

REEL TURNING APPARATUS

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates to a reel turning apparatus, and in particular, to a reel turning apparatus, which is, when a reel is held, capable of effectively preventing the reel from being damaged.

Description of the Related Art

Conventionally, a winding apparatus for tape, which automatically performs winding of a carrier tape for mounting chip-type electronic parts on a reel and replacement thereof, is used. The winding apparatus is provided with a rotational axle capable of holding the reel, and it is arranged so that a reel is attached to the rotational axle and turned, and thereby the carrier tape, which is continuously fed out, can be wound onto the reel. Here, as for the structure of the rotational axle and the reel, a rotational axle and a reel of a type shown in Fig. 6 are known.

In Fig. 6, a rotational axle 80 comprises an axle portion 81 formed into a round rod, which gradually becomes sharper toward the front end, and three wing members 82 provided at intervals of 120° in the peripheral direction of axle portion 81, each of which is able to come out of the peripheral surface of the axle portion 81 and is retractable therefrom via an elastic member (not shown). Also, the reel 83 is provided with a rotation center hole

84 of a cylindrical shape capable of allowing the axle portion 81 to go therethrough, and three receiving portions 85, which are formed on the inner side of the rotation center hole 84 and have a groove-like shape respectively corresponding to the respective wing members 82.

In the structure as described above, when a strip-shaped carrier tape (not shown) is wound onto the reel 83, first of all, the reel 83 is transferred by a predetermined arm member and the axle portion 81 is inserted into the rotation center hole 84. At this time, when the positions of the wing members 82 and the receiving portions 85 do not agree with each other, the wing members 82 retract into the axle portion 81 against the elastic force of the elastic member. From this state, the positions of the wing members 82 and the receiving portions 85 are made to agree with each other by relatively turning the reel 83 and the rotational axle 80, and thereby the wing members 82 return to their initial position and are received into the receiving portions 85. Thus, the rotational axle 80 holds the reel 83. After the reel 83 is positioned at a predetermined angle, the lead end of the carrier tape is inserted into a groove 83A formed in the reel 83 via a feeding device (not shown) to secure the lead end to the reel 83. Then, by turning the rotational axle 80, the tape is wound onto the reel 83.

However, in the structure of the rotational axle 80 as described above, when the machining accuracy of the reel 83 is poor, i.e., when there is any deviation of the

position where the receiving portions 85 are formed, or when the width of the receiving portions 85 is too tight, a problem arises that the axle portion 81 cannot be inserted into the rotation center hole 84. Accordingly, the problem can be removed by giving an enough clearance to the configuration thereof when forming the rotation center hole 84 and the receiving portions 85. However, in this case, chattering occurs on the reel 83 causing instability in positioning of the reel 83, which results in a problem that it is difficult to insert the lead end of the tape into the groove 83A.

Further, when the reel 83 is set to the rotational axle 80, since in most cases the reel 83 is inserted while the wing members 82 scratch the inner surface of the rotation center hole 84, the rotation center hole 84 is easily damaged. Particularly, when a paper reel is used, there is another problem that the rotation center hole 84 is broken. Furthermore, to set the reel 83 onto the rotational axle 80 having wing members 82, it is necessary to prepare a dedicated reel 83 corresponding to the configuration of the wing members 82, there is still another problem that the reel 83 is not versatile.

Patent document 1 (Japanese Unexamined Patent Application Publication No.9-314968), Patent document 2 (Japanese Unexamined Patent Application Publication No.10-148889), and Patent document 3 (Japanese Unexamined Patent Application Publication No.11-208049) also disclose the structures in which the rotational axle is inserted into the rotation center hole of the reel.

According to these documents, the rotational axle is provided with projections, which protrude out of the outer periphery surface thereof, and it is arranged so that the rotational axle holds the reel by these projections being received in groove-like notches formed in the rotation center hole of the reel.

However, according to patent documents 1-3, in order to maintain the function of the rotational axle to hold the reel, the material of the reel has to have such hardness as to endure against the force acting between the projections and the notches. Therefore, when the reel is formed out of a relatively soft material such as paper, a strong rotation force applied to the reel may generate a large force around the notches, which results in breaking the notches.

SUMMARY OF THE INVENTION

The present invention has been proposed in view of the above-described problems. Accordingly, an object of the present invention is to provide a reel turning apparatus, which is capable of holding a reel sandwiching the same therebetween to prevent the reel from being damaged, and it is adapted so that the reel can be reliably held irrespective of the configuration of a rotation center hole of the reel, and thereby the versatility thereof is enhanced.

In order to achieve the above-mentioned object, the present invention adopts a constitution such that a reel turning apparatus comprises a holding section, which holds

a reel capable of winding or feeding out a tape, wherein the holding section is provided so as to sandwich a pair of flange-like members constituting the reel therebetween to provide a rotation force to the reel. Owing to the above constitution, unlike the conventional art, it is possible to hold the reel without inserting the axle member into the rotation center hole of the reel. Owing to this, since it is made possible to prevent the reel from chattering and the reel can be positioned precisely, it is made possible, even in the case where the lead end of the tape is inserted into a groove formed in the reel, to reliably perform the same. Further, it is possible to eliminate the necessity to use a dedicated reel, and thus a turning apparatus with versatility can be obtained.

In the present invention, it is preferred to adopt a constitution such that the holding section includes a main driving section which comes into contact with the outer side of one flange-like member, and a driven section which comes into contact with the outer side of the other flange-like member; the main driving section and the driven section are provided so as to part away from and come closer to each other. Owing to the above constitution, since the main driving section and the driven section come into contact with the outer sides respectively of the flange-like members, the rotation center hole is prevented from being damaged while the reel is being set and rotated.

Also, it is possible to adopt a constitution such that the main driving section and the driven section are

provided with a portion having an anti-slip structure respectively, which comes into contact with the reel. By adopting the above constitution, it is made possible to reliably hold the reel, and thus it is made possible to stably provide a rotation force of the main driving section to the reel.

Furthermore, another constitution is preferably adopted such that the holding section is provided with a positioning axle section which is provided along the axis of a cylindrical rotation center hole of the reel and is capable of being inserted into the center hole. Owing to the above constitution, it is made possible to easily perform the positioning of the reel and to maintain the rotation center position of the reel more precisely.

In this specification, if not otherwise specified, the terms indicating the directions or positions are based on Fig. 1, used as a reference.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a sectional side elevation schematically showing a reel turning apparatus according to one embodiment of the present invention; Fig. 2(A) is a perspective view schematically showing a reel; Fig. 2(B) is a front view of the reel in Fig. 2(A); Fig. 3 is an enlarged section showing an essential portion of the apparatus shown in Fig. 1; Fig. 4 is a front view of the apparatus shown in Fig. 1, from which a driven section is omitted; Fig. 5 is a sectional view of the apparatus as shown in Fig. 1 showing a state immediately before the reel

is held; and Fig. 6 is a perspective view schematically showing a reel and a rotational axle for holding the same according to a conventional art.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

An embodiment of the invention will be described below with reference to the drawings.

Fig. 1 is a sectional side elevation schematically showing a reel turning apparatus in a tape winding apparatus to which the present invention is applied. In this figure, a turning apparatus 10 comprises a holding section 13 including a main driving section 11 and a driven section 12 that hold a reel R while sandwiching the same therebetween, a driving unit 15 that rotates the main driving section 11, and a positioning axle section 16 disposed along the axis line of a cylindrical rotation center hole R1 of the reel R.

As shown in Figs. 2(A) and (B), the reel R comprises a disk-like portion R2 integrally formed around the periphery of the cylindrical rotation center hole R1, a hub portion R3 of cylindrical shape connected to the outer periphery portion of the disk-like portion R2, and a pair of flange-like members R4, R4 integrally formed on both sides respectively in the axial direction of the hub portion R3 (direction perpendicular to the figure in Fig. 2(B)). The disk-like portions R2 and the hub portions R3 are provided with grooves R5 extending toward the cylindrical rotation center hole R1 at intervals of 120° along the periphery so as to allow a lead end of a tape

(not shown) to be inserted into the groove R5. Within the face of disk-like portion R2, in the lower-right area in Fig. 2(B), a round hole R6 is formed.

As shown in Fig. 1, the main driving section 11 comprises a main driving rotor 19 disposed on the outer side (left side) of the side panel 18 forming a housing of the tape winding apparatus, a body portion 20, which continues to the right side of the main driving rotor 19 and has a hollow cylindrical shape extending horizontally passing through the side panel 18, and a stepped support cylinder 21, disposed on the inner side (right side) of the side panel 18, into which the body portion 20 is inserted and which has bearings 21A, 21B on the inner periphery of the right and left end portions thereof. As also shown in Fig. 3, the main driving rotor 19 is provided with a concave portion 23 opening to the contact face 19A side, which comes into contact with the reel R, and on the bottom side of the concave portion 23 (right side in Fig. 3), a bearing 24 for supporting the positioning axle section 16 is provided. Further, to the contact face 19A, an anti-slip member 25 made of silicone rubber or the like is applied.

As shown in Fig. 1, the driven section 12 comprises a driven rotor 27 having a contact face 27A which comes into contact with the reel R, a receiving plate 29 connected to the driven rotor 27 via a bearing 28, and a sandwiching and holding cylinder 30, which is connected to the receiving plate 29 so as to move the driven rotor 27 and the receiving plate 29 in the right and left

direction. To the contact face 27A of the driven rotor 27, as with the contact face 19A of the main driving rotor 19, an anti-slip member 32 made of silicone rubber or the like is applied. Also, the driven rotor 27 and the receiving plate 29 are provided with openings 27B and 29A at the central area thereof respectively so as to allow a rod 33A of a positioning cylinder 33 and the front-end side of the positioning axle section 16 to insert into the openings 27B and 29A respectively. Here, the sandwiching and holding cylinder 30 and the positioning cylinder 33 are supported via an arm member 34 having L-like shape viewed from the side, and the arm member 34 is provided rotatably around the lower-right end portion in Fig. 1.

The driving unit 15 comprises a support plate 37 supported by the side panel 18 via brace members 36 which are positioned at upper and lower portions thereof, a motor 38 attached to the left-face side of the support plate 37 shown in the lower area in Fig. 1, a first pulley 39 fixed to the output axle 38A of the motor 38, a second pulley 40 provided to the periphery of the body portion 20, and a belt 41 wrapped around between the first and the second pulleys 39, 40. It is arranged so that the body portion 20 and the main driving rotor 19 are rotatable by turning the motor 38.

The positioning axle section 16 goes through within the body portion 20, and comprises an axle main body 43 of hollow cylinder, which has a length that both ends thereof come out of the main driving section 11, and a flange portion 44, which continues to the left end

periphery of the axle main body 43 and is positioned within the concave portion 23 to come into contact with the bearing 24. One end side (left-end side) of the axle main body 43 is formed into a tapered shape and is disposed so that the same is positioned within the opening 27B of the driven rotor 27 while the reel R is held. On the other hand, the other end side (right end side) of the axle main body 43 is fixed so as not to rotate to an auxiliary support plate 45, which is positioned on the right side of the support plate 37.

As shown in Figs. 3 and 4, attached to the left-side face of the flange portion 44 in Fig. 3 is a plate member 47 having a generally elliptical planar shape, and attached to the lower portion of the plate member 47 is a sensor 48 capable of detecting the rotation angle of the reel R. A lead wire 49 extending from the sensor 48 goes through the small hole 44A formed in the lower area of the flange portion 44 and through the axle main body 43 and is connected to a control unit (not shown).

In Fig. 1, reference numeral 51 denotes a press-out plate for the reel R. The press-out plate 51 is provided movably in right and left direction being supported by a pair of upper and lower press-out cylinders 52 attached to the side panel 18.

Next, the entire operation in the above-described embodiment will be described.

Here, it is assumed that, after the cylindrical rotation center hole R1 of the reel R has been set to the rod 33A of the positioning cylinder 33 from a transfer

apparatus (not shown), as shown in Fig. 5, the arm member 34 is set to its erected position to cause the flange-like portion R4 of the reel R to face to the main driving rotor 19 side. In order to make the holding section 13 hold the reel R from the above-described state, first of all, the rod 33A is made to proceed to a position (position indicated with chain double-dashed line in Fig. 5) where a slight clearance is left between the front tip of the positioning axle section 16 and the same. Then, the sandwiching and holding cylinder 30 is activated to move the driven rotor 27 rightward, and as shown in Fig. 1, the positioning axle section 16 is inserted into the cylindrical rotation center hole R1 of the reel R, and the flange-like portion R4 is brought into contact with the contact face 19A of the main driving rotor 19. Owing to this, the reel R is sandwiched between the main driving rotor 19 and the driven rotor 27. In this state, by turning the body portion 20 and the main driving rotor 19 with the driving unit 15, the reel R is given a rotational force. Following this, the driven rotor 27 also turns while pressing the reel R toward the main driving rotor 19.

Here, to begin winding a tape (not shown) to the reel R, first of all, the reel R is turned several times. Then, the sensor 48 detects the position of the round hole R6 of the reel R and stops the rotation of the reel R at a specific rotational angle of the reel. And it is arranged so that the lead end of the tape is inserted into the groove R5 of the reel R via a feeding device (not shown), and that by turning the reel R in the above state, the lead end is

held within the groove R5.

When the reel R completes winding the tape, the rod 33A of the positioning cylinder 33 comes closer to the positioning axle section 16 again, and the driven rotor 27 moves apart from the reel R. Then, the press-out plate 51 moves leftward in Fig. 1 to insert the rod 33A into the cylindrical rotation center hole R1 of the reel R. And then, the arm member 34 is rotated and the reel R is loaded to the above-mentioned transfer apparatus.

Therefore, according to the embodiment as described above, when the reel R is held, since the main driving rotor 19 and the driven rotor 27 come into surface contact with the outer surfaces of the flange-like portion R4, it is possible to minimize the load given to the reel R. As a result, it is possible to effectively prevent the reel R from being damaged. Owing to this arrangement, even when the reel R is formed out of paper, the reel can be held with no problem. Thus, the degree of freedom in the forming material of the reel R can be increased.

Although the best arrangement, method and the like to carry out the invention has been disclosed in the above description, the present invention is not limited thereto.

That is to say, although mainly a particular embodiment has been specifically illustrated and described, without departing from the technical spirit and scope of the object of the invention, a person skilled in the art can add various modifications to the above-described embodiment in configuration, quantity, position, direction or other detailed constitutions.

Accordingly, the description limiting the configuration or the like, which has been disclosed in the above description is set forth illustratively with the purpose of facilitating the understanding of the present invention, and not intended to limit the invention thereto. Therefore, it should be understood that any description of any component member, which uses appellation without part or all of the limitations to the configuration and the like, is included within the present invention.

For example, although the reel R has, for convenience of description, the same constitution as the conventional example, various design changes are possible as long as the main driving section 11 and the driven section 12 are capable of sandwiching the reel R. However, if the groove R5 and the round hole R6 are formed as in the above-described embodiment, it is advantageous that a constitution can be adopted such that the lead end of the tape is held automatically.

Also, in the above embodiment, the constitution is such that only the driven rotor 27 can move in the right and left direction. However, there may be a constitution such that the main driving rotor 19 alone or both of the driven rotor 27 and the main driving rotor 19 can move in the right and left direction so as to part away from and come closer to each other.

Further, the turning apparatus 10 can be applied to a reel for feeding out the tape.

As described above, according to the present invention, the holding section is formed so as to sandwich

the flange-like member of the reel therebetween, and thereby a rotational force is given to the reel. Therefore, unlike the conventional art, the reel can be reliably held without inserting the axle member into the rotational center hole of the reel, and it is possible to reduce the chattering of the reel. Furthermore, it is possible to obtain such versatility as the reel can be held irrespective of the configuration of the rotation center axle thereof.

Still further, since the main driving section and the driven section constituting the holding section are provided so as to come into contact with the outer side of the flange-like members respectively, and to part away from and come closer to each other, it is made possible, when the reel is held, to reduce the load given to the reel, and thus the reel is prevented from being damaged.

Still furthermore, when the portions in the main driving section and the driven section, which come into contact with the reel, are formed into an anti-slip structure respectively, it is possible to increase the reel holding force, and thereby the rotational force of the main driving section can be stably given to the reel.

And further again, since the holding section is provided with the positioning axle section which can be inserted into the cylindrical rotation center hole of the reel, it is possible, when the reel is held, to easily perform the positioning of the reel, and to maintain the rotation center position of the reel precisely.

WHAT IS CLAIMED IS

1. A reel turning apparatus, comprising: a holding section, which holds a reel capable of winding or feeding out a tape, wherein

said holding section is provided so as to sandwich a pair of flange-like members constituting said reel therebetween to provide a rotation force to the reel.

2. The reel turning apparatus according to claim 1, wherein said holding section includes a main driving section which comes into contact with the outer side of one flange-like member, and a driven section which comes into contact with the outer side of the other flange-like member; and the main driving section and the driven section are provided so as to part away from and come closer to each other.

3. The reel turning apparatus according to claim 2, wherein said main driving section and driven section are provided with a portion respectively having an anti-slip structure, which comes into contact with the reel.

4. The reel turning apparatus according to claim 1, 2 or 3, wherein said holding section is provided with a positioning axle section which is provided along the axis of a cylindrical rotation center hole of the reel and is capable of being inserted into the center hole.