

PATENT SPECIFICATION

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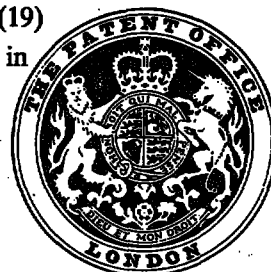
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(54) TAPE LEADERS FOR RECORDING TAPES

(71) We, SONY CORPORATION, a corporation organised and existing under the laws of Japan, of 7-35 Kitashinagawa-6, Shinagawa-ku, Tokyo, Japan, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:

This invention relates to tape leaders suitable for recording tapes.

In tape cassettes for use in audio or video recording and/or reproducing apparatus, it is known to provide tape leaders connected between the ends of a magnetic recording tape and the hubs of the supply and take-up reels, so that one or the other of the tape leaders can be detected to indicate the end of the tape from a respective reel. One known type of tape leader is formed of a flexible base of polyester film having a thin layer or film of aluminium or copper provided on one surface of the base. This is formed by vapour depositing or plating the metal on the base, or by adhering or bonding a metal film to the base. Such a tape leader can conveniently be detected by a resonance sensor including an oscillator having an LC resonance circuit, a detector for detecting the output of the oscillator, and a warning and/or shut-off mechanism which responds to detection of a change in the frequency of the oscillator output or a break in such output. At least the inductance element of the resonance circuit is included in a sensor which is disposed adjacent to the path of the recording tape so that, when the tape leader is disposed adjacent to the sensor, the inductance of the resonance circuit is changed and, accordingly, the oscillating frequency is changed or the oscillation is stop-

ped. For example, in an existing video tape recorder (VTR), when the tape leader is detected, an automatic shut-off mechanism may be actuated to halt the recording, reproducing, fast-forward or rewinding operation and to eject the tape cassette from the VTR, or a warning lamp and/or buzzer or other audible signal may be energised.

However, such a tape leader has a poor ability to return to its original flat condition after being bent. Therefore, after frequent use of the recording tape, the tape leader may become crumpled or snap, or cracks or fissures may develop in the metal thereof. The foregoing problems are especially encountered when the recording tape is made to follow a sinuous path about numerous tape guides. When such a tape leader is damaged, it is difficult to replace it, and moreover, when the tape leader is damaged it may damage or cause uneven winding of the magnetic or other recording tape with the result that drop-out of the video or other recorded signals may occur.

Moreover, with such a tape leader, the aluminium or copper film is corroded or oxidized when the recording tape is exposed to a humid atmosphere for an extended length of time. This changes the electric conductivity, with the result that the sensing of the tape-end is no longer reliable.

According to the present invention there is provided a tape leader comprising a metal film, and two flexible synthetic resin films coextensive with said metal film and between which the latter is laminated.

The invention will now be described by way of example with reference to the accompanying drawings, in which:

Figure 1 is a perspective view of a length of

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recording tape provided with tape leaders according to the invention;

Figure 2 is an enlarged, fragmentary, sectional view taken along the line II-II in Figure 1;

Figure 3 is a perspective view of a tape cassette in which a recording tape provided with tape leaders according to the invention is housed;

Figure 4 is a diagrammatic view showing the cassette of Figure 3 associated with a VTR; and

Figure 5 is a diagrammatic view of a resonance sensor circuit for detecting a tape leader according to the invention.

Referring to Figure 1, a recording tape 10, for example a conventional magnetic recording tape, has tape leaders 11 and 12 extending from the opposite ends and respectively secured to the hubs to take-up and supply reels 13 and 14.

As particularly shown in Figure 2, each of the tape leaders 11 and 12 comprises an electrically conductive metal film 15, for example of aluminium or copper foil or film, which is bonded or laminated between two flexible, synthetic resin films 16a and 16b formed, for example, of a polyester, polyamide, polyimide or acetate resin. By way of example, the electrically conductive metal film 15 may have a thickness of about 9 microns, while each of the flexible synthetic resin films 16a and 16b has a thickness of about 12 microns.

In producing the tape leaders 11 and 12, a thermosetting epoxy resin is applied to surfaces of flexible synthetic resin films, and a film of the electrically conductive metal is sandwiched between the epoxy resin coated surfaces of the flexible synthetic resin films. The resulting sandwich is then passed between suitable pressure rollers and heated so as to provide a lamination where it is then passed through a slit by which the desired tape leaders 11 and 12 are cut from the lamination.

As is shown in Figure 2, the tape leaders 11 and 12 may be connected to the respective ends of the magnetic recording tape 10 by means of conventional splicing tape 17.

Referring now to Figure 3, it will be seen that the magnetic recording tape 10 having the tape leaders 11 and 12 connecting the opposite ends thereof to the hubs of take-up and supply reels 13 and 14 may conveniently be incorporated in a tape cassette 18 having a substantially rectangular cassette housing 19 in which the reels 13 and 14 are rotatably disposed in side-by-side relation. The housing 19 may, as shown, have an opening 20 extending along one of its long sides, with tape guide pins 21 and 22 provided in the housing 19 adjacent to the opposite ends of the opening 20 for guiding the tape 10 between

the reels 13 and 14 in a path 10' indicated in broken lines, and which extend along the open side of the housing 19 when the cassette 18 is not in use. The cassette 18 has a lid 23 which is pivotally mounted on the housing 19 so as to be movable between a closed position (not shown) in which the lid 23 covers and protects the tape 10 in path 10' when the cassette 18 is not in use, and an opened position in which the opening 20 is exposed so that the tape 10 in path 10' can be suitably engaged for withdrawal from the housing 19 of the tape 10 between the reels 13 and 14, as shown in full lines in Figure 3.

The cassette 18 is particularly suited for use in connection with a VTR of the type shown schematically in Figure 4. Such a VTR generally includes a tape guide drum 24 having one or more rotary magnetic heads (not shown) moved in a circular path coinciding with the circumferential surface of the drum 24 for scanning record tracks extending obliquely across the tape 10, when the latter is wrapped in a helical path about at least a portion of the circumferential surface of the drum 24, and a holder (not shown) for receiving and positioning the cassette 18 at a location spaced from the drum 24. The VTR is conveniently provided with a tape loading device, which in Figure 4 is simply shown to include a tape engaging member 25, a pinch roller 26 and tape guide members 27, 28 and 29 which, in an initial condition of the tape loading device, are engageable with the run of tape 10 extending between the guide pins 21 and 22. In the course of a tape loading operation, the tape engaging member 25, the pinch roller 26 and the tape guide members 27, 28 and 29 move to the positions shown in Figure 4 and are effective to withdraw a loop of the tape 10 from the housing 19 with one side of the tape loop extending from the supply reel 14 and the guide pin 22 being wrapped about a portion of the circumference of the drum 24 and guided with respect to the latter by the guide member 29 and a fixed guide member 30, while the other side of the tape loop is held away from the guide drum 24 by the guide members 27 and 28 and directed to the guide pin 21 and, from the latter, to the take-up reel 13. Moreover, at the completion of the tape loading operation, the pinch roller 26 is disposed, as shown, to press the tape 10 against a rotated capstan 31 by which the tape 10 is made to advance in the direction indicated by the arrows in Figure 4. for a recording or reproducing operation of the apparatus. In the course of such operation, the tape 10 is unwound from the supply reel 14 and rewound on the take-up reel 13, and it is, of course, desirable that the operation be terminated when the tape 10 has been fully unwound from the supply reel 14. The VTR is further capable of a fast-forward operation in which the tape 10 is

rapidly unwound from the supply reel 14 and wound on the take-up reel 13, and of a rewind operation in which the tape 10 is rapidly unwound from the take-up reel 13 and returned to the supply reel 14. It is also desirable that such fast-forward and rewind operations be terminated when the tape 10 is fully unwound from the supply reel 14 or from the take-up reel 13, respectively. In order to indicate that the tape 10 is fully unwound from the supply reel 14, the apparatus shown in Figure 4 further includes a sensor 32 disposed adjacent to the path of the tape 10 between the guide pin 22 and the guide member 29, and which is operative to detect the presence of the tape leader 12. A similar sensor 32a may be disposed adjacent to the portion of the tape path between the guide pin 21 and the guide member 28 for detecting the presence of the tape leader 11 when the tape 10 is fully unwound from the take-up reel 13 during a rewind operation.

As is shown particularly in Figure 5, each of the sensors 32 and 32a may comprise a resonance circuit formed by an inductance 32L, a capacitor 32C and a Q-damping resistor 32R in a parallel circuit connected with an oscillator 33 which, as shown, may comprise an amplifier 33A and a positive feedback resistor 33R. Under normal conditions, that is, so long as the tape leader 12 is not disposed adjacent to the sensor 32 so as to influence the inductance 32L by means of the electrically conductive metal film 15, the oscillator 33 oscillates with a predetermined frequency, for example 200 KHz. The ac output from the oscillator 33 is converted into a dc signal by a low-pass filter 34 which may simply be constituted by a rectifying diode. The level of the dc signal from the low-pass filter 34 is detected by a level detector 35 which may, in turn, control an automatic shut-off mechanism 36 and/or a warning or signal lamp 37 and an audible signal or warning buzzer 38. So long as detector 35 detects a predetermined dc level, that is, so long as a tape leader 11 or 12 is not adjacent to the respective sensor 32 or 32a, the automatic shut-off mechanism 36 and the warning lamp and buzzer 37 and 38 are maintained in their inoperative conditions. However, when the tape leader 11 or 12 is disposed adjacent to the inductance 32L of the respective sensor 32a or 32 so as to indicate the full unwinding of the tape 10 from the reel 13 or 14, the sharpness Q of the resonance circuit is sharply reduced so as either to halt the oscillation or substantially to increase the frequency thereof. In either event, the output from the low-pass filter 34 is reduced to zero with the result that the detector 35 causes operation of the automatic shut-off mechanism 36 and of the warning lamp and buzzer 37 and 38. Upon such operation of the automatic shut-off mechanism

36, the driving of the tape 10 by the capstan 31 and the rotation of the take-up reel 13 for winding the tape 10 thereon during a recording or reproducing operation are halted. Similarly, during a fast-forward operation or a rewind operation, the detection of the tape leader 12 by the sensor 32 or the detection of the tape leader 11 by the sensor 32a and the resulting operation of the automatic shut-off mechanism 36 serve to halt the rapid rotation of the take-up reel 13 or of the supply reel 14.

Tape leaders as described may be provided between successive portions of a magnetic recording tape on which respective information signals are recorded. In that case, the tape leaders may be detected or sensed for indicating the position of the magnetic recording tape or for achieving a pause in the transport of the tape at the intervals between the successive recorded information signals.

Moreover, although the tape leaders 11 and 12 have been described as being associated with a magnetic recording tape, it is to be understood that tape leaders according to the invention may be similarly employed with other types of recording tapes. Finally, it will be appreciated that the tape leaders according to this invention may be employed with a recording tape which is to be used in an open-reel apparatus, as well as in a cassette-type apparatus.

WHAT WE CLAIM IS:-

1. A tape leader comprising a metal film, and two flexible synthetic resin films coextensive with said metal film between which the latter is laminated.
2. A tape leader according to claim 1, wherein said metal film is electrically conductive.
3. A tape leader according to claim 1, wherein each of said resin films is formed of polyester, polyamide, polyimide or acetate resin.
4. A tape leader according to claim 1, wherein each of said resin films is bonded to the adjacent surface of said metal film by a thermosetting resin.
5. A tape leader according to claim 1 secured, at least at one of its ends, to an adjacent end of a recording tape.
6. A tape leader according to claim 5, wherein said recording tape is a magnetic recording tape.
7. A tape leader according to any one of the preceding claims, wherein said resin films are substantially identical.
8. A tape leader according to any one of the preceding claims, wherein said metal film has a thickness of 9 microns and said resin films each have a thickness of 12 microns.
9. A tape leader substantially as hereinbefore described with reference to Figures 1 and 2 of the accompanying drawings.



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rapidly unwound from the supply reel 14 and wound on the take-up reel 13, and of a rewind operation in which the tape 10 is rapidly unwound from the take-up reel 13 and returned to the supply reel 14. It is also desirable that such fast-forward and rewind operations be terminated when the tape 10 is fully unwound from the supply reel 14 or from the take-up reel 13, respectively. In order to indicate that the tape 10 is fully unwound from the supply reel 14, the apparatus shown in Figure 4 further includes a sensor 32 disposed adjacent to the path of the tape 10 between the guide pin 22 and the guide member 29, and which is operative to detect the presence of the tape leader 12. A similar sensor 32a may be disposed adjacent to the portion of the tape path between the guide pin 21 and the guide member 28 for detecting the presence of the tape leader 11 when the tape 10 is fully unwound from the take-up reel 13 during a rewind operation.

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Tape leaders as described may be provided between successive portions of a magnetic recording tape on which respective information signals are recorded. In that case, the tape leaders may be detected or sensed for indicating the position of the magnetic recording tape or for achieving a pause in the transport of the tape at the intervals between the successive recorded information signals.

Moreover, although the tape leaders 11 and 12 have been described as being associated with a magnetic recording tape, it is to be understood that tape leaders according to the invention may be similarly employed with other types of recording tapes. Finally, it will be appreciated that the tape leaders according to this invention may be employed with a recording tape which is to be used in an open-reel apparatus, as well as in a cassette-type apparatus.

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1. A tape leader comprising a metal film, and two flexible synthetic resin films coextensive with said metal film between which the latter is laminated.

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3. A tape leader according to claim 1, wherein each of said resin films is formed of polyester, polyamide, polyimide or acetate resin.

4. A tape leader according to claim 1, wherein each of said resin films is bonded to the adjacent surface of said metal film by a thermosetting resin.

5. A tape leader according to claim 1 secured, at least at one of its ends, to an adjacent end of a recording tape.

6. A tape leader according to claim 5, wherein said recording tape is a magnetic recording tape.

7. A tape leader according to any one of the preceding claims, wherein said resin films are substantially identical.

8. A tape leader according to any one of the preceding claims, wherein said metal film has a thickness of 9 microns and said resin films each have a thickness of 12 microns.

9. A tape leader substantially as hereinbefore described with reference to Figures 1 and 2 of the accompanying drawings.

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