

PINCH ROLLER

BACKGROUND OF THE INVENTION

1) Field of the Invention

This invention relates to a pinch roller for a magnetic tape feeding device of a magnetic head apparatus of a tape recorder or the like.

2) Description of the Prior Art

A pinch roller for a magnetic tape feeding device, for example, of a tape recorder conventionally includes a rotary member having a column- or cylinder-like profile and a tubular member made of a rubber material and fitted around an outer periphery of the rotary member. The outer periphery of the rubber tubular member of the completed pinch roller assumes a barrel-like profile with an intermediate portion thereof in the axial direction of the pinch roller swollen a little diametrically outwardly.

The reason why the outer periphery of the rubber tubular member assumes such a barrel-like profile is that, where an axial intermediate portion thereof is swollen diametrically outwardly, the rubber tubular member will press most strongly at the swollen portion thereof against a magnetic tape so that lateral

widthwise movement of the tape can be prevented thereby.

By the way, in production of such a pinch roller as described above, conventionally a rubber tubular member is first fitted around an outer periphery of a rotary member and is then ground at an outer periphery thereof by a grinding machine so as to finish the pinch roller into a barrel-shaped profile.

In this manner, a conventional pinch roller necessitates a step of grinding an outer periphery of a rubber tubular member after the rubber tubular member has been fitted around an outer periphery of a rotary member. Such an additional working step raises the production cost of a pinch roller accordingly.

Besides, because a low working accuracy of an outer periphery of a rubber tubular member will deteriorate feeding of a tape by the pinch roller, management of tools is necessary to maintain grind stones for a grinding machine constantly to fixed concave arcuate shapes. Accordingly, much labor is conventionally required for production of pinch rollers. Further, different grind stones are required for various peripheral profiles of rubber tubular members, and this raises a problem that tool management becomes further difficult.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide a pinch roller which eliminates the necessity of a grinding step after assembly thereof and can be produced efficiently at a low production cost.

In order to attain the object, according to the present invention, there is provided a pinch roller for a magnetic tape feeding device, comprising a rotary member having a column- or cylinder-like profile, and a tubular member made of a rubber material softer than the material of the rotary member and fitted around an outer periphery of the rotary member, the rubber tubular member having an equal thickness of material over the entire length and circumference thereof, a portion of the outer periphery of the rotary member around which the rubber tubular member is fitted having a greater diameter at an intermediate portion thereof in a direction of the axis of the pinch roller than that at opposite end portions thereof.

Thus, if the rubber tubular member is fitted around the outer periphery of the rotary member, the profile of the outer periphery of the rotary member which is swollen diametrically outwardly at the axially intermediate portion thereof will have such an influence on the outer periphery of the rubber tubular member that

it assumes a substantially barrel-like profile.

Since the pinch roller is completed only by fitting around the outer periphery of the rotary member the rubber tubular member which has a uniform thickness of material over the entire length and circumference thereof, a grinding step after assembly which is required in conventional techniques becomes unnecessary. As a result, the pinch roller can be produced very simply. Besides, troublesome management of tools also becomes unnecessary. Accordingly, the present invention can provide a pinch roller which can be produced at a reduced cost and is suitable for mass production.

A specific embodiment of the present invention 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 vertical sectional view of a pinch roller according to a first embodiment of the present invention;

FIG. 2 is a similar view showing a second embodiment of the present invention;

FIG. 3 is a similar view showing a third embodiment of the present invention; and

FIG. 4 is a similar view but showing a typical

conventional pinch roller.

DETAILED DESCRIPTION OF THE ILLUSTRATED EMBODIMENT

Referring first to FIG. 4, a conventional pinch roller is shown. The pinch roller shown includes a rotary member 1 having a column-like or cylinder-like profile, and a tubular member 2 made of a rubber material and fitted around an outer periphery of the rotary member 1. After assembly, the rubber tubular member 2 is ground at an outer periphery thereof by a grind stone 3 on a grinding machine or the like so that it may have a barrel-like profile in which an intermediate portion thereof in a direction of the axis of the pinch roller is swollen diametrically outwardly in accordance with the profile of a concave arcuate grinding face of the grind stone 3.

Now, a pinch roller according to a first embodiment of the present invention will be described with reference to FIG. 1. The pinch roller shown in FIG. 1 includes a cylindrical rotary member 11 made of a synthetic resin material, and a tubular member 12 made of a rubber material softer than the material of the rotary member 11 and fitted around an outer periphery of the rotary member 11. The cylindrical rotary member 11 has a rotary shaft fitting hole 14 formed therethrough along an axis thereof and has a pair

of outer annular flanges 15, 16 formed at opposite axial ends of the outer periphery thereof. Thus, a rubber tubular member receiving portion 17 is formed by a portion or the entirety of the outer periphery of the rotary member 11 between the flanges 15, 16. The rubber tubular member receiving portion 17 of the rotary member 11 has a barrel-like profile wherein a central portion thereof in a direction of the axis of the pinch roller presents a maximum outer diameter and opposite ends present a same minimum outer diameter.

Meanwhile, the rubber tubular member 12 has an equal thickness of material over the entire length and circumference thereof as shown in phantom in FIG. 1, and has an inner diameter a little smaller than the outer diameter at the opposite ends of the rubber tubular member receiving portion 17 of the rotary member 11. Further, the overall length of the rubber tubular member 12 is a little smaller than the overall length of the rubber tubular member receiving portion 17.

Thus, if the rubber tubular member 12 is fitted onto the rubber tubular member receiving portion 17 of the rotary member 11 while yielding elastic deformation thereof, an inner circumferential face of the rubber tubular member 12 is closely contacted with the outer peripheral face of the rotary member 11. As a result,

the profile of the rubber tubular member 12 adapts itself to the profile of the rotary member 11 so that the outer peripheral face thereof will present a barrel-shaped profile as shown in solid line in FIG. 1.

5 With such a construction as described above, machining by a grinding machine of the rubber tubular member 12 after having been fitted around the outer periphery of the rotary member 11 is unnecessary. Instead, the outer peripheral face of the rotary member
10 11 need be formed in a barrel shape in advance. However, since the rotary member 11 is made of a synthetic resin material and can thus be formed by molding using a metal mold, such barrel-like shaping will not complicate a working step. Accordingly, it is
15 apparent that production of a pinch roller is facilitated as working by a grinding machine is unnecessary, and troublesome management of tools can be eliminated and reduction in production cost and
20 improvement in efficiency in production of pinch rollers can be attained.

 It is to be noted that the profile of an outer peripheral face of a rotary member according to the present invention is not limited to the specific one of the first embodiment shown in FIG. 1 but can be changed
25 or modified in various manners.

FIG. 2 shows a second embodiment of the present invention wherein a rotary member has a different profile in outer peripheral face thereof. In particular, a rubber tubular member receiving portion 37 of a rotary member 31 has such a profile that only an intermediate portion 38 thereof is locally swollen diametrically outwardly while opposite axially end portions 39 present a uniform outer diameter. The swollen portion 38 of the rotary member 31 may have, for example, an arcuate cross section. Also in the present embodiment, if a tubular member 32 made of a rubber material and having an equal thickness of material over the entire length and circumference thereof is fitted around the rubber tubular member receiving portion 37 of the rotary member 31, the outer peripheral face of the tubular member 32 will present a substantially barrel-like profile similarly as in the first embodiment described above. Consequently, similar effects can be attained as in the first embodiment.

FIG. 3 shows a third embodiment of the present invention wherein a rotary member has a further different profile in outer peripheral face thereof. In particular, a rubber tubular member receiving portion 47 of a rotary member 41 around which a rubber tubular member 42 fitted is formed so as to have such a profile

that a central portion presents a maximum outer diameter while opposite ends present a same minimum outer diameter, and in cross section, the maximum diameter presenting portion and each of the minimum diameter presenting portions is interconnected by a straight line segment.

Accordingly, also the present embodiment can attain similar effects as in the first and second embodiments described above.

10 While description is given above of the three different embodiments of the present invention, according to the present invention, it is not always necessary for a rotary member to have an annular flange thereon. Further, while the rotary members of a
15 cylindrical configuration are illustrated, the rotary member may otherwise be of such a column-like configuration that a shaft is formed in an integral relationship with the rotary member such that it extends from the centers of opposite upper and lower end faces
20 of the rotary member.

CLAIMS

1. A pinch roller for a magnetic tape feeding device, comprising a rotary member having a column- or cylinder-like profile, and a tubular member made of a rubber material softer than the material of the rotary member and fitted around an outer periphery of said rotary member, said rubber tubular member having an equal thickness of material over the entire length and circumference thereof, a portion of the outer periphery of said rotary member around which said rubber tubular member is fitted having a greater diameter at an intermediate portion thereof in a direction of the axis of said pinch roller than that at opposite end portions thereof.

2. A pinch roller as set forth in claim 1, wherein the portion of the outer periphery of said rotary member around which said rubber tubular member is fitted has a barrel-like profile.

3. A pinch roller as set forth in claim 1 or 2, wherein the portion of the outer periphery of said rotary member around which said rubber tubular member is fitted has an arcuate profile in section along the axis of said pinch roller.

4. A pinch roller as set forth in claim 1 or 2, wherein the portion of the outer periphery of said



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rotary member around which said rubber tubular member is fitted includes an intermediate diametrically outwardly swollen portion and a pair of opposite uniform diameter portions contiguous to said intermediate diametrically outwardly swollen portion.

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5. A pinch roller as set forth in claim 1 or 2, wherein the portion of the outer periphery of said rotary member around which said rubber tubular member is fitted has such a profile that a central portion in the axial direction of said pinch roller presents a maximum outer diameter while opposite ends thereof present a same minimum outer diameter, and in section along the axis of said pinch roller, the maximum diameter presenting portion and each of the minimum diameter presenting portions is interconnected by a straight line segment.

6. A pinch roller as set forth in any one of the preceding claims, wherein said rotary member has a pair of outer annular flanges formed at opposite ends thereof in the axial direction of said pinch roller in a contiguous relationship to the portion of the outer periphery of said rotary member around which said rubber tubular member is fitted.

7. A pinch roller substantially as hereinbefore described with reference to, and as shown in, the accompanying drawings.

