. A pressure-roller 42 may be provided to keep the film strip in operative engagement with the sprocket. A cement pot 43, containing a suitable cementitious substance, is suitably supported over the film strip and is provided with a suitable nozzle or dispensing outlet for applying a line or trail of cementitious substance on the advancing film 13.

After passing the sprocket 41, the film strip passes beneath a suitably supported container or receptacle 44, which disposes a line or trail of magnetic particles on the line or trail of cement which the film has received from the container 43. In order that the magnetic particles be concentrated into a uniform strip and held in position prior to being covered by one or more layers of cementitious substance, the film may then be arranged to pass over a suitable magnet, indicated diagrammatically at 45. After passing over this magnet, the film passes beneath another receptacle or container 46, which lays a coating of cementitious substance over the metal particles which have been embedded in the cementitious substance which has been applied to the film by the container 43. The film may then be passed over suitable sprockets 47 and 48 and around intermediate guide-rollers 49, 50, 51, 52 and 53, and upon a drying-drum 54. In passing to the drying drum, the film may be caused to pass between a pair of pressure-rollers 55 and 56, which act to compact the magnetic particles together and to press the plastic overlying cementitious layer firmly upon the film. Also, before reaching the drum 54, the film may be passed beneath a suitably supported container or receptacle 57, which deposits another layer of cementitious substance over the metal particles and cementitious substance already applied to the film, thus further securing the metal particles in place on the film. Drum 54, if desired, may be driven by mechanism similar to the mechanism described with regard to the apparatus shown in Fig. 1.

As will be apparent from the above, the talking strip which is adapted to be used for the production and reproduction of sound tones consists of a line of magnetically connected metal particles deposited and secured on a flexible strip of non-magnetic material. In producing such talking record strip, a line or trail 58 of suitable cementitious substance is first deposited on the flexible non-metallic material as it moves through the apparatus. A line or trail of magnetically connected metal particles, which may be a metallic ribbon, such as 19, or small metal particles, such as 59, is then deposited on the cementitious line 58 as the strip 13 is moved through the apparatus. Thereafter, one or more lines or layers, such as 60 and 61, are deposited over the line or trail of magnetically connected metal particles previously deposited on the film. After the cementitious substance has become set and dry, this tone record strip may be used for the production and reproduction of sound tones by any suitable mechanism.

For instance, in order to place a sound record on the strip, it is preferable to have the strip arranged to pass at uniform constant speed from one reel, such as 62, to another, such as 63, and in passing from one reel to another to pass in magnetic proximity to

the core or needle of a suitable electro-magnet or talking head 64, which is included in an electrical telephone circuit, comprising a microphone or transmitter 65, battery 66 and conductors 67. The talking head 64 sets up local polarization in the trail or line of magnetic particles carried on the film corresponding to the sounds passing into the transmitter 65 of the recording circuit.

When the recording operation is completed, the polarized strip is rewound onto a suitable reel, such as 68. When reproduction of the recording sound tones is desired, the film may be caused to pass from reel 68 to another reel, such as 69, preferably at the same constant speed as the strip traveled when the magnetic record was made thereon. The reproduction of the original sound tones may be had by causing the polarized film to pass beneath the needle or core of a suitable electro-magnet or reproducing head 70, which is included in any suitable reproducing circuit. For instance, as shown in Fig. 5, this circuit may include a loud speaker 71, battery 72, and conductors 73, and also, if desired, may include one or more audion bulbs 74.

From the above, it will be apparent that I have described a method of and apparatus for producing a talking film or strip employing a line of magnetically connected metal particles which may either be in the form of a metal ribbon or in the form of small particles, and that I have also described a method of and apparatus for polarizing the strip to place a sound record thereon, and a method of and apparatus for reproducing from such strip the sound records represented by the local polarization of the strip.

As aforesaid, in my copending application Serial No. 698,588, I have disclosed and claimed the apparatus illustrated in Figure 1, I have disclosed and claimed the talking record, including a line of magnetically connected metal particles in the form of a metal ribbon on the flexible non-magnetic material, in my copending application Serial No. 291,167, filed July 9, 1928, for Talking motion picture film and method of making same, being a division of my application Serial No. 698,588. I have disclosed the talking record consisting of magnetically connected metal particles in the form of small particles embedded in a cementitious substance deposited on the flexible non-magnetic material and the apparatus for producing the same, as shown in Figure 3, in my copending application Serial No. 317,289, filed November 5, 1928, for Sound film and method of making same.

It is apparent that many changes could be made over the specific disclosures, descriptions and illustrations presented herewith for the purpose of illustrating certain possible embodiments of my invention, without departing from the scope thereof. It is, therefore, to be understood that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

What I claim is:

1. The method of making records for reproducing sound tones, which consists of depositing a line of cementitious substance on a moving strip of flexible non-magnetic material, then depositing a line of magnetically connected metal particles on the line of cementitious substance to secure said metal particles to said moving strip and then subjecting said line of metal particles to local polarization.

2. The method of making records for reproducing sound tones, which consists of depositing a line of cementitious substance on a moving strip of flexble non-magnetic material, depositing a line of magnetically connected metal particles on said line of cementitious substance, covering said cementitious substance and metal particles with a layer of cementitious substance, and then subjecting said line to local polarization.

This specification signed this 16th day of December, 1929.

HARRY E. CHIPMAN.