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Multi-head transducer assembly for helical scan video tape recorders.

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Proprietor: VICTOR COMPANY OF JAPAN, LIMITED, 3-12, Moriya-cho, Kanagawa-ku Yokohama (JP)
Inventor: Niwa, Kazuhiro, Sawatari Apaoto 6, Sawatari, Kanagawa-ku Yokohama (JP)
Inventor: Tsunekawa, Masaharu, 1306-623, 1-3, Takeyama, Midori-ku Yokohama (JP)

Representative: Hartley, David et al, c/o Withers & Rogers 4 Dyer's Buildings Holborn, London, EC1N 2JT (GB)

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Description

"Multi-Head transducer Assembly for Helical Scan Video Tape Recorders"

Background of the invention

The present invention relates generally to electromagnetic transducers, and more particularly to a multi-head video transducer assembly having the features of the preamble of claim 1.

Multi-head magnetic transducer assemblies are currently employed in helical scan video tape recorders to effect still-picture or slow-motion playback. Such a multi-head transducer assembly comprises a pair of magnetic heads secured to a base and arranged successively in spaced relationship in the direction of transport of magnetic tape. Each head has a generally U-shaped core and in I-shaped bridging core connected to the limb portions of the U-shaped core to form a closed magnetic circuit with a magnetic gap therein. The heads are arranged so that the I-shaped core of each head is located in opposition to the U-shaped core of the other head. The opposed portions of the I-shaped cores adjacent the magnetic gaps respectively have right-angled edges which run parallel with the magnetic gaps.

An example of a known multihead transducer assembly is disclosed in GB-A-2113896. In this assembly the cross-talk between the heads of the assembly is diminished by a short circuiting winding around each of the heads and a magnetic shield between the heads.

However, it has been difficult to obtain satisfactory image quality on such special mode playback.

Summary of the invention

This difficulty is overcome by an electromagnetic transducer assembly which is characterised by a nonmagnetic base and the bridging cores of said heads respectively having acutely shaped edge portions adjacent the magnetic gaps and opposed to each other across the space between said heads.

The present invention is based on the discovery that the image quality is subject to degradation from crosstalk between the paired transducer heads due to the creation of false magnetic gaps at the sharp edge portions of the I-shaped cores.

The present invention contemplates to shape the opposed edge portions of the I-shaped cores adjacent the magnetic gaps so that they present round surfaces to magnetic medium. The rounded edge portions eliminate the magnetic gap effect of the conventional multi-head transducer assembly and ensure excellent image quality.

Another factor that affects on image quality is found to be the result of radio interference. According to another feature of the invention, the coil of each head is wound both on the web portion of the U-shaped core and on the I-shaped core. The ratio of coil turns on the U-shaped core to coil turns on the I-shaped core is proportional to the ratio of the transverse cross-sectional area of the I-shaped core to the transverse cross-sectional area of the web portion of the U-shaped core. As a result, radio interference noise introduced to the U-shaped core is cancelled with the noise introduced to the I-shaped core.

Brief description of the drawings

The present invention will be described in further detail with reference to the accompanying drawings, in which:

fig. 1 is a plan view of a video transducer assembly of the invention for use in helical scan video tape recorders;
fig. 2 is a side view of the transducer assembly of fig. 1; and
fig. 3 is a perspective view of a portion of the transducer assembly.

Detailed description

In fig. 1, a video transducer assembly of the invention, generally shown at 10, comprises a mount or head base 11 of nonmagnetic material, and a pair of electromagnetic transducer heads 1a and 1b firmly secured to the base 11. As shown in fig. 2, the base 11 is secured in place to the rotary cylinder of a helical scan type video tape recorder between upper and lower drum halves 12 and 13 to expose the head 10 slightly beyond the circumference of the cylinder. In a well known manner, another transducer assembly of similar construction is mounted on a diametrically opposite position of the rotary cylinder.

Each head comprises a generally U-shaped ferromagnetic core 2 and I-shaped ferromagnetic core 3 secured to the front and rear side limb portions of the U-shaped core. As seen in figs. 1 to 3, the front limb of each U-shaped core is tapered and accurately recessed at the end thereof and the front end portion of each I-shaped core is also accurately recessed to form a tapered portion to form a magnetic gap 5. The reason for this is to provide concentration of magnetic flux lines across the magnetic gaps 5a, 5b. As shown in fig. 2, the magnetic gap 5a is inclined to the vertical in a direction opposite to the inclination of magnetic gap 5b to the vertical. The recessed portions of the U- and I-shaped cores are filled with fused glass shown at 6a, 6b to precisely define the gap length.

The magnetic heads 1a and 1b are laterally spaced apart so that the distance L between magnetic gaps 5a and 5b is preferably equal to 1 millimeter or less. To ensure this amount of spacing, the transverse dimension of each I-shaped core is smaller than the transverse dimension of the web portion of each U-shaped core. A coil 4a is wound on the web portion of U-shaped core 2a and further wound on I-shaped core 3a. Likewise, a coil 4b is wound on the web portion of U-shaped core 2b and further wound on I-shaped core 3b. During recording, a specified one of the heads is used to record a video program and the same head is used on playback. During special mode of operation such as still-picture and slow-motion, the other head is additionally brought into play.

According to the invention, I-shaped cores 3a
and 3b respectively have rounded front edge portions 7a and 7b to keep the edge portions from sharply contacting magnetic tape being transported. These round shaped edge portions are thus rendered unparallel with the magnetic gaps 5a, 5b. This results in the elimination of magnetic gap effect which would otherwise be produced by sharp edges parallel to the magnetic gaps.

Each of the windings 4a and 4b has N1 turns on U-shaped core and N2 turns on I-shaped core. To avoid radio interference, the turn ratio N1/N2 is preferably proportional to the ratio S2/S1, where S1 and S2 represent respectively the cross-sectional area of magnetic circuit on the web portion of each U-shaped core (which corresponds to the area of contact of U-shaped core with magnetic tape) and the cross-sectional area of magnetic circuit on I-shaped core (which corresponds to the area of contact of I-shaped core with magnetic tape). Since the strength of radio interference noise produced is proportional to core's cross-sectional area, radio interference noise introduced to the U-shaped core is cancelled with that introduced to the I-shaped core. The provision of the windings on both cores also raises the output level of the head without substantially increasing thermal noise due to the resistive component of the coils.

Experiments showed that crosstalk between heads 1a and 1b was improved by approximately 6 dB and the output level was increased by approximately 3 dB.

Claims

1. An electromagnetic transducer assembly (10) adapted to be mounted on a rotary cylinder (12, 13) of a helical-scan type video tape recorder, comprising:
   a base (11); and a pair of magnetic heads (1*, 1') secured to said base (11) and successively arranged in spaced relationship with each other in the direction of transport of a magnetic medium, each of the heads (H, P) comprising a generally U-shaped core (2*, 2') having a pair of limb portions and a web portion therebetween, a bridging core (3*, 3') connected to said limb portions to form a closed magnetic circuit having a magnetic gap (5*, 5') therein, and a coil (4*, 4') wound on said closed magnetic circuit, characterised by a nonmagnetic base (11) and the bridging cores of said heads respectively having acutely shaped edge portions (7*, 7') adjacent the magnetic gaps (5*, 5') and opposed to each other across the space between said heads.

2. An electromagnetic transducer assembly as claimed in claim 1, wherein the bridging cores are generally l-shaped.

3. An electromagnetic transducer assembly as claimed in claim 2, wherein the coil (4*, 4') of each of said heads (1*, 1') is wound on the web portion and the I-shaped core, the ratio of coil turns (N1) on said web portion to coil turns (N2) on the I-shaped core being proportional to the ratio of the cross-sectional area (S1) of said l-shaped core to the cross-sectional area (S1) of said web portion.

4. An electromagnetic transducer assembly as claimed in claim 3, wherein the cross-sectional area (S1) of said l-shaped core is smaller than the cross-sectional area (S1) of said web portion.

5. An electromagnetic transducer assembly as claimed in claim 2, wherein the azimuths of said magnetic gaps (5*, 5') differs from each other.

Patentansprüche

1. Elektromagnetische Wandlerbaugruppe (10), die an einem rotierenden Zylinder (12, 13) eines Schrägschnittabtastungs-Videobandrecorders montierbar ist, mit:
   einem Basisteil (11) und
   zwei Magnetköpfen (1a, 1b), die an dem Basisteil (11) befestigt und in Transportrichtung eines magnetischen Mediums aufeinandergeschichtet mit gegen seitigem Abstand angeordnet sind, wobei jeder Magnetkopf (1a, 1b) einen im wesentlichen U-förmigen Kern (2a, 2b) mit zwei Schenkelbereichen und einem dazwischen befindlichen Stegbereich, einen mit den Schenkelbereichen in der Weise verbundenen Überbrückungskern (3a, 3b), daß ein geschlossener, einer Magnetspalt (5a, 5b) einschließender Magnetkreis gebildet wird, sowie eine auf den geschlossenen Magnetkreis aufgewickelte Spule (4a, 4b) aufweist, dadurch gekennzeichnet, daß ein nichtmagnetisches Basisteil (11) vorgesehen ist und daß die Überbrückungskerne der Magnetköpfe jeweils bogig-förmige Randbereiche (7a, 7b) aufweisen, die an die Magnetspalte (5a, 5b) angrenzen und über den zwischen den Magnetköpfen befindlichen Raum einander gegenüberliegen.

2. Elektromagnetische Wandlerbaugruppe nach Anspruch 1, dadurch gekennzeichnet, daß die Überbrückungskerne im wesentlichen l-förmig sind.

3. Elektromagnetische Wandlerbaugruppe nach Anspruch 2, dadurch gekennzeichnet, daß die Spule (4a, 4b) jedes Magnetkopfs (1a, 1b) auf den Stegbereich und den l-förmigen Kern aufgewickelt ist, wobei das Verhältnis der auf dem Stegbereich befindlichen Spulenwindungen (N1) zu der auf dem l-förmigen Kern befindlichen Spulenwindungen (N2) proportional zu dem Verhältnis der Querschnittsfläche (S2) des l-förmigen Kerns zu der Querschnittsfläche (S1) des Stegbereichs ist.

4. Elektromagnetische Wandlerbaugruppe nach Anspruch 3, dadurch gekennzeichnet, daß die Querschnittsfläche (S1) des l-förmigen Kerns kleiner als die Querschnittsfläche (S2) des Stegbereichs ist.

5. Elektromagnetische Wandlerbaugruppe nach Anspruch 2, dadurch gekennzeichnet, daß die Seitenwinkel der Magnetspalte (5a, 5b) unterschiedlich zueinander sind.

Revendications

1. Ensemble de transducteur électromagnétique (10) adapté pour être monté sur un cylindre rotatif (12, 13) d'un magnétoscope à bande vidéo du type à balayage hélicoïdal, comportant:
   une base (11); et
   une paire de têtes magnétiques (1a, 1b) fixées à ladite base (11) et successivement disposées selon
une relation d’espacement l’une par rapport à l’autre dans la direction de transport d’un support magnétique, chacune des têtes (1a, 1b) comportant un noyau globalement en forme de U (2a, 2b) possédant une paire de parties branches et une partie centrale entre celles-ci, un noyau de jonction (3a, 3b) connecté auxdites parties branches de façon à former un circuit magnétique fermé ayant un entrefer (5a, 5b) à l’intérieur de celui-ci, et un bobinage (4a, 4b) enroulé sur ledit circuit magnétique fermé, caractérisé par une base non magnétique (11), les noyaux de jonction desdites têtes possédant respectivement des parties de bord en forme d’arc (7a, 7b) adjacentes aux entrefers (5a, 5b) et opposées l’une à l’autre de part et d’autre de l’espace entre lesdites têtes.

2. Ensemble de transducteur électromagnétique selon la revendication 1, dans lequel les noyaux de jonction sont globalement en forme de I.

3. Ensemble de transducteur électromagnétique selon la revendication 2, dans lequel le bobinage (4a, 4b) de chacune desdites têtes (1a, 1b) est enroulé sur la partie centrale et sur le noyau en forme de I, le rapport des tours d’enroulement (N1) sur ladite partie centrale aux tours d’enroulement (N2) sur le noyau en forme de I étant proportionnel au rapport de la surface (S2) de la section transversale dudit noyau en forme de I à la surface (S1) de la section transversale de ladite partie centrale.

4. Transducteur électromagnétique selon la revendication 3, dans lequel la surface (S1) de la section transversale dudit noyau en forme de I est inférieure à la surface (S2) de la section transversale de ladite partie centrale.

5. Transducteur électromagnétique selon la revendication 2, dans lequel les azimuts desdits entrefers (5a, 5b) diffèrent l’un de l’autre.