SPECIFICATION

Magnetic-tape cassette

The invention relates to a magnetic-tape cassette for use on a recording and/or playback apparatus having an erase interlock sensor for preventing inadvertent erasure of a recording on the tape in the cassette. The invention relates particularly to a magnetic-tape cassette comprising a housing which contains a magnetic-tape and which is made in two halves in at least one of which an opening is provided for cooperation with the erase interlock sensor of a recording and/or playback apparatus of the kind (hereinafter referred to as "the kind described") in which the sensor, which is connected to a recording control device of the apparatus and is movable between a first position in which it allows the recording control device to be switched to a recording position, and a second position in which it prevents switching of the recording control device to the recording position, detects whether said opening in the cassette housing is open or closed and accordingly occupies one or the other of said first and second positions, the cassette having an erase interlock device which comprises a control member which is movable between first and second positions in one of which it closes said opening in the cassette housing and in the other of which it leaves the opening open. In a cassette of this construction which is known from German Offenlegungsschrift 2,604,172, the control member of the erase interlock device is simply movable between two positions, the erase interlock being operative in one of these positions and inoperative in the other. When designing an erase interlock device, care must be taken that its control member cannot inadvertently be set to that position in which recording is permitted, so as to prevent inadvertent erasure of a prerecorded tape. Therefore, as is known from the said German Offenlegungsschrift 2,616,895, it has been proposed to provide the control member of an erase interlock device with a catch which can only be released deliberately, so as to prevent accidental cancellation of the erase interlock. This increases the effectiveness of such an erase interlock device, but it also complicates the operation of the device, which is not an advantage in situations where it is desirable that the erase interlock device can be actuated simply and quickly.

According to the invention there is provided a magnetic-tape cassette comprising a housing which contains a magnetic tape and which is made in two halves in at least one of which an opening is provided for cooperation with the erase interlock sensor of a recording and/or playback apparatus of the kind described, the cassette having an erase interlock device which comprise a control member which is movable between first and second positions in one of which it closes said opening in the cassette housing and in the other of which it leaves the opening open, wherein at least one additional position is provided for the control member, in which position the control member closes said opening if the sensor occupies its second position when the opening is closed, or leaves the opening open if the sensor occupies its second position when the opening is open, and wherein means are provided which block the path of movement of the control member between this additional position and the first and second positions of the control member.

The means which block said path of movement of the control member may comprise a blocking element which is movable out of said path.

This blocking element may be constituted by a stop on a movable cover of the cassette. The means which block said path of movement of the control member may comprise a blocking element which is constituted by a rigid projection on the inner side of one half of the cassette housing, and the control member may be movable into or out of said additional position when the two halves of the housing are separated from one another.

In a preferred embodiment of the invention, two of said additional positions are provided for the control member, in each of which positions the control member closes said opening if the sensor occupies its second position when the opening is closed, or leaves the opening open if the sensor occupies its second position when the opening is open, and first means are provided which block the path of movement of the control member between one of said additional positions and the first and second positions of the control member, and second means are provided which block the path of movement of the control member between the other of said additional positions and the first and second positions of the control member, the first means comprising a blocking element which is movable out of the respective path, and the second means comprising a blocking element which is constituted by a rigid projection on the inner side of one half of the cassette housing, and the control member being movable into or out of said other of said additional positions when the two halves of the housing are separated from one another.

Embodiments of the invention will now be described with reference to the accompanying drawings, in which

Figure 1 is a sectional plan view of a reversible magnetic-tape cassette according to a first embodiment of the invention, having two erase interlock devices with rotatable control members.

Figure 2 is a sectional view to an enlarged scale, taken on the line II—II in Figure 1, and

Figure 3 is a sectional plan view of a part of a magnetic-tape cassette according to a second embodiment of the invention, having an erase interlock device with a slidable control member.

Figure 1 and 2 show a reversible magnetic-tape cassette 1, which comprises a housing made in two complementary halves 2 and 3. The housing comprises two major walls 2*a* and 3*a* which are disposed opposite one another in parallel planes, and a plurality of side walls which extend between the major walls at the peripheries thereof. The

division between the two halves of the housing lies in a plane parallel to the planes of the major walls 2*a* and 3*a*. The housing accommodates a magnetic tape 4 as a record carrier for audio and/or video signals, which tape extends from a first reel 7 to a second reel 8 in the housing *via* guide elements 5 and 6. The tape extends along one of the narrow side walls of the housing, in which wall an opening 9 is formed through which either a loop of the magnetic tape can be pulled out of the housing for cooperation with magnetic heads of a recording and/or playback apparatus, or through which magnetic heads can enter the housing to cooperate with the magnetic tape. Depending on whether the cassette is placed on a recording and/or playback apparatus with the major wall 2*a* of the housing half 2 or the major wall 3*a* of the housing half 3 facing the apparatus, in which case the magnetic tape will travel from reel 7 to reel 8 or in the reverse direction from reel 8 to reel 7 respectively, the magnetic heads scan different tracks on the magnetic tape. Since these two alternative operating positions of the cassette on the apparatus available, the cassette comprises two erase interlock devices 10 and 11, each of these devices corresponding to one of the two operating positions of the cassette.

Each of the two erase interlock devices 10 and 11 comprises a manually rotatable control member 12 and 13 respectively and an associated opening formed in the major wall of a corresponding one of the two housing halves 2 or 3. Figures 1 and 2 show only the opening, designated 14, in the housing half 3. These openings can be either exposed or closed by the respective control members, for which purpose these members each comprise an eccentric pin-shaped projection 15 and 16 respectively. Depending on whether the relevant opening is exposed or closed, the corresponding erase interlock device 10 or 11 will be operative or inoperative. In the present case an erase interlock device of the apparatus and is movable between exposed and inoperative when the relevant opening is closed. These openings are arranged for cooperation with an erase interlock sensor which is provided on the recording and/or playback apparatus. This sensor, which is not shown in the drawings, is connected to a recording control device of the apparatus and is moveable between a first position in which it allows the recording control device to be switched to a recording position, and a second position in which it prevents a switching of the recording control device to the recording position. The opening 14 cooperates with the sensor if the major wall 3*a* of the housing half 3 faces the apparatus, and the other opening (not shown) cooperates with the sensor if the major wall 2*a* of the housing half 2 faces the apparatus. In either case the sensor detects whether the relevant opening is open or closed by the control member of the associated erase interlock device and accordingly occupies one or the other of its first and second positions. In the present embodiment the sensor occupies its first position to allow recording to take place if the relevant opening is closed, and occupies its second position to prevent recording if the opening is open. It is obvious that the converse method of operation may be chosen if desired, in which case the sensor occupies its second position if the opening is closed and its first position if the opening is open.

Hereinafter mainly the erase interlock device 11 is described in detail. The erase interlock device 10 is of identical construction. The control member 13 of the erase interlock device 11 comprises a cylindrical portion with coaxial spindles 17 and 18 which are journalled in bearings 19 and 20 in the housing half 2 and the housing 3 respectively, so that the control member is rotatable over a circular path. On the cylindrical portion of the control member the eccentric pin-shaped projection 16 is formed, with its axis extending parallel to the axis of the spindles 17 and 18 at a distance therefrom such that by rotation of the control member the projection 16 can be positioned over the opening 14 to close it or can be moved to another position in which the opening 14 is left open. The cylindrical portion of the control member is also formed with a radially projecting tab 21, which serves as a finger-grip for moving the control member 13. The corresponding tab on the control member 12 of the erase interlock device 10 is designated 22. In the present example the projection 16 and the tab 21 lie in the same radial plane of the control member 13 so that the position or angle of the tab 21 is also indicative of the position of the projection 16 relative to the opening 14. In Figures 1 and 2 the control member 13 is shown in a position in which the projection 16 does not close the opening 14, so that the erase interlock device 11 is operative. The position of the control member 13, as well as the corresponding position of the control member 12, is designated by an arrow 23 in Figure 1.

The requirements imposed on such an erase interlock device in respect of its effectiveness may differ. It may, for example, be desirable that the erase interlock device can be rendered operative or inoperative by the user of the cassette with one simple operation. However, it may also be desirable to protect the erase interlock device so that this device can only be released by the user of the casstte through an additional operation, so as to avoid inadvertent erasure of a recording, such as could happen if, for example, the erase interlock device were accidentally released during storage of the cassette. It may also be desirable that the erase interlock device is further protected to the extent that the user of the cassette cannot release the erase interlock device without first separating the two halves of the cassette housing, which would require a deliberate act on the part of the user. In order to meet all the above-mentioned requirements, the control member of each erase interlock device in the present embodiment can be set to any one of a total of four positions, the device being inoperative in one position only,

which is referred to hereinafter as the "first position," so that recording on the magnetic tape 4 is possible in this position only. In the other three positions of the erase interlock device, hereinafter referred to as the "second," "third" and "fourth" positions, the erase interlock device is operative and recording on the magnetic tape 4 is prevented. The erase interlock device may then simply be set by hand from the first to the second position by the user of the cassette, whilst for setting the erase interlock device from the second to the third position a blocking element in the path of the control member of the erase interlock device has to be removed, which requires a deliberate operation by the user of the cassette. Setting the erase interlock device from the third to the fourth position is possible only after separating the two halves of the cassette housing owing to the presence of a further blocking element, which also lies in the path of the control member. In this way the effectiveness of the erase interlock device increases from the second to the third and from the third to the fourth position of the device. The erase interlock devices 10 and 11 are shown in their fourth positions in Figures 1 and 2 which positions are designated by the arrows 23. The other three positons are schematically represented by the dotted-line positions of the tab 21 and the projection 16, the third position being designated by the arrow 24, the second by the arrow 25 and the first by the arrow 26; the same applies for the erase interlock device 10.

In the present example the cassette 1 has a marking strip 27 on the outside of the side wall of the cassette housing which is opposite that in which the opening 9 is formed. The marking strip may, for example, consist of a paper strip, and on it can be marked information concerning the recording made on the magnetic tape in the cassette. In front of the marking strip 27 is a protective cover 28, which comprises a U-shaped strip 29 which fits over said side wall of the cassette housing and which have a window 30 through which the marking strip is visible. At its ends the cover is hingedly connected to the cassette housing by means of part-spherical elements 31 and 32 respectively, which serve both as hinge elements and as fastening elements for securing the cover 28 to the housing. The cover 28 can be pivoted about the elements 31 in the direction of the arrow 33 after releasing the elements 32, or about the elements 32 in the direction of the arrow 34 after releasing the elements 31. In each case the marking strip 27 becomes accessible. If desired the cover 28 may also be removed completely from the cassette by releasing both the elements 31 and the elements 32.

In the region of the erase interlock device 10 and in the region of the erase interlock device 11 in the cover 28 has openings 35 and 36 respectively. The opening 35 receives the tab 22 of the erase interlock device 10 and the opening 36 receives the tab 21 of the erase interlock device 11. The ends of the openings 35 and 36 constitute stops, 37, 38 and 39, 40 respectively, which limit the movements of the tabs 22 and 21 respectively when the latter are located in the openings 35 and 36 respectively. In this way, the first and second positions (26 and 25 respectively) of each of the two interlock devices 10 and 11 are defined, the control members 12 and 13 being simply movable by hand between the two positions. As stated previously, the erase interlock devices are inoperative in the first position (26) and operative in the second position (25).

The stops 38 and 40 on the cover 28 also each constitute a blocking element which normally prevents the relevant erase interlock device 10 or 11 from being set to the third position (24). This position is obtained when the tab 22 or 21 is positioned inside the cover 28, behind the relevant stop 38 or 40 respectively, as is shown by the dotted lines 24 in Figure 1. Moving an erase interlock device from the second to the third position can be effected only after the cover 28 has been pivoted away from its closed position to move it out the path of the relevant tab 22 or 21, which can then be moved to set the respective erase interlock device to the third position, after which the cover is snapped back into the closed position. The erase interlock device is retained in this third position by the cover and cannot be moved inadvertently to the second or first position. This last position can only be obtained when the cover 28 is again opened to expose the relevant tab 22 or 21.

Movement of an erase interlock device from the third position (24) to the fourth position (23) is prevented by a further blocking element in the path of the relevant tab 22 or 21, which element is constituted by a fixed projection 41 on the housing half 3 for the erase interlock device 10 and by a fixed projection 42 on the housing half 2 for the erase interlock device 11. In this fourth position the tab 22 or 21 engages in a slot 43 or 44 respectively in the relevant projection 41 or 42. As can be seen, an erase interlock device can only be set to this fourth position during assembly of the cassette, the control member 12 or 13 being set to the relevant position between the two housing halves 2 and 3 with the tab 22 or 21 respectively. An erase interlock device can only be moved out of this fourth position after separating the two housing halves. Thus, this fourth position of the erase interlock devices affords the maximum protection against inadvertent resetting. The housing halves 2 and 3 of the cassette can be secured together by means of a screw-threaded or snap connection. However, the two housing halves may also be sealed together, in which case the user of the cassette cannot move the erase interlock devices out of the fourth position without breaking the joint between the two housing halves.

It can be seen that the different positions of the erase interlock devices afford different degrees of protection against inadvertent resetting of the erase interlock. Thus, the user of a cassette is able to select the degree of protection to be afforded by the respective erase interlock device. For example

if he is using the cassette with this erase interlock device in its operative second position, he is able to cancel the erase interlock simply by moving the erase interlock device to its inoperative first position. This may be deseriable if the cassette is intended for making further recordings. However, if the user sets the erase interlock device to the third position, he can be sure that the erase interlock will not be cancelled inadvertently, since cancellation requires the deliberate act of removing a blocking element from the path of the erase interlock device. The fourth position of the erase interlock device will be selected when it is not intended to make any further recordings on the tape in the cassette.

In the embodiment of Figure 3 an erase interlock device 45 is shown which again has four positions (23, 24, 25, 26). However, in this case the control member of the erase interlock device is constituted by a slide 46 which, in the inoperative first position (26) of the erase interlock device, as is shown in Fig. 3, closes an opening 48 formed in a side wall 47 of one housing half of the cassette 1. For releasing the erase interlock the slide 46 is moved by means of a tab 51 in the direction of the arrow 49 to expose the opening 48. The tab 51 projects through an elongate opening 50 formed in the wall 47. A blocking element 52 is situated in the path of the tab. This blocking element can be set in two positions, in one of which, as shown in Figure 3, a portion 53 of the blocking element which extends at right angles to the rest of the element and constitutes a stop lies in the opening 50 and limits the movement of the tab 51 to define the second position (25) of the erase interlock device. The blocking element 52 is movable in a direction perpendicular to the direction of movement 49 of the slide 46, *i.e.* in the direction of the arrow 54, into a second position in which the portion 53 of the blocking element lies outside the opening 50 and is situated beyond the path of the tab 51, so that this tab can be moved as far as a stop 55 formed by the wall 47 at the end of the opening 50. If the blocking element 52 is then reset to its original first position, the slide 46 can no longer be moved since the tab 51 on the slide is held between the stop 55 and the portion 53 of the blocking element in the position which constitutes the third position (24) of the erase interlock device. If the erase interlock device is to be returned from said third position to the second or the first position, the blocking element 52 must be moved again, which requires a deliberate operation. The third position (24) of the erase interlock device thus again affords a high degree of protection, because the erase interlock cannot be cancelled inadvertently.

The fourth position (23) of the erase interlock device, in which position the interlock device can be set only during assembly of the cassette, is defined by a further opening 56 provided for the tab 51 in the wall 47 adjacent the stop 55. The tab 51 can be inserted in this opening before the assembly of the housing halves of the cassette. The erase interlock device is again retained in this fourth position (23) with absolute security, since it can be moved out of this position only after separation of the two halves of the cassette housing.

It is to be noted that within the scope of the invention many modifications are possible, especially in respect of the construction of the control member and its function as an erase interlock device. The same also applies to the choice of positions provided for the erase interlock device. For example, in each of the embodiments described there could be provided only the first, second and third positions or only the first, second and fourth positions. It is not essential that the fourth position follows the third position in the direction of movment of the erase interlock device, starting from the first position. The fourth position may even be situated before the first position.

CLAIMS

1. A magnetic-tape cassette comprising a housing which contains a magnetic tape and which is made in two halves in at least one of which an opening is provided for cooperation with the erase interlock sensor of a recording and/or playback apparatus of the kind described, the cassette having an erase interlock device which comprises a control member which is movable between first and second positions in one of which it closes said opening in the cassette housing and in the other of which it leaves the opening open, wherein at least one additional position is provided for the control member, in which position the control member closes said opening if the sensor occupies its second position when the opening is closed, or leaves the opening open if the sensor occupies its second position when the opening is open, and wherein means are provided which block the path of movement of the control member between this additional position and the first and second positions of the control member.

2. A magnetic-tape cassette as claimed in Claim 1, wherein the means which block said path of movement of the control member comrpise a blocking element which is movable out of said path.

3. A magnetic-tape cassette as claimed in Claim 2, wherein the blocking element is constituted by a stop on a movable cover of the cassette.

4. A magnetic-tape cassette as claimed in Claim 1, wherein the means which block said path of movement of the control member comprise a blocking element which is constituted by a rigid projection on the inner side of one half of the cassette housing, and the control member is movable into or out of said additional position when the two halves of the housing are separated from one another.

5. A magnetic-tape cassette as claimed in Claim 1, wherein two of said additional positions are provided for the control member, in each of which positions the control member closes said opening if the sensor occupies its second position

if he is using the cassette with this erase interlock device in its operative second position, he is able to cancel the erase interlock simply by moving the erase interlock device to its inoperative first position. This may be deseriable if the cassette is intended for making further recordings. However, if the user sets the erase interlock device to the third position, he can be sure that the erase interlock will not be cancelled inadvertently, since cancellation requires the deliberate act of removing a blocking element from the path of the erase interlock device. The fourth position of the erase interlock device will be selected when it is not intended to make any further recordings on the tape in the cassette.

In the embodiment of Figure 3 an erase interlock device 45 is shown which again has four positions (23, 24, 25, 26). However, in this case the control member of the erase interlock device is constituted by a slide 46 which, in the inoperative first position (26) of the erase interlock device, as is shown in Fig. 3, closes an opening 48 formed in a side wall 47 of one housing half of the cassette 1. For releasing the erase interlock the slide 46 is moved by means of a tab 51 in the direction of the arrow 49 to expose the opening 48. The tab 51 projects through an elongate opening 50 formed in the wall 47. A blocking element 52 is situated in the path of the tab. This blocking element can be set in two positions, in one of which, as shown in Figure 3, a portion 53 of the blocking element which extends at right angles to the rest of the element and constitutes a stop lies in the opening 50 and limits the movement of the tab 51 to define the second position (25) of the erase interlock device. The blocking element 52 is movable in a direction perpendicular to the direction of movement 49 of the slide 46, *i.e.* in the direction of the arrow 54, into a second position in which the portion 53 of the blocking element lies outside the opening 50 and is situated beyond the path of the tab 51, so that this tab can be moved as far as a stop 55 formed by the wall 47 at the end of the opening 50. If the blocking element 52 is then reset to its original first position, the slide 46 can no longer be moved since the tab 51 on the slide is held between the stop 55 and the portion 53 of the blocking element in the position which constitutes the third position (24) of the erase interlock device. If the erase interlock device is to be returned from said third position to the second or the first position, the blocking element 52 must be moved again, which requires a deliberate operation. The third position (24) of the erase interlock device thus again affords a high degree of protection, because the erase interlock cannot be cancelled inadvertently.

The fourth position (23) of the erase interlock device, in which position the interlock device can be set only during assembly of the cassette, is defined by a further opening 56 provided for the tab 51 in the wall 47 adjacent the stop 55. The tab 51 can be inserted in this opening before the assembly of the housing halves of the cassette. The erase interlock device is again retained in this fourth position (23) with absolute security, since it can be moved out of this position only after separation of the two halves of the cassette housing.

It is to be noted that within the scope of the invention many modifications are possible, especially in respect of the construction of the control member and its function as an erase interlock device. The same also applies to the choice of positions provided for the erase interlock device. For example, in each of the embodiments described there could be provided only the first, second and third positions or only the first, second and fourth positions. It is not essential that the fourth position follows the third position in the direction of movment of the erase interlock device, starting from the first position. The fourth position may even be situated before the first position.

CLAIMS

1. A magnetic-tape cassette comprising a housing which contains a magnetic tape and which is made in two halves in at least one of which an opening is provided for cooperation with the erase interlock sensor of a recording and/or playback apparatus of the kind described, the cassette having an erase interlock device which comprises a control member which is movable between first and second positions in one of which it closes said opening in the cassette housing and in the other of which it leaves the opening open, wherein at least one additional position is provided for the control member, in which position the control member closes said opening if the sensor occupies its second position when the opening is closed, or leaves the opening open if the sensor occupies its second position when the opening is open, and wherein means are provided which block the path of movement of the control member between this additional position and the first and second positions of the control member.

2. A magnetic-tape cassette as claimed in Claim 1, wherein the means which block said path of movement of the control member comrpise a blocking element which is movable out of said path.

3. A magnetic-tape cassette as claimed in Claim 2, wherein the blocking element is constituted by a stop on a movable cover of the cassette.

4. A magnetic-tape cassette as claimed in Claim 1, wherein the means which block said path of movement of the control member comprise a blocking element which is constituted by a rigid projection on the inner side of one half of the cassette housing, and the control member is movable into or out of said additional position when the two halves of the housing are separated from one another.

5. A magnetic-tape cassette as claimed in Claim 1, wherein two of said additional positions are provided for the control member, in each of which positions the control member closes said opening if the sensor occupies its second position

when the opening is closed, or leaves the opening open if the sensor occupies its second position when the opening is open, and wherein first means are provided which block the path of movement of the control member between one of said additional positions and the first and second positions of the control member, and second means are provided which block the path of movement of the control member between the other of said additional positions and the first and second positions of the control member, the first means comprising a blocking element which is movable out of the respective path, and the second means comprising a blocking element which is constituted by a rigid projection on the inner side of one half of the cassette housing, and the control member being movable into or out of said additional positions when the two halves of the housing are separated from one another.

6. A magnetic-tape cassette substantially as herein described with reference to Figures 1 and 2 or Figure 3 of the accompanying drawings.

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