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FLYWHEEL

BACKGROUND OF THE INVENTION

1) Field of the Invention

This invention relates to a flywheel suitable for use in a tape recorder or the like.

2) Description of the Prior Art

5 Flywheels employed in tape recorders and the like are generally of such a type that a shaft extends centrally through a metallic rotary body formed as an integral member by a die or the like and is fixed to the body. They however require many production
10 steps especially where pulleys are formed in the metal disks, resulting in higher production costs.

With the foregoing in view, it has recently been contemplated to produce flywheels of the above sort by combining annular metal plates and pulleys
15 made of a synthetic resin (see, for example, Japanese Utility Model Laid-Open No. 112752/1983).

Flywheels of the above-described sort are however accompanied inter alia by certain problems.

SUMMARY OF THE INVENTION

20 With the foregoing in view, the present invention has as its principal object the provision of a flywheel which can facilitate the assembly work of

an annular metal plate and an associated synthetic resin pulley which permits a reduction to its production cost.

According to this invention, there is thus
5 provided a flywheel composed of an annular metal plate and a pulley made of a synthetic resin superposed coaxially. The annular metal plate defines a plurality of outwardly-extending notches at equi-angular intervals along its inner peripheral
10 edge and at least one interlocking hole between a respective pair of notches. The pulley is provided at the same equi-angular intervals as the notches with a plurality of holding lugs extending outwardly beyond the inner peripheral edge of the annular
15 metal plate and holding an inner peripheral edge portion of the plate between the lugs and a main part of the pulley. The main part of the pulley is provided with at least one interlocking member maintained in engagement with said at least one of
20 said holes, the arrangement being such that during assembly of the flywheel, the interlocking member may be brought into engagement with said at least one of said holes by coaxially superposing the metal plate and pulley with the holding lugs and inter-
25 locking member registered with the notches and then

turning the metal plate and pulley relative to one another.

Owing to the function of the holding lugs provided on the plastic pulley, the annular metal plate and plastic pulley are prevented from
5 separation. In addition, the interlocking member serves as a stop against relative rotation between the plate and the pulley so that the plate and the pulley are prevented from idling. Since the annular
10 metal plate and plastic pulley are combined together by turning the holding lugs away from the notches and holding an inner peripheral edge portion of the annular metal plate between the holding lugs and the main part of the plastic pulley, it is possible to
15 allow the holding lugs to overlap with the annular metal plate over a wide area. Owing to this feature, the annular metal plate and plastic pulley do not separate from each other even if the plastic pulley should undergo plastic deformation to a certain
20 extent. Since the interlocking member is made of the synthetic resin, i.e. an elastic material, each elastic deformation of the interlocking member can be absorbed by itself so long as the elastic deformation is not unduly large. The above-mentioned
25 idling can hence be prevented without great risk or

failure.

BRIEF DESCRIPTION OF THE DRAWINGS

A specific embodiment of the present invention will hereinafter be described in detail by way of
5 example, and not by way of limitation, with reference to certain Figures of the accompanying drawings.

FIGURE 1 is a simplified cross-sectional view of a flywheel according to this invention;

FIGURE 2 is a top plan view showing the
10 structure of an annular metal plate employed in the embodiment of Figure 1;

FIGURE 3 is an enlarged fragmentary cross-sectional view as seen in the direction indicated by the arrows III,III in Figure 2;

15 FIGURE 4 is a top plan view showing the structure of a plastic pulley employed in the embodiment of Figure 1;

FIGURE 5 is an enlarged cross-sectional view as seen in the direction indicated by the arrows
20 V,V in Figure 4;

FIGURES 6(a) and 6(b) illustrate the assembly work of the flywheel in different stages;

FIGURE 7 is a cross-sectional view of a conventional flywheel shown in Figure 8, which is
25 seen in the direction indicated by VII,VII in Figure 8

and illustrates the structure of a conventional flywheel; and

FIGURE 8 is a top plan view of the conventional flywheel.

5 With reference to the accompanying drawings and first to Figures 7 and 8, the conventional flywheel comprises annular metal plate 71 and a pulley 72 made of a synthetic resin (and hereinafter called "a plastic pulley" for the sake of brevity).
10 Items 71 and 72 are coaxially superposed and fixed to each other. A shaft, for example, a capstan 73 is centrally and fixedly inserted through the pulley 72. As exemplary of known means for fixing the annular metal plate 71 and plastic pulley 72 to each
15 other, the plastic pulley 72 is provided with four hooks 74 which are maintained in engagement with an inner peripheral edge portion of the annular metal plate 71. Since the unification of the annular metal plate 71 and pulley 72 cannot be achieved fully
20 by the interlocking hooks 74 alone, a double-tack or two-sided glue sheet 75 is also interposed between them to adhere them firmly to each other.

 It is necessary to apply the double-tack sheet 75 to either the annular metal plate 71
25 or the plastic pulley 72 before superposing them

one on the other. This step is very cumbersome. If the double-tack sheet 75 should be omitted, problems will arise if the hooks 74 undergo plastic deformation during a high-temperature test which is conducted as the final step of the production process of the flywheel. Namely, the hooks 74 will lose their holding function for the annular metal plate 71, leading to such problems that the annular metal plate 71 and plastic pulley 72 may be separated from each other and/or may be caused to idle relative to each other.

Referring now to Figure 1, a flywheel constructed in accordance with the present invention is formed by coaxially superposing an annular metal plate 10 punched out from a sheet metal such as iron plate or stainless steel plate on a plastic pulley 20, relatively rotating the plate and the pulley to lock the plate to the pulley and then inserting a shaft (for example, capstan) 30 centrally through the pulley 20 and fixing the shaft 30 to the pulley 20.

As illustrated in Figure 2, four outwardly-extending notches 11 are formed at an equal interval of 90 degrees along the inner peripheral edge of the annular metal plate 10 and four interlocking holes 12

-- are also formed through the the annular metal plate 10 at locations shifted over 45 degrees from the their corresponding notches 11. On the lower side of the annular metal plate 10, both side edges of each of the notches 11 are machined into chamfers 13 as depicted on an enlarged scale in FIGURE 3 which is a cross-sectional view as seen in the direction indicated by the arrow III,III in FIGURE 2. The provision of the chamfers 13 facilitates release of the elastic interlocking member during the assembly work of the flywheel as will be described herein.

On the other hand, the plastic pulley 20 is composed of a disk 21, a ring 22, holding lugs 23 and an elastic interlocking member 24 as illustrated in FIGURE 4, which is a top plan view, and in FIGURE 5 which is an enlarged cross-sectional view as seen in the direction indicated by the arrows V,V in FIGURE 4. The plastic pulley 20 is formed as an integral body by molding it from a resin. The disk 21 defines centrally a through-hole through which the capstan 30 extends. A belt or the like is mounted on the peripheral outer wall of the disk 21. The ring 22 has an outer diameter slightly smaller than the diameter of the central hole of the annular metal plate 10 and extends upwardly from the upper surface of the disk 21. In a state inserted through the circular hole of the annular metal plate

10, an upper part of the ring 22 projects out beyond the upper surface of the annular metal plate 10.

The holding lugs 23 are formed in the vicinity of the upper extremity of the ring 22 and extend
5 outwardly from the outer wall of the ring 22. In the illustrated embodiment, four holding lugs 23 are formed at angular intervals of 90 degrees. The inner peripheral edge of the annular metal plate 10 is held
10 between the holding lugs 23 and the upper surface of the disk 21. A through-hole 25 is formed through the disk 21 at a location directly under one of the holding lugs 23. An elastic interlocking member 24 is formed of a thin planar part 26, which extends outwardly in the through-hole 25 with the inner end thereof
15 connected to the disk 21 but the outer end thereof maintained free, and a projection 27 formed at the outer end of the thin planar part 26 and extending upwardly beyond the upper surface of the disk 21 toward the annular metal plate. The elastic interlocking
20 member 24 is maintained in engagement with one of the interlocking holes 12 of the annular metal plate 10.

Upon assembly of the above-described flywheel, the holding lugs 23 and elastic interlocking member 24 formed on the plastic pulley 20 are first of all
25 brought into registration with the notches 11 and are then axially fitted in the notches 11, as depicted in

FIGURE 6(a). At this stage, the projection 27 of the elastic interlocking member 24 extends into the corresponding notch 11 and the holding lugs 23 are located above the upper surface of the annular metal plate 10.

Thereafter, as shown in FIGURE 6(b), the annular metal plate 10 and plastic pulley 20 are turned over a predetermined angle (45° in the illustrated embodiment) relative to each other so that the elastic interlocking member 24 is brought into engagement with one of the interlocking holes 12. At this stage, the holding lugs 23 are located on the upper surface of the annular metal plate 10, whereby the annular metal plate 10 is held between the upper surface of the disk 21 and the holding lugs 23. On the other hand, the elastic interlocking member 24 which has been in engagement with the corresponding notch 11 is released readily from the notch 11 owing to the chamfer 13 provided in the lower surface of the annular metal plate 10. At a position corresponding to the interlocking hole 12, the projection 27 of the elastic interlocking member 24 is brought into engagement with the interlocking hole 12. Owing to the elasticity of the elastic interlocking member 24, the projection 27 is biased toward the interlocking hole 12.



As a result, the annular metal plate 10 is held at both sides thereof between the upper surface of the disk 21 forming the plastic pulley 20 and the four holding lugs 23 and moreover, is prevented from turning relative to the plastic pulley 20 by the elastic interlocking member 24 maintained in engagement with the interlocking hole 12.

According to the present embodiment, the annular metal plate 10 and plastic pulley 10 can be united together by superposing them and then turning them relative to each other until the elastic interlocking member 24 engages the interlocking hole 12. Unlike the prior art, the present invention does not require the application of any double-tack sheet or the like so that the assembly can be completed with extreme ease. It is therefore possible to facilitate the assembly work and hence to reduce the production cost.

In addition, the holding lugs 23 are shifted from the corresponding notches 11 along the inner peripheral edge of the annular metal plate 10 and are hence brought into contact with the upper surface of the annular metal plate 10. It is hence possible to make the holding lugs 23 substantially long in the radial direction of the annular metal plate 10. It is thus possible to avoid such inconvenience that the annular metal plate 10 and plastic pulley 20 could be



- separated from each other, even if the plastic pulley 20 undergoes some plastic deformation.

It should however be borne in mind that the present invention is not limited to or by the following
5 embodiment. For example, the numbers of the notches and holding lugs are not necessarily limited to 4. Their numbers may be suitably changed depending on their specifications. Similarly, the present invention is not limited to the use of only one elastic
10 interlocking member. The number of elastic interlocking members may be determined suitably within a range not exceeding the number of the interlocking holes.



CLAIMS:

1. A flywheel composed of an annular metal plate and a pulley made of a synthetic resin superposed coaxially, the annular metal plate
5 defining a plurality of outwardly-extending notches at equi-angular intervals along its inner peripheral edge and at least one interlocking hole between a respective pair of the notches, the pulley being provided at the same equi-angular
10 intervals as the notches with a plurality of holding lugs extending outwardly beyond the inner peripheral edge of the annular metal plate and holding an inner peripheral edge portion of the plate between the lugs and a main part of the pulley and the main
15 part of the pulley is provided with at least one interlocking member maintained in engagement with said at least one of said holes, the arrangement being such that during assembly of the flywheel, the interlocking member may be brought into engage-
20 ment with said one of said holes by coaxially superposing the metal plate and pulley with the holding lugs and interlocking member registered with the notches and then turning the metal plate and pulley relative to one another.



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2. The flywheel as claimed in claim 1,
wherein the interlocking member comprises a thin
planar part, which extends in an outward direction
and is formed in the main part of the pulley with
the inner end thereof connected to the main part
but the outer end thereof maintained free, and a
projection formed at the outer end of the thin
planar part and extending toward the annular metal
plate.

3. The flywheel as claimed in claim 1 or 2,
wherein the notches of the annular metal plate are
formed at angular intervals of 90 degrees and the
interlocking holes of the annular metal plate are
formed at angular intervals of 90 degrees at locations
shifted over 45 degrees from their corresponding
notches.

4. A flywheel substantially as hereinbefore
described with reference to, and as shown in, Figs.
1 to 5 and Fig. 6(b) of the accompanying drawings.
