

PRINTED FLEXIBLE RIBBON CABLEBACKGROUND OF THE INVENTION1) Field of the Invention

This invention relates to a head connecting printed flexible ribbon cable for a tape recorder of the automatic reversing type which is used to establish an electric connection between a magnetic head of the turnover type and an amplifier circuit for driving the magnetic head.

2) Description of the Prior Art

Tape recorders of the automatic reversing type are already known wherein a magnetic head is turned over by 180 degrees as the tape feeding direction reverses. Such a magnetic head is electrically connected to an amplifier or driver circuit for driving the magnetic head by suitable connecting means. Since the magnetic head is turned over by 180 degrees around a horizontal axis while the amplifier circuit is provided at a stationary portion of the tape recorder, the connecting means must be such that it does not resist turning motion of the magnetic head.

An exemplary one of conventional connecting means is illustratively shown in FIG. 4. Referring to FIG. 4,

a head holder c is supported for rotation around a horizontal axis on a base member b secured to a head mounting plate a, and a magnetic head d is secured at a frond end of the head holder c. The magnetic head d has
5 electric terminals e on a rear end face thereof, and a thin conductor line g is securely connected at one end thereof to each of the electric terminals e of the magnetic head d by soldering or by some other suitable means. Each of the conductor lines g is covered by a
10 vinyl insulator coating f.

Where the magnetic head d is of the 2-channel type, it has a total of 5 terminals e including 4 signal terminals and one shield terminal which is provided to ground the entire magnetic head d. Accordingly, a total
15 of 5 conductor lines g are individually connected to the terminals 3 of the magnetic head d. In order to prevent an error in wiring of the individual conductor lines g from the terminals e, the vinyl insulator coatings f are made different in color from one another. The conductor
20 lines g are passed through a conductor line passing hole h formed along the axis of rotation of the head holder c and are led out rearwardly from the rear end of head holder c. The other ends of the conductor lines g are securely connected to an amplifier circuit i by
25 soldering or by some other suitable means, thereby

establishing an electric connection between the magnetic head d and the amplifier circuit i.

In the conventional head connecting structure described above, the vinyl insulator coatings f which
5 cover the individual conductor lines g are necessarily made different in color from one another. Accordingly, construction and operation of wiring of the conductor lines g are complicated.

Further, since the conductor lines g present a
10 smallest thickness at boundary portions j between the soldered portions and the conductor line portions, they may be broken or disconnected at one of such boundary portions j after the conductor lines g have been repetitively bent by rotation of the magnetic head d or
15 by back and forth movement of the head mounting plate a. In order to prevent such a disconnection of the conductor lines g at the boundary portions j near the soldered portions, end portions of the conductor lines g near the soldered portions must be securely fixed by a
20 bonding agent or by some other suitable means together with the vinyl insulators f. This makes construction and wiring operation of the conductor lines g further complicated.

Meanwhile, the 5 conductor lines g are bundled
25 together and are passed through the conductor line

passing hole h provided along the axis of rotation of the head holder c. The conductor lines g thus resist rotation of the head holder c in either of the opposite forward and reverse directions, and this tendency particularly increases as the temperature lowers. Accordingly, the turning force of a turning over mechanism not shown for the magnetic head d must be increased. Besides, since it is difficult to increase the diameter of the conductor line passing hole h from a point of view of the spacing, it is impossible to pass a flexible printed circuit board in place of the plurality of conductor lines g.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide a magnetic head connecting printed flexible ribbon cable for a tape recorder of the automatic reversing type which is simplified in structure and wiring operation, eliminates a trouble of breaking of wire at a soldered portion, and does not resist against turning over of a head holder.

In order to attain the object, according to the present invention, there is provided a head connecting printed flexible ribbon cable for a tape recorder of the automatic reversing type for establishing an electric connection between an amplifier circuit and a magnetic head which is turned over by 180 degrees around an axis perpendicular to a tape contacting face of said magnetic head as the feeding direction of a magnetic tape for recording or reproduction reverses, said printed flexible ribbon cable having, adjacent a

head side connecting section thereof at which said cable is connected to a terminal of said magnetic head, a curved section which is curved in such a manner as to extend substantially in an arc around the axis of turning motion of said magnetic head and wherein said printed flexible ribbon cable is bent substantially perpendicularly in the opposite directions at the opposite ends of said curved section thereof.

With the printed flexible ribbon cable of the present invention, since the curved section of the ribbon cable which establishes an electric connection between the amplifier circuit and the magnetic head which is turned over by 180 degrees as the feeding direction of a magnetic tape reverses extends substantially in an arc around the axis of rotation of the head holder, the turning force when the magnetic head makes a turning over operation is absorbed by the curved section and is not transmitted to the head side connecting section nor to the amplifier side connecting section of the printed flexible ribbon cable. Accordingly, neither of the head side connecting section and the amplifier side connecting section of the printed flexible ribbon cable is broken or

disconnected by an influence of a turning over operation of the magnetic head, and therefore a turning over operation of the head holder can be performed smoothly.

A specific embodiment of the present invention
5 will now be described in detail by way of example with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a magnetic head supporting structure in which a printed flexible ribbon cable of
10 the present invention is incorporated;

FIG. 2 is a sectional view taken along line II-II of FIG. 1;

FIG. 3 is a fragmentary perspective view of the printed flexible ribbon cable of FIG. 1 connecting to a magnetic
15 head and an amplifier circuit; and

FIG. 4 is a view similar to FIG. 2 but illustrating a conventional means for connecting a magnetic head and an amplifier circuit to each other.

DETAILED DESCRIPTION OF THE ILLUSTRATED EMBODIMENT

20 Referring to FIGS. 1 to 3, a magnetic head supporting structure in which a printed flexible ribbon cable of the present invention is incorporated is shown. The magnetic head supporting structure shown includes a head mounting plate 1, and a base member 2 having a channel-

shaped vertical section and secured to an upper face of the head mounting plate 1. A head holder 3 is supported for rotation around a horizontal axis on the base member 2. As particularly seen in FIG. 2, a front half 4 of the head holder 3 in the direction of the axis thereof has a larger diameter than a rear half 5 thereof. The larger diameter portion 4 of the head holder 3 is supported for rotation in a front wall 2a of the base member 2 while the smaller diameter portion 5 is supported for rotation on the other rear wall 2b.

The larger diameter portion 4 of the head holder 3 has an inner bore or fitting hole 4a formed therein, and magnetic head 6 is fitted in and secured to the fitting hole 4a. Referring to FIG. 3, the magnetic head 6 has a plurality of (5, for example) terminals 7 provided projectingly on a rear face 6b thereof remote from a tape contacting face 6a thereof at which the magnetic head 6 is to contact with a magnetic tape not shown for recording or reproduction.

A gear 8 is secured at the rear end of the smaller diameter portion 5 of the head holder 3 and normally meshes with another gear not shown of a turning over mechanism not shown.

Referring back to FIG. 2, an opening 9 is perforated in a contiguous relationship to the fitting

hole 4a in the axis direction in a radial wall 10 of the head holder 3 between the larger and smaller diameter portions 4 and 5. The opening 9 preferably extends in an arc, which may be eccentric, around the axis of rotation of the head holder 3, and a printed flexible ribbon cable 11 according to the present invention extends through the opening 9. The opening 9 thus has a circumferential extent sufficient for the printed flexible ribbon cable 11 to pass therethrough.

10 The cable 11 is secured at one end thereof to the terminals 7 of the magnetic head 6 by soldering or by some other suitable means while the other end portion thereof is secured to an amplifier or driver circuit 12 for driving the magnetic head 6. An electric connection between the magnetic head 6 and the amplifier circuit 12 is thus established by the cable 11.

 Referring to FIG. 3, the cable 11 includes a head side connecting section 13 provided at one end thereof and connected to the terminals 7 of the magnetic head 6, an amplifier side connecting section 14 provided at the other end thereof and connected to the amplifier circuit 14, and a communicating section 15 communicating both connecting sections 13, 14 with each other. The communicating section 15 of the

cable 11 has, adjacent the head side connecting section 13, a curved section 16 which is curved in such a manner as to extend in an eccentric arc around the axis of rotation of the head holder 3 and the magnetic head 6 over the smaller diameter portion 5 of the head holder 3. The curved section 16 is bent at the opposite ends thereof substantially perpendicularly in opposite directions to each other.

Referring to FIG. 2, the head side connecting section 13 of the cable 11 is introduced into the fitting hole 4a through the opening 9 of the head holder 3 and is secured to the terminals 7 of the magnetic head 6. The curved section 16 is thus arranged in such a manner as to extend along an outer face of the smaller diameter portion 5 of the head holder 3. A portion of the communicating section 15 adjacent the curved section 16 between the curved section 16 and the amplifier side connecting section 14 is fitted and held in a slit 17 which is formed at the center of the top of the rear wall 2b of the base member 2 by a pair of horizontally inwardly extending tabs 17b. An opening 17a is left between the tabs 17b in order for the cable 11 to be fitted into the slit 17 therethrough.

Referring to FIG. 1, as the feeding direction of

a magnetic tape not shown reverses, the head holder 3 is turned over by 180 degrees around the horizontal axis in the clockwise or counterclockwise direction in FIG. 1 by the turning over mechanism not shown via the gear 8 held in meshing engagement with the gear not shown of the turning over mechanism. Upon rotation of the head holder 3 by 180 degrees around the horizontal axis perpendicular to the plane of tape contacting face 6a of the magnetic head 6, the curved section 16 is moved by the magnetic head 6 in such a manner as to wrap around or unwrap from the head holder 3. In particular, when the head holder 3 rotates in the clockwise direction in FIG. 1, the curved section 16 of the cable 11 is wrapped around the outer periphery of the smaller diameter portion 5 of the head holder 3, and when the head holder 3 rotates reversely in the counterclockwise direction, the curved section 16 is unwrapped from the outer periphery of the smaller diameter portion 5. The curved section 16 of the cable 11 thus has a sufficient extent to allow such wrapping and unwrapping movement of the cable 11 around the smaller diameter portion 5 of the head holder 3. Due to such wrapping and unwrapping movement of the cable 11, a turning over operation of the head holder 3 can be performed smoothly, and the turning force of the

head holder 3 is not transmitted to fixing portions of the head side connecting section 13 of the cable 11 to the terminals 7 of the magnetic head 6 nor to a fixing portion of the amplifier side connecting section 14 to the amplifier circuit 12. Therefore, no disconnection will be caused at such fixing portions of the cable 11 by an influence of rotation of the head holder 3.

It is to be noted that the present invention is not limited to the specific embodiment described above and shown in the drawings. For example, while in the embodiment described above the curved section 16 of the cable 11 is curved in such a manner as to partially surround the outer periphery of the smaller diameter portion 5 of the head holder 3, the cable 11 may be wrapped around the head holder 3 in such a manner as to permit rotation of the head holder 3.

Further, the printed flexible ribbon cable 11 may be either a flexible printed circuit board as shown in the drawings or a flat vinyl wire.

CLAIMS:

1. A head connecting printed flexible ribbon cable for a tape recorder of the automatic reversing type for establishing an electric connection between an amplifier circuit and a magnetic head which is turned over by 180 degrees around an axis perpendicular to a tape contacting face of said magnetic head as the feeding direction of a magnetic tape for recording or reproduction reverses, said printed flexible ribbon cable having, adjacent a head side connecting section thereof at which said cable is connected to a terminal of said magnetic head, a curved section which is curved in such a manner as to extend substantially in an arc around the axis of turning motion of said magnetic head and wherein said printed flexible ribbon cable is bent substantially perpendicularly in the opposite directions at the opposite ends of said curved section thereof.

2. A head connecting printed flexible ribbon cable for a tape recorder of the automatic reversing type substantially as hereinbefore described with reference to, and as shown in, the accompanying drawings.

