Magnetic Record Reproducing Apparatus

Description

The present invention relates to a magnetic record reproducing apparatus such as VTR (Video Tape Recorder), Camcorder and DAT (Digital Audio Taperecorder) which records and/or reproduces signals on a magnetic tape.

Generally, magnetic record reproducing apparatus such as a VTR, Camcorder or DAT is configured to record and thereafter reproduce signals on one full side of a magnetic tape, and when the tape is played in one direction, signals are recorded on one whole side, on the tilt, by means of a head drum inclined relative to the tape, and can thereafter be reproduced using the head drum.

Contrary to this conventional technique, Japanese laid open Patent Application No. Sho 61(1986) 199214 published on September 3, 1986, entitled "Magnetic Record Reproducing Apparatus" discloses a recording/reproducing technique in which the tape is divided into upper and lower domains or areas onto which luminance and chrominance signals are recorded separately. One magnetic head is provided for the luminance signal and another magnetic head is provided for the chrominance signal, which are both arranged in a common rotating magnetic head drum, so that the luminance signal and chrominance signal can be separately recorded and reproduced in the upper and lower domains of the tape.

Also, Japanese laid open Patent Application No. Sho 61-242362, entitled "Rotating Magnetic Head Apparatus" filed on April 19, Sho 60(1985)and published on October 28, 1986, and Japanese laid open Patent Applications Nos. Sho 62-154214, entitled "Magnetic Record Reproducing Apparatus" and Sho 62-154215, entitled "Tape Guide Cylinder" filed on December 26, Sho 60(1985) by Matsushita Electric Co., and published on July 9, 1987 disclose techniques wherein a tape is divided into, upper and lower sections, so

that luminance and chrominance signals can be recorded and reproduced separately.

However, with all of these prior technique, it is necessary to re-wind the tape after use, since recording or reproduction is carried out in one tape running direction only.

Furthermore, as the recording or reproduction can be done only when a tape is played in one direction, in the case of VHS, 120-minute tape can normally record or reproduce 120 minutes only while 160-minute tape can record or reproduce 160 minutes only. These periods can be extended when a 120-minute tape is used for recording or reproducing in a double mode so that a 240-minute recording or reproduction period can be provided, and when a 160-minute tape is used in triple mode a 480-minute recording or reproduction period is provided. However, even with such extended play techniques, the problem of re-winding the tape remains.

The conventional techniques also have the drawback of low utility efficiency of tape due to recording or reproduction being performed on whole width of a tape and only in one direction.

With a view to overcoming these disadvantages, the present invention provides a magnetic recording or reproducing apparatus for use with magnetic tape, comprising a first head drum for recording or reproducing signals in a first domain of a magnetic tape running in a first direction, and a second head drum for recording or reproducing signals in a second domain of the tape when running in a second opposite direction, wherein the head drums are arranged such that tracks recorded thereby form in a herring-bone pattern.

In order that the invention may be more fully understood an embodiment thereof will now be described by way of example with reference to the accompanying drawings, in which:

Figure 1 is a side view of major parts for magnetic record reproducing apparatus in accordance with the present invention;
Figure 2 is a diagram of signal record on magnetic tape, made in accordance with the present invention; and
Figure 3A and Figure 3B are schematic views of tape playing procedures for recording/reproducing signals on magnetic tapes, in accordance with the present invention.

Referring to Figure 1, a first head drum 20 records signals or reproduces recorded signals whilst tape 4 is running in a first direction, labelled direction A.

When the tape is played in direction A, the first head drum 20, mounted with a predetermined angle of inclination to the tape, rotates about its axis in direction C, and accordingly heads 22, 24 mounted on the first head drum 20 operate on upper domain 4a of the tape 4, to record or reproduce signals.

A second head drum 30 records or reproduces signals when the tape 4 is played in the opposite direction, labelled direction B. Thus, when the tape 4 is played in direction B, the second head drum 30, mounted at a predetermined angle to the tape in the opposite direction to first head drum 20, rotates in direction D about its axis of rotation so that its heads 32, 34 are played such that signals are recorded or reproduced on a lower domain 4b of the tape 4.

Figure 2 illustrates how signals are recorded on the tape by the magnetic record reproducing apparatus shown in Figure 1. The tracks 12, 14 formed on upper and lower domains 4a, 4b of a tape 4 to produce a herring-bone pattern by the first and second head drums 20, 30 which are slanted in mutually opposite directions due to the angles of inclination of the head drums relative to the tape 4. Thus, when the tape 4 is played in direction A, a track 12 is formed on the upper domain 4a of a tape by the head of a first head drum, and when the tape 4 is played in direction B, a track 14 slanted in

the opposite direction from said track 12 is formed on the lower domain 4b of the tape by the head of the second head drum.

In this manner, the first and second head drums record respective signals, or reproduce recorded signals on the upper and lower domains of a tape 4.

Figure 3A and Figure 3B are schematic drawings for showing operational conditions wherein signals are recorded or reproduced on a tape in magnetic record reproducing apparatus in accordance with the present invention.

Figure 3A illustrates operational conditions when the tape is played in direction A while Figure 3B illustrates operational conditions when the tape is played in the opposite direction B.

In both Figures 3A and 3B, the tape extends between reel disks 40a, 40b, typically in a cassette (not shown), around the first and second head drums 20, 30. The tape is guided around the heads by first, second and third rollers 52a, b, c; first, second, third and fourth slant poles 54a, b, c, d; impedance rollers 50a, b, c, d and guide rollers 46a, b.

First and second tension poles 48a, b, adjust the tension of the tape on the first and second heads 20, 30 depending on the selected driving mode for the apparatus (fast winding, rewinding, reproduction etc.).

First and second capstan drive motors 60a, b, rotate about respective drive axles 62a, b which cooperate with first and second pinch rollers 64a, b and also drive respective first and second gears 42a, b through drive belts 56a, b, the gears 42 driving first and second idler gears 44 a,b respectively. Thus, referring to Figure 3A, when the tape is driven in direction A, second capstan motor 60b rotates the second capstan axle 62b and at the same time, rotates the second driving gear 42b by virtue of the second belt 56b. The second driving gear 42b rotates the second idler 44b and simultaneously moves the

second
idler 44b to the left.

The second idler 44b is moved to the left and transmits torque from second driving gear to the second reel disk 40b so that it is rotated and winds up the tape 4, while the second pinch roller 64b is drivingly coupled to second capstan axle 62b so as to drive the tape 4 in direction A.

When the tape 4 is played in direction A, the first head drum 20 is rotated in direction C and signals are recorded on or recorded signals are reproduced from upper domain 4a (refer to Figure 1 or Figure 2) of the tape 4.

At this point, the second head drum 20 is not separately driven (rotated), so the friction force by not-driven second head drum 20 and the tape 4 can be disregarded.

Playing of the tape in the opposite direction B will now be explained with reference to Figure 3B.

When the tape 4 is loaded, the first capstan motor 60a rotates the first capstan axis 62a and at the same time, rotates the first driving gear 42a by means of the first belt 56a.

The first driving gear 42a rotates the first idler 44a and simultaneously moves the first idler to the right.

The first idler 44a is moved to the right and transmits torque from the first driving gear 42a to the first reel disk 40a.

Then, said first reel disk 40a is rotated and winds up the tape 4 while the first pinch roller 64a is drivingly coupled to the first capstan axle 62a and drives the tape 4 in direction B.

At this point, the second head drum 30 rotates in direction D and either records signals on the lower domain 4b (refer to Figure 1 or Figure 2) of the tape 4 or reproduces recorded signals from domain 4b.

In this manner, the magnetic record reproducing apparatus in accordance with the present invention can record or reproduce in both directions, needs no rewinding and doubles the usage time of a tape.

It should be understood that the invention is not necessarily limited to the above described examples. In practice many variations are possible to those skilled in the art without departing from the scope of the invention.

Specifically, in the foregoing, signals are recorded and reproduced on the upper domain of a tape by the head mounted on the first head drum, and on the lower domain of a tape by the head mounted on the second head drum. However, it is also possible that by changing the positions of the heads, signals can be recorded and reproduced on the lower domain of a tape by the head mounted on the first head drum, and on the upper domain of a tape by the head of the second drum head drum.

Claims

1. A magnetic recording or reproducing apparatus for use with magnetic tape, comprising a first head drum for recording or reproducing signals in a first domain of a magnetic tape running in a first direction, and a second head drum for recording or reproducing signals in a second domain of the tape when running in a second opposite direction, wherein the head drums are arranged such that tracks recorded thereby form in a herring-bone pattern.

2. An apparatus according to claim 1, including means for selectively operatively engaging the tape with the first head drum when the tape is running in the first direction whilst permitting the tape to move past the second head drum, and means for operatively engaging the tape with the second head drum when the tape is running in the second direction whilst permitting the tape to move past the first head drum.

3. An apparatus according to claim 2, comprising:
a first capstan motor for rotating a first capstan axle when the tape is driven in the first direction;
a first idler for rotating a first reel disk by receiving a driving force from the first capstan motor via a belt and a driving gear;
a first pinch roller pressing against the first capstan axle for guiding the tape;
a second capstan motor for rotating a second capstan axle when the tape is driven in the second direction;
a second idler for rotating a second reel disk by receiving a driving force from the second capstan motor via a belt and a driving gear; and
a second pinch roller pressing against the second capstan axle for guiding the tape.

4. A magnetic recording reproducing apparatus substantially as hereinbefore described with reference to the accompanying drawings.