June 24, 1958 M. CAMRAS 2,840,380

MAGNETIC RECORDER SOUND UNIT

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Fig. 1

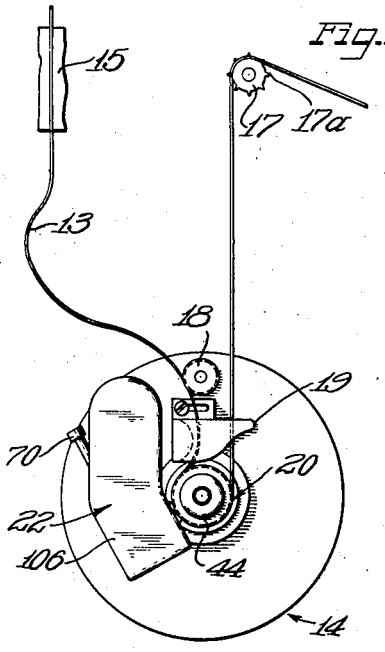


Fig. 2

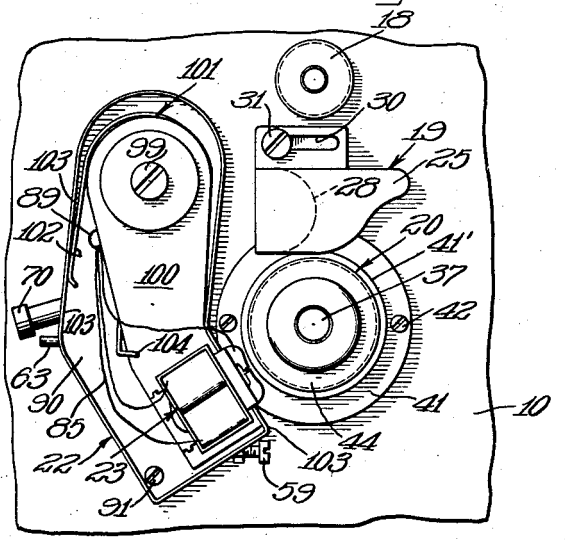


Fig. 3

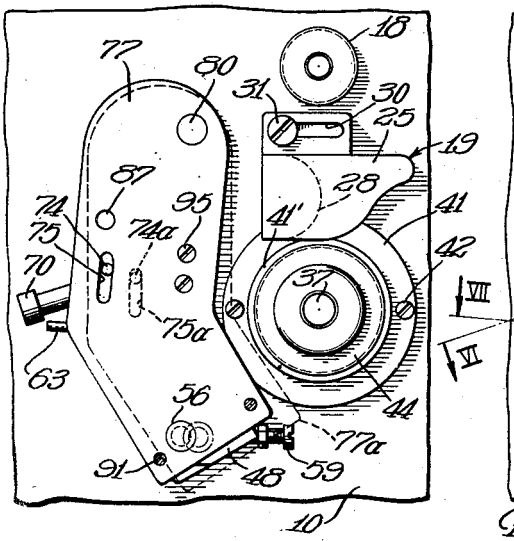
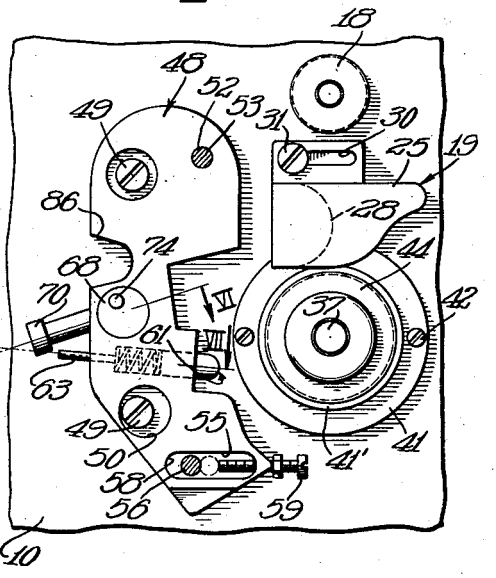


Fig. 4



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MAGNETIC RECORDER SOUND UNIT

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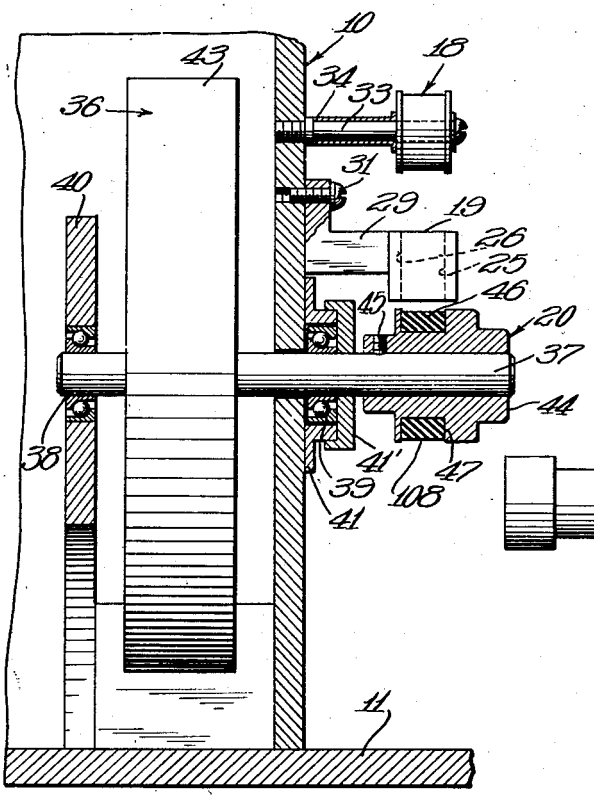


Fig. 5

Fig. 6

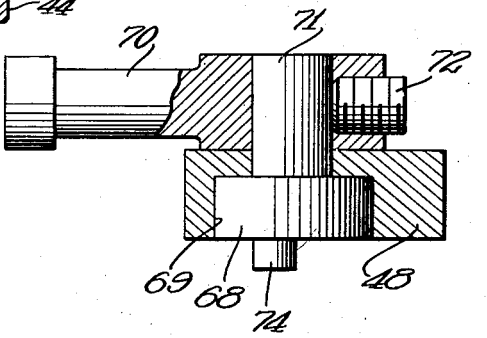
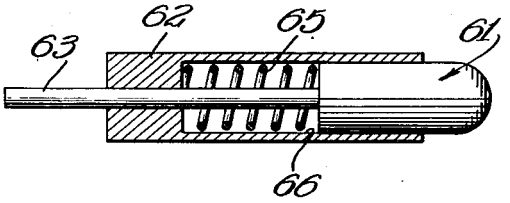


Fig. 7



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MAGNETIC RECORDER SOUND UNIT

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Application January 23, 1952, Serial No. 267,815

5 Claims. (Cl. 274—4)

This invention relates to a magnetic recording sound unit and more particularly to a magnetic sound projector for motion pictures.

The use of a magnetic sound track on a moving picture film has been known for some time, and many suggestions have been made as to how it might be used in a motion picture projector so that the sound to accompany the moving picture might be reproduced from a magnetic sound track rather than from an optical sound track as is the common present day practice.

While many suggestions have been made, none of the known systems today have been as satisfactory as desirable from a commercial standpoint. One of the chief complications in using a magnetic sound track on motion picture film lies in the fact that the film tends to have irregularities occurring as a result of the presence of or formation of the sprocket holes in the film. It has been very difficult to maintain the recording head in conforming relation to the film at these irregularities and, consequently, it has been very difficult to obtain good quality of reproduction with any magnetic record made on a motion picture film.

One of the principal features and objects of the present invention is to provide a novel method and means for reproducing sound from a magnetic record made on motion picture film.

A further object of the present invention is to provide a novel magnetic recording and reproducing head and mounting therefor.

A further object of the present invention is to provide a novel magnetic sound projector.

Another and further object of the present invention is to provide a novel rotary stabilizing element for a magnetic sound projector. The present invention is a continuation-in-part of my copending application entitled "Magnetic Sound Apparatus," Serial No. 771,494 filed August 30, 1947, now U. S. Patent No. 2,654,809 issued October 6, 1953.

The novel features which I believe to be characteristic of my invention are set forth with particularity in the appended claims. My invention itself, however, both as to its organization, method of operation and manner of construction, together with further objects and advantages, may be understood by reference to the accompanying drawings, in which:

Figure 1 is a somewhat diagrammatic elevational view of a portion of a magnetic sound and motion picture projector which embodies certain of the novel principles and teachings of the present invention;

Figure 2 is an enlarged fragmentary elevational view of a portion of the projector of Figure 1, but with the cover plate of the head housing removed and showing the head assembly;

Figure 3 is a fragmentary elevational view similar to Figure 2, but with the housing upper plate removed and showing the housing bottom plate;

Figure 4 is a fragmentary elevational view similar to

Figure 2, but with the head housing removed and showing the stationary mounting base therefor;

Figure 5 is an enlarged vertical transverse sectional view of a rotary stabilizing element according to the present invention;

Figure 6 is an enlarged fragmentary sectional view taken substantially along the line VI—VI of Figure 4; and

Figure 7 is a fragmentary sectional view taken substantially along the line VII—VII of Figure 4.

The present invention relates primarily to the magnetic recording sound unit of a moving picture projector. It is immaterial in the present invention whether the sound projector is mounted in a separate housing or is carried in the same housing with the motion picture projector mechanism. The vertical wall **10** and base **11** shown in Figure 5 may therefore constitute part of a separate housing for the sound projector or may be a portion of a casing for both the sound unit and the motion picture projector.

The moving picture film **13**, as shown in Figure 1, is delivered to the sound projector indicated generally by the reference numeral **14** through a conventional gate mechanism schematically illustrated at **15**. The film is driven through the sound projector by means of the sprocket wheel **17** which has a plurality of projections or points **17***a* which engage in corresponding sprocket holes in the film **13**. It is particularly the irregularities in the film dimensions produced during the formation of these sprocket holes or resulting from the presence of the holes which give rise to the problems to be met by the present invention.

The film **13** extends between the roller **18** and the adjustable guide member **19** and passes around the rotary stabilizing element **20**. The roller or stationary post **18** prevents the entering film from interfering with the film leaving the rotary stabilizing element. As seen in Figure 2, the housing **22** contains a magnetic recorder and reproducer head **23** which is adapted to cooperate with the magnetic sound track (not shown) on the back of the film **13** as the film passes around the rotary stabilizing element **20**. The magnetic sound track is ordinarily carried on the photographic film between the edge of the motion picture film and the edge of the sprocket holes therein. A suitable type of head for use in the present invention is disclosed in my copending application entitled "Electromagnetic Transducer Head," Serial No. 229,618, filed June 2, 1951, now U. S. Patent No. 2,713,091, issued July 12, 1955.

As shown in Figure 5, the guide member **19** includes a pair of spaced plates **25** and **26** spaced approximately the width of the film by the curved plate **28** (Fig. 2). The guide member **19** is adjustably mounted on the wall **10** by means of the mounting bracket **29** having a slot **30** therein (Fig. 2) through which extends the clamping screw **31**. The roller **18** is likewise mounted on the wall **10** by means of a mounting bolt **33** and spacer sleeve **34**.

As also seen in Figure 5, the rotary stabilizing element **20** includes a flywheel assembly **36** which is mounted on a shaft **37**. The shaft **37** is itself sustained in position by the bearings **38** and **39**, which are carried in the wall **40** and in the support bracket **41** secured to the wall **10**, respectively. As will be evident from Figure 2, the support bracket **41**, which is closed by means of a cap **41'**, is held relative to the front wall **10** by screws **42**. The housing **43** of the flywheel assembly **36** contains a massive rotor which is pivotally supported for rotation relative to the center of the shaft **37**. A viscous damping fluid, such as oil, is contained within the housing **43** to cause the massive rotor to partake of the rotation of the housing **43**.

The flywheel assembly **36** acts as a mechanical filter to sustain the rotation of the shaft **37** at a constant angular velocity despite variations in the torque applied thereto. As the shaft **37** is first rotated, the housing likewise rotates and the massive weight is accelerated by the viscous friction between the housing and the flywheel due to the presence of the oil damping fluid. When the flywheel is rotating at full speed, the massive weight rotates at substantially the same angular velocity as the housing **43**. However, any torque applied to the shaft **37** tending to cause acceleration or deceleration thereof is resisted by the viscous friction between the housing **43** and the rotor, and thus the actual change in velocity imparted to the shaft **37** is reduced to a small value.

The rotary stabilizing element **20** also includes a capstan **44**, the rotation of which is stabilized by the flywheel assembly **36** to tend to impart constant linear velocity to the film **13** as it passes around the capstan, the capstan **44** being secured to the shaft **37** by means of set screw **45**. The purpose of the rubber ring **46** mounted within the recess **47** of the capstan will hereinafter be more fully described.

For mounting the head **23** and controlling its relation to the capstan **44** and the film passing therearound, the housing **22** is movably mounted on a stationary base **48** (Fig. 4). The stationary base **48** is mounted in spaced relation to the wall **10** by means of screws **49** whose heads are seated in counterbores **50** in the base. The base is provided with pivot hole **52** for pivotally receiving the housing pivot bolt **53**. The base is further provided with a slot **55** for receiving the pin **56** of the housing for limited arcuate movement therein about the pivot bolt **53**. The end wall **58** of the slot **55** limits the movement of the pin **56** away from the capstan **44** and an adjustable screw **59** limits movement of the pin **56** toward the capstan.

A spring finger **61** is reciprocably mounted in a cylinder **62** carried beneath the base plate **48**. The finger **61**, as shown in Figure 7, has a stem **63** extending axially therefrom and through the cylinder **62** to protrude from the rear of the base. A spring **65** is seated in a recess **66** of the cylinder and urges the finger **61** outwardly. The finger **61** is adapted to engage an abutment plate depending from the housing to urge the housing toward the capstan **44**.

The stationary base **48** also has an eccentric control assembly for retracting the housing from its position adjacent the capstan **44** to which it is urged by the finger **61**. The eccentric adjustment assembly comprises a disk **68** rotatably mounted in a cylindrical recess **69** in the base plate **48** (Figure 6). The rotation of the disk **68** is controlled by means of an arm **70** which, as seen in Figure 6, is attached to a shaft **71** depending from the disk **68** by means of a set screw **72**. The disk **68** carries an eccentrically mounted pin **74** which cooperates with a slot **75** in the bottom plate **77** of the housing as seen in Figure 3. By shifting the arm **70** to the upper position as shown in Figure 1, the disk **68** is rotated to move the pin **74** to the dotted position indicated at **74***a* at the top of the slot **75***a* in Figure 3, the position of the bottom plate then being indicated in dotted outline at **77***a* (Fig. 3).

In the position of the arm shown in Figures 2 to 4, the housing is effectively locked in its retracted position and the finger **61** is ineffective to move the housing toward the capstan **44**. However, when the pin **74** is moved clockwise past a certain position, the finger **61** is then effective to control the position of the housing. The bottom plate **77** is provided with a hole **80** for receiving the bolt **53** therethrough.

For providing access of the wires **85** (Figure 2) to the head **23**, the base plate **48** has a notch **86** therein and the bottom plate **77** has an opening **87** therethrough. As seen in Figure 2, a further opening **89** is provided in a second upper plate **90** of the housing which is secured to the bottom plate by means of screws **91**. The screws **95** seen in Figure 3 serve to fasten the abutment plate for finger **61** beneath the bottom plate of the housing. The stem **63** of the finger **61** serves to retract the finger to the position shown in Figure 4 during assembly of the base plate **48**.

As shown in Figure 2, the head **23** is mounted on an arm **100** which is pivotally mounted in the housing by means of a pivot bolt **99** which is spaced from the housing pivot bolt **53**. The arm **100** is urged toward the capstan **44** by means of a wire spring **101** having one end **102** seated against a flange wall **103** of the housing upper plate **90**, the other end **104** engaging the arm **100**. The outward movement of the arm **100** relative to the housing is limited by the flange wall **103** of the plate **90**. As shown in Figure 1, the housing **22** is provided with a top cover **106** which encloses all but the projecting confronting pole portions of the head **23**.

In accordance with the present invention, the capstan **44** of the rotary stabilizing element is provided with a rubber or rubber-like surface **108** of the ring **46** (Figure 5) which is substantially the width of the film. The confronting pole portions of the head **23** are adapted to resiliently urge the film that travels around the capstan **44** against the rubber surface **108** which serves as a resilient cushion for conforming to irregularities on the front surface of the film and thereby minimizing the jarring forces exerted on the head **23** as a film travels therebetween. Thus the film must travel between a pair of resiliently opposed members, with the cushioning surface **108** tending to absorb irregularities in the film, to greatly improve the recording and reproducing qualities of the apparatus.

By virtue of the traction or high coefficient of friction inherent in the rubber surface **108** and the action of the head **23** in pressing against the back side of the film, a pinch roll or the like is unnecessary to insure driving of the capstan **44** by the film. A light roller may be used against the film just prior to where it passes under the head, if desired.

While I have shown a particular embodiment of my invention it will, of course, be understood that I do not wish to be limited thereto, since many modifications may be made and I therefore contemplate, by the appended claims, to cover all such modifications that fall within the true spirit and scope of my invention.

I claim as my invention:

1. In a magnetic sound apparatus, a rotary stabilizing element, a base mounted adjacent said rotary stabilizing element, an eccentric member rotatably mounted in said base, a housing pivotally mounted on said base and having a slot therein, a pin carried by said eccentric member eccentrically thereto and riding in said slot for locking said housing in a retracted position, a spring-urged finger carried by said base and engaging said housing to urge the housing toward said rotary stabilizing element, an arm pivotally mounted in said housing, a wire spring engaging said housing and said arm to urge said arm toward said rotary stabilizing element, means carried by said housing limiting movement of said arm, said housing substantially enclosing said arm, and an electromagnetic transducer head carried by said arm and projecting from said housing for cooperation with said rotary stabilizing element to reproduce sound from a sound track traveling therebetween.

2. A magnetic transducer head assembly comprising a base plate, a flat planar bottom plate overlying said base plate, first means pivotally connecting said base plate and said bottom plate, a flat planar arm overlying said bottom plate and disposed in parallel closely spaced relation thereto, second means spaced from said first means pivotally connecting said arm to said bottom plate, a transducer head rigidly carried by said arm for pivotal movement therewith, means urging said bottom plate to pivot in one direction relative to said base plate, means

for limiting pivotal movement of said bottom plate in said one direction, and means urging said arm to pivot in said one direction relative to said bottom plate.

3. A magnetic transducer head assembly comprising a base plate having a circular recess therein, having a spring urged plunger carried thereby, and having an elongated slot, a bottom plate pivotally mounted on said base plate and having an elongated slot overlying said base plate recess, a disk journalled in said base plate recess and having an eccentrically disposed pin thereon projecting into the bottom plate elongated slot, said bottom plate having a pin projecting through said base plate elongated slot, means associated with said base plate elongated slot for adjustably limiting movement of said pin therein in one direction to limit pivotal movement of said bottom plate relative to said base plate in said one direction, said bottom plate having means engaging said spring urged plunger, said plunger urging said bottom plate to pivot in said one direction, means for rotating said disk operative to pivot said base plate in the opposite direction against the action of said spring urged plunger, an arm pivotally mounted on said bottom plate on an axis displaced from axis of pivotal movement of said bottom plate, spring means for urging said arm for pivotal movement in said one direction, means limiting pivotal movement of said arm relative to said bottom plate, and an electromagnetic transducer head rigidly mounted on said arm for pivotal movement therewith.

4. A self-contained magnetic transducer head assembly for attachment as a unit to a support, comprising a flat planar base plate having a spring urged plunger reciprocally carried thereby, a flat planar bottom plate pivotally mounted in spaced parallel relation to said base plate, said bottom plate having means engaging said spring urged plunger, said plunger urging said bottom plate to pivot in one direction, a flat planar arm pivotally mounted on said bottom plate in spaced parallel relation thereto, spring means for urging said arm for pivotal movement in said one direction, means limiting pivotal movement of said arm relative to said bottom plate, and an electromagnetic transducer head mounted on said arm for pivotal movement therewith.

5. A self-contained magnetic transducer head assembly for attachment as a unit to a support, comprising a flat planar base plate having a spring urged plunger reciprocally carried thereby, a flat planar bottom plate pivotally mounted in spaced parallel relation to said base plate, said bottom plate having means engaging said spring urged plunger, said plunger urging said bottom plate to pivot in one direction, a flat planar arm pivotally mounted on said bottom plate in spaced parallel relation thereto, spring means for urging said arm for pivotal movement in said one direction, means limiting pivotal movement of said arm relative to said bottom plate, an electromagnetic transducer head mounted on said arm for pivotal movement therewith, and a cover plate cooperating with said bottom plate to enclose said arm and a portion of the head carried thereby.

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