

Description

The present invention relates generally to tape cassette reels and more particularly to a tape cassette reel having an upper reel portion formed by a dichromatic molding method.

Fig. 1 shows an example of a tape cassette as disclosed in EP-A-0276941 for use with a so-called 8 mm video tape recorder.

Referring to Fig. 1, it will be seen that a cassette body 1 is comprised of an upper cassette half 2a, a lower cassette half 2b and a tape protecting member 3. The upper cassette half 2a and the lower cassette half 2b are coupled to each other to form a box. The tape protecting member 3 is rotatably attached to the box portion. A transparent, rectangular window 4 is formed on the upper surface of the upper cassette half 2a. Supply and take-up or cassette reels 5S and 5T are provided within the cassette body 1 so as to become freely rotatable. A tape 6 is wound around the cassette reels 5S and 5T through the tape protecting member 3, while both ends of the tape 6 are respectively fixed to the cassette reels 5S and 5T.

Cassette reel pushing springs 7, 7 are provided on the upper surface of the cassette body 1. The cassette reel pushing springs 7, 7 are respectively engaged with center pins 9 (Fig. 2) provided at the central, upper end portion of each of the cassette reels 5S and 5T, as will be described later. Further, a braking member (not shown) is also provided within the cassette body 1 so as to mesh with a brake engaging tooth 12 (Fig. 2) formed around the lower reel portion of each of the cassette reels.

According to the above-mentioned cassette body, it is possible to visually confirm the wound condition of the tape 6 around the cassette reels 5S and 5T through the transparent, plastic window formed on the upper cassette half 2a. If the upper reel or flange portion of each of the cassette reels 5S, 5T is completely made of a transparent, resin material, the inside structure of the reel hub is seen from the outside. To solve this problem, the assignee of the present application has previously proposed a tape cassette reel in which a central portion 15 of an upper flange portion of each of the cassette reels 5S, 5T is formed by a desired opaque material and a peripheral portion 14 of the upper flange portion is formed of a transparent material by a dichromatic molding method. This previously-proposed tape cassette reel will be described hereinunder with reference to Figs. 2 to 4.

Fig. 2 is a perspective view illustrating an overall arrangement of each of the tape cassette reels 5S, 5T, Fig. 3 is a side view of a section of a reel hub portion of each of the tape cassette reels 5S, 5T shown in Fig. 1 and Fig. 4 is a plan view of each of the tape cassette reels 5S, 5T.

Referring to Figs. 2 to 4, it will be seen that the tape cassette reels 5S, 5T is comprised of a reel hub 10 formed as one body with a lower flange portion 8 and an upper flange portion 13 secured to the upper end face of the reel hub 10. The upper flange portion 13 is comprised of the peripheral portion 14 made of a transparent, synthetic resin and the central portion 15 made of a desired, opaque material. The upper flange portion 13 is provided with protruded portions 16, 16 formed on the lower end face at its central portion 15 which are fixed to upper end faces 17, 17 of the reel hub 10 by means of an ultrasonic welding-process. Further, a circular concave portion 18 is formed on the upper surface of the upper flange portion 13. An aperture 19 is formed through the central portion 15 of the upper flange portion 13, and a center pin 9 is loosely supported between the central, lower surface of the upper flange portion 13 and the central, upper end face of the reel hub 10. The center pin 9 forms a contact portion which comes in contact with the cassette reel pushing springs 7 provided in the cassette housing 1.

As shown in Fig. 3, a hub drive shaft engaging aperture 20 is formed on the lower surface side of the reel hub 10 so that it can be engaged with a hub drive shaft of an 8 mm video tape recorder body (not shown). As shown in Fig. 2, a clamp piece engaging portion 21 is formed around the peripheral surface of the reel hub 10. The clamp piece engaging portion 21 is used to fix the tape end thereto together with a clamp piece (not shown). Reel brake engaging teeth 12 are formed around the outer peripheral surface of the lower flange portion 8. In Fig. 2, reference numerals 22, 22 designate protruded portions which are used as pouring gates.

According to the above-mentioned prior-art tape cassette reel, when the upper flange portion 13 is formed by the dichromatic molding method, if the tape cassette reel is very small, just like a tape cassette reel for a tape cassette of 8 mm video tape recorder, then the thickness of the upper flange portion 13 is decreased and hence the bonding strength of resin on the bonding surface between the transparent peripheral portion 14 and the central portion 15 made of the coloured resin is considerably decreased. The bonding surface can not obtain sufficient bonding strength because the peripheral portion 14 and the central portion 15 are moulded from different synthetic resins and the moulding conditions thereof are not equal.

It is a general object of the present invention to provide an improved tape cassette reel having an upper flange portion formed by a dichromatic moulding process.

According to the present invention, there is provided a tape cassette reel comprising:

(a) an upper flange portion having a central portion, a peripheral portion and a bonding surface between them, said central portion being made of an opaque resin and said peripheral portion being made of transparent resin by a dichromatic moulding process; and

(b) an integrally formed lower flange portion and reel hub, characterised in that a plurality of through-holes are formed through said central portion of said upper flange portion, a plurality of welding pins are formed on the upper surface of the reel hub for insertion into the through-holes in the central portion and a stepped portion is formed on the bonding surface between said central portion and said peripheral portion thereby increasing the bonding strength of said bonding surface, the step portion comprising a lip on said peripheral portion for location between said central portion and said reel hub.

As will become apparent from the following description, the invention can provide a tape cassette reel which can increase the bonding strength of the bonding surface between a central portion and a peripheral portion of an upper flange portion of the cassette reel using a dichromatic moulding process and which is suitable for use with an 8 mm video tape recorder.

The invention will be further described by way of non-limitative example with reference to the accompanying drawings in which:-

Figure 1 is a perspective view illustrating an example of a prior art video cassette;

Figure 2 is an enlarged perspective view illustrating a prior art tape cassette reel;

Figure 3 is a fragmentary, cross-sectional view illustrating a central portion of the tape cassette reel shown in figure 2;

Figure 4 is a plan view of the prior art tape cassette reel shown in figure 2;

Figure 5 is a perspective view illustrating an embodiment of a tape cassette reel according to the present invention;

Figure 6 is a fragmentary, cross-sectional view illustrating a central portion of the tape cassette reel shown in figure 5;

Figure 7 is a plan view of the tape cassette reel of the invention shown in figure 5; and

Figure 8 is a perspective view illustrating a reel hub of the tape cassette reel of the invention.

An embodiment of a tape cassette reel according to the present invention will hereinafter be described in detail with reference to figures 5 to 8. In this embodiment, the tape cassette reel of the invention is applied to the tape cassette reel for an 8 mm video tape recorder similarly to the example of the prior art shown in figure 2. Throughout figures 5 to 8, like parts corresponding to those of figures 1 to 4 are marked with the same references

and therefore need not be described in detail.

In this embodiment, as shown in figures 5 and 6, the reel hub 10 is made of a milk-white synthetic resin and is formed as one body with the lower flange portion 8. The upper flange portion 13 is bonded to an upper surface 23 of a cap-shaped portion 29 of the reel hub 10. This upper flange portion 13 is comprised of the peripheral portion 14 made of a transparent resin and the central portion 15 made of a synthetic resin of a desired color by a dichromatic molding method. A stepped portion 25 is formed on a bonding surface 24 at which the central portion 15 and the peripheral portion 14 are bonded to each other. The stepped portion 25 effectively widens the bonding area of the transparent synthetic resin of the peripheral portion 14 and the colored synthetic resin of the central portion 15 at the bonding surface 24. As shown in Fig. 6, the diameter of the central portion 15 is selected to be slightly smaller than the diameter ϕ of a cap-shaped portion 29 of the reel hub 10. The upper surface of the central portion 15 is concaved by a very small amount as shown by a depth d in Fig. 6, thereby forming a circular concave portion 18.

At the center of the central portion 15 of the upper flange portion 13, there is formed a central aperture 19 through which protrudes the center pin 9 which is integrally formed with the cap-shaped upper surface 23 at its center. Further, a plurality of through-holes 28, 28, ... are formed through the central portion 15 so as to pass therethrough welding pins 27 and guide pins 26 which will be described later. The through-holes 28 are located so as to divide equally by six a predetermined circumference of a circle drawn around the central aperture 19. Into these central apertures 19 and through-holes 28, there are respectively inserted the center pin 9, three guide pins 26 and three welding pins 27 which are all implanted on the upper surface 23 cap-shaped portion 29 of the reel hub 10 as shown in Fig. 8. When the center pin 9, the guide pins 26 and the welding pins 27 are inserted into the center aperture 19 and the through-holes 28 of the upper flange portion 13, the guide pins 26 are guided into the through-holes 28, whereby the upper flange portion 13 becomes parallel to the lower flange portion 8 of the reel hub 10.

As shown in Fig. 8, the length H of each of the welding pins 27 is selected to be larger than the combined value of the thickness t of the central portion 15 of the upper flange portion 13 and the depth d of the circular protruded portion 18. The top end portions of three welding pins 27 protruded from the upper surface of the upper flange portion 13 are welded and secured to the cap-shaped upper surface 23 of the reel hub 10 by an ultrasonic welding-process. In the ultrasonic welding-

process, the top end portion of each of the welding pins 27 is located within the depth d of the circular concave portion 18. The through-hole 28 into which the guide pin 26 is inserted might be a blind through-hole. It is needless to say that the top of the center pin 9 is protruded so as to come in contact with the upper surface of the upper flange portion 13.

With the above-mentioned arrangement, when the welding pins 27 are secured to the reel hub 10 by the ultrasonic welding-process, if the parallelism between the upper flange portion 13 and the lower flange portion 8 is disturbed, the three other guide pins 26, which are not welded, can act to maintain the parallelism of the upper flange portion 13 and the lower flange portion 8.

As shown in Figs. 6 and 7, four members 30, 30, ... are downwardly elongated from the lower surface of the peripheral portion 14 of the upper flange portion 13 along the outer periphery of the cap-shaped portion 29 of the reel hub 10. These elongated portions 30, 30, ... are also useful for accurately positioning the upper flange portion 13 relative to the reel hub 10.

According to the present invention, as set forth above, the central portion 15 and the peripheral portion 14 of the upper flange portion 13 are made by molding the colored resin and the transparent resin by the so-called dichromatic molding method. In this case, the colored resin and the transparent resin are synthetic resins such as acrylonitrile butadiene styrene copolymer (ABS) resin, so-called SAN resin and so on. According to the dichromatic molding process, two kinds (two colors) of resins are molded by one set of mold cores and the molded products are removed from the mold cores under the condition that the respective molded products are welded together, thereby being molded to be unitary.

According to the tape cassette reel of this embodiment, if the tape cassette reel has an upper flange portion of less than 1 mm thick, like the tape cassette-reel of a tape cassette for 8 mm video tape recorder, then the bonding strength on the bonding surface can be increased and the upper flange portion is precisely secured to the reel hub in parallel relation with ease. Thus, the tape cassette reel of the present invention can precisely position the upper flange portion on the reel hub with ease.

As set out above, according to the present invention, it is possible to obtain a tape cassette reel in which the bonding strength on the bonding surface can be increased in the dichromatic molding process.

Claims

1. A tape cassette reel comprising:

- (a) an upper flange portion (13) having a central portion (15), a peripheral portion (14) and a bonding surface between them, said central portion (15) being made of an opaque resin and said peripheral portion (14) being made of transparent resin by a dichromatic moulding process; and
- (b) an integrally formed lower flange portion (8) and reel hub (10), characterised in that a plurality of through-holes (28) are formed through said central portion (15) of said upper flange portion, a plurality of welding pins (27) are formed on the upper surface of the reel hub (10) for insertion into the through-holes (28) in the central portion (15) and a stepped portion (24,25) is formed on the bonding surface between said central portion (15) and said peripheral portion (14) thereby increasing the bonding strength of said bonding surface, the step portion comprising a lip (25) on said peripheral portion (14) for location between said central portion (15) and said reel hub (10).

2. A tape cassette reel according to claim 1, further including a plurality of guide pins (26) formed on the upper surface of the reel hub (10) for insertion into the through-holes (28) in the central portion (15).

3. A tape cassette reel according to claim 1 or 2, further comprising a circular concave portion (18) above said central portion (15).

4. A tape cassette reel according to claim 3, wherein the height of each of said welding pins (27) is selected to be larger than the combined value of the thickness of said central portion (15) and the depth of said circular concave portion (18).

5. A tape cassette reel according to any one of the preceding claims wherein the hub (10) has a cylindrical side wall and the upper flange peripheral portion has downwardly extending portions (30) for abutting the cylindrical side wall of the hub.

Patentansprüche

1. Bandkassettenspule bestehend aus:

- a) einem flanschförmigen Oberteil (13) mit einem zentralen Teil (15), einem außenliegenden Teil (14) und einer Verbindungsoberfläche zwischen ihnen, wobei das zen-

process, the top end portion of each of the welding pins 27 is located within the depth d of the circular concave portion 18. The through-hole 28 into which the guide pin 26 is inserted might be a blind through-hole. It is needless to say that the top of the center pin 9 is protruded so as to come in contact with the upper surface of the upper flange portion 13.

With the above-mentioned arrangement, when the welding pins 27 are secured to the reel hub 10 by the ultrasonic welding-process, if the parallelism between the upper flange portion 13 and the lower flange portion 8 is disturbed, the three other guide pins 26, which are not welded, can act to maintain the parallelism of the upper flange portion 13 and the lower flange portion 8.

As shown in Figs. 6 and 7, four members 30, 30, ... are downwardly elongated from the lower surface of the peripheral portion 14 of the upper flange portion 13 along the outer periphery of the cap-shaped portion 29 of the reel hub 10. These elongated portions 30, 30, ... are also useful for accurately positioning the upper flange portion 13 relative to the reel hub 10.

According to the present invention, as set forth above, the central portion 15 and the peripheral portion 14 of the upper flange portion 13 are made by molding the colored resin and the transparent resin by the so-called dichromatic molding method. In this case, the colored resin and the transparent resin are synthetic resins such as acrylonitrile butadiene styrene copolymer (ABS) resin, so-called SAN resin and so on. According to the dichromatic molding process, two kinds (two colors) of resins are molded by one set of mold cores and the molded products are removed from the mold cores under the condition that the respective molded products are welded together, thereby being molded to be unitary.

According to the tape cassette reel of this embodiment, if the tape cassette reel has an upper flange portion of less than 1 mm thick, like the tape cassette-reel of a tape cassette for 8 mm video tape recorder, then the bonding strength on the bonding surface can be increased and the upper flange portion is precisely secured to the reel hub in parallel relation with ease. Thus, the tape cassette reel of the present invention can precisely position the upper flange portion on the reel hub with ease.

As set out above, according to the present invention, it is possible to obtain a tape cassette reel in which the bonding strength on the bonding surface can be increased in the dichromatic molding process.

Claims

1. A tape cassette reel comprising:
 - (a) an upper flange portion (13) having a central portion (15), a peripheral portion (14) and a bonding surface between them, said central portion (15) being made of an opaque resin and said peripheral portion (14) being made of transparent resin by a dichromatic moulding process; and
 - (b) an integrally formed lower flange portion (8) and reel hub (10), characterised in that a plurality of through-holes (28) are formed through said central portion (15) of said upper flange portion, a plurality of welding pins (27) are formed on the upper surface of the reel hub (10) for insertion into the through-holes (28) in the central portion (15) and a stepped portion (24,25) is formed on the bonding surface between said central portion (15) and said peripheral portion (14) thereby increasing the bonding strength of said bonding surface, the step portion comprising a lip (25) on said peripheral portion (14) for location between said central portion (15) and said reel hub (10).
2. A tape cassette reel according to claim 1, further including a plurality of guide pins (26) formed on the upper surface of the reel hub (10) for insertion into the through-holes (28) in the central portion (15).
3. A tape cassette reel according to claim 1 or 2, further comprising a circular concave portion (18) above said central portion (15).
4. A tape cassette reel according to claim 3, wherein the height of each of said welding pins (27) is selected to be larger than the combined value of the thickness of said central portion (15) and the depth of said circular concave portion (18).
5. A tape cassette reel according to any one of the preceding claims wherein the hub (10) has a cylindrical side wall and the upper flange peripheral portion has downwardly extending portions (30) for abutting the cylindrical side wall of the hub.

Patentansprüche

1. Bandkassettenspule bestehend aus:
 - a) einem flanschförmigen Oberteil (13) mit einem zentralen Teil (15), einem außenliegenden Teil (14) und einer Verbindungs-oberfläche zwischen ihnen, wobei das zen-



trale Teil (15) aus einem lichtundurchlässigen Harz und das außenliegende Teil (14) aus einem transparenten Harz durch ein dichromatisches Formverfahren hergestellt sind; und

b) einem einteilig ausgebildeten flanschförmigen Unterteil (8) und einer Spulennabe (10), **dadurch gekennzeichnet**, daß eine Vielzahl von Durchgangslöchern (28) in besagtem zentralen Teil (15) des besagten flanschförmigen Oberteiles ausgebildet sind, eine Vielzahl von Schweißstiften (27) auf der oberen Oberfläche der Spulennabe (10) ausgebildet sind zur Einführung in die Durchgangslöcher (28) in dem zentralen Teil (15) und ein stufenförmiges Teil (24, 25) auf der Verbindungsoberfläche ausgebildet ist zwischen dem besagten zentralen Teil (15) und dem besagten außenliegenden Teil (14), womit die Verbindungsfestigkeit der Verbindungsoberfläche erhöht wird und wobei das Stufenteil einen Rand (25) auf besagtem außenliegendem Teil (14) zur Auflage zwischen besagtem zentralen Teil (15) und besagter Spulennabe (10) enthält.

2. Bandkassettenspule nach Anspruch 1, die weiterhin eine Vielzahl von Führungsstiften (26) enthält, die auf der oberen Oberfläche der Spulennabe (10) ausgebildet sind, zur Einführung in die Durchgangslöcher (28) in dem zentralen Teil (15).

3. Bandkassettenspule nach Anspruch 1 oder 2, die weiterhin ein kreisförmiges konkaves Teil (18) oberhalb von besagtem zentralen Teil (15) enthält.

4. Bandkassettenspule nach Anspruch 3, worin die Höhe eines jeden Schweißstiftes (27) derart ausgewählt ist, daß er länger ist als die Summe aus der Stärke des besagten zentralen Teiles (15) und der Tiefe des besagten kreisförmigen konkaven Teiles (18).

5. Bandkassettenspule nach einem der vorhergehenden Ansprüche, worin die Nabe (10) eine zylindrische Seitenwand und das flanschförmige außenliegende Oberteil ein sich nach unten erstreckendes Teil (30) aufweist, das stumpf an die Seitenwand der Nabe anstößt.

Revendications

1. Bobine de cassette de bande, comprenant :
(a) une partie de joue supérieure (13) ayant une partie centrale (15), une partie périphérique (14) et une surface de liaison placée

entre elles, la partie centrale (15) étant formée d'une résine opaque et la partie périphérique (14) étant formée d'une résine transparente par une opération de moulage dichromatique, et

(b) une partie de joue inférieure (8) et un moyeu (10) de bobine qui sont formés en une seule pièce, caractérisée en ce que plusieurs trous débouchants (28) sont formés dans la partie centrale (15) de la partie de joue supérieure, plusieurs ergots (27) de soudage sont formés à la surface supérieure du moyeu (10) de la bobine afin qu'ils puissent pénétrer dans les trous débouchants (28) de la partie centrale (15), et une partie à gradin (24, 25) est formée à la surface de liaison entre la partie centrale (15) et la partie périphérique (14) afin que la résistance de liaison à la surface de liaison soit accrue, la partie de gradin comprenant une lèvre (25) formée à la partie périphérique (14) et destinée à être positionnée entre la partie centrale (15) et le moyeu (10) de la bobine.

2. Bobine de cassette de bande selon la revendication 1, comprenant en outre plusieurs ergots (26) de guidage formés à la surface supérieure du moyeu (10) de bobine afin qu'ils pénètrent dans les trous débouchants (28) formés dans la partie centrale (15).

3. Bobine de cassette de bande selon la revendication 1 ou 2, comprenant en outre une partie concave circulaire (18) placée au-dessus de la partie centrale (15).

4. Bobine de cassette de bande selon la revendication 3, dans laquelle la hauteur de chacun des ergots de soudage (27) est sélectionnée afin qu'elle soit supérieure à la valeur combinée de l'épaisseur de la partie centrale (15) et de la profondeur de la partie concave circulaire (18).

5. Bobine de cassette de bande selon l'une quelconque des revendications précédentes, dans laquelle le moyeu (10) a une paroi latérale cylindrique et la partie périphérique de joue supérieure a des parties (30) dépassant vers le bas et destinées à être en butée contre la paroi latérale cylindrique du moyeu.

