Aug. 20, 1929. F. J. BANISTER 1,725,124

COMPOSITE GEAR

Filed June 23, 1928

Fig. 1.

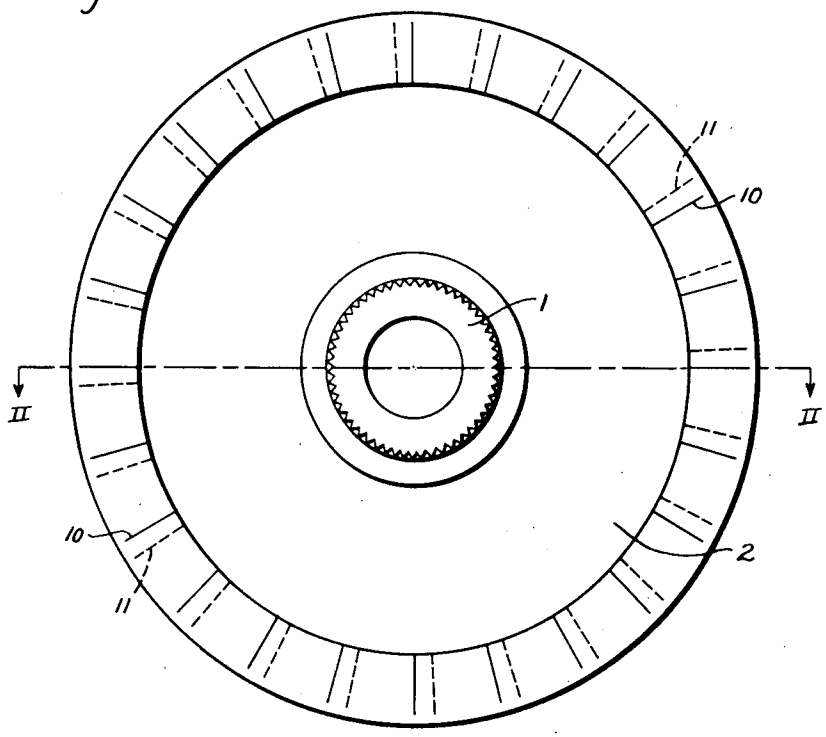


Fig. 2.

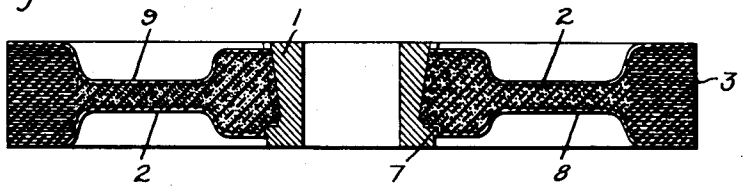
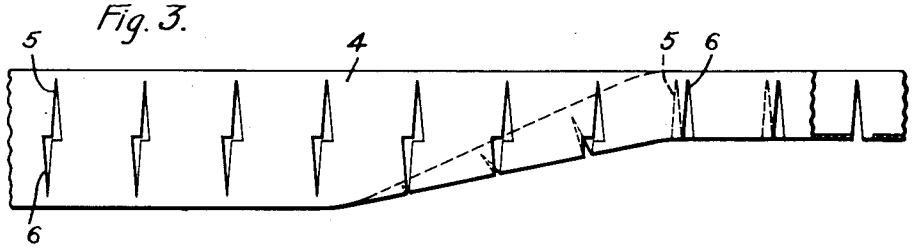


Fig. 3.



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UNITED STATES PATENT OFFICE.

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COMPOSITE GEAR.

Application filed June 23, 1928. Serial No. 287,775.

My invention relates to composite articles and more particularly to gear wheels comprising fibrous material impregnated with a binding agent, such as a phenolic condensation product, and molded on a metal hub, under heat and pressure, to form a composite, unitary structure.

The principal object of my invention is to provide a composite gear wheel of the above designated character that is simple and inexpensive in construction, mechanically durable, and efficient as a gear element and that may be uniformly and economically manufactured in large quantities.

Another object of my invention is to improve the construction of non-metallic gears and blanks therefor, so as to provide a gear that has greatly increased strength over previous gears of this type and which is more durable and efficient in service.

Another and more specific object of my invention is to provide an improved rim structure for composite gear wheels which consists, essentially, of a continuous strip of fibrous material, impregnated with a binding agent, such as phenolic condensation product, and wound edgewise to form the rim of the gear, said strip being doubled and notched, in an improved manner, to compensate for the difference in curvature between the outer and the inner peripheries of the rim and to preserve the strength of the fibrous material.

In the patent to Bierman et al No. 1,599,550, dated September 14, 1926, is disclosed a gear wheel having a non-metallic rim which is formed by winding a continuous strip of fibrous material edgewise about the periphery of the web. In making the rim of the gear as disclosed in the patent to Bierman et al, diamond-shaped notches are cut in the strip, which is then folded upon itself and helically wound around the outer periphery of the web.

After winding the strip on the web, the edges of the diamond-shaped notches are in contact, thus compensating for the difference in diameter of the periphery of the web and the outer edges of the wound strip.

My present invention is an improvement over the type of gear wheel described and claimed in aforesaid patent and is directed chiefly to the formation of a gear wheel having a mechanically durable and efficient rim structure.

My invention will be better understood by reference to the accompanying drawings in which:

Figure 1 is an elevational view of a gear embodying the principles of my invention;

Fig. 2 is a cross sectional view of the gear shown in Fig. 1 taken on the line II—II of Fig. 1; and

Fig. 3 is a plan view of a strip of fibrous material, notched and partially doubled, which is employed as the rim in the gear wheel illustrated in Fig. 1.

Referring to Fig. 1 of the drawing, a composite gear wheel such as I propose comprises a knurled metal hub 1, a web 2 and a rim 3.

In practicing my invention, a comparatively wide strip 4 of fibrous sheet material is provided in which a plurality of notches are cut, but, instead of the notches being of diamond shape, as disclosed in the above mentioned patent to Bierman et al, each notch consists of two cuts 5 and 6 of V-shape, which communicate with, but are offset from, each other, the notch 5 extending upwardly from the center of the strip and the notch 6 extending downwardly from the center of the strip. When the strip 4 is folded upon itself along its central line, the notches 5 and 6 both extend upwardly and are in staggered relation with respect to each other.

The folded strip 4 is then impregnated with a binder, such as a phenolic condensation product, and wound on the interior of a mold having an upwardly extending central portion. A comminuted fibrous material, such as paper, duck or the like, also impregnated with a phenolic condensation product, is then placed between the upwardly extending central portion of the mold and the helically wound rim portion 3 of the gear wheel, and pressure is applied which compacts the comminuted material and forces it firmly against the external rim portion, forming a unitary structure consisting of the rim 3 and the fibrous comminuted material 2.

In forming the finished gear wheel, the operations are essentially the same as those disclosed in the co-pending application of

Kent et al, Serial No. 8,193, filed February 10, 1925, which is assigned to the Westinghouse Electric and Manufacturing Company. The hub member 1, having an outwardly extending flange 7, is disposed centrally in the matrix of a mold, the flange 7 being adapted to snugly fit in a recessed portion thereof. A lower disk or shroud 8, the previously formed unitary portions 2 and 3, and an upper shroud or disk 9 are then disposed around the central hub member 1. The disk members 8 and 9 which may be made of fibrous sheet material, such as paper, duck or other spinnable or non-spinnable material, are also impregnated with a binding agent, such as a phenolic condensation product, before they are assembled. The assembled structure is then subjected to heat and pressure, the heat causing the binder to flow and the pressure compacting the softened material. Upon subsequent and continued application of heat and pressure, the entire mass will solidify to form a composite, integral structure corresponding, in shape, to the gear wheel shown in Fig. 2. After the gear wheel is thus formed, it is permitted to cool and is machined to the exact size required and the teeth cut in the usual manner.

I have found that, when the rim portion of the gear is made from a folded strip which is notched in the manner described, the rim in which the teeth are cut is very much stronger and is less liable to injury under shocks than when the notches are of diamond shape. When such folded strips are helically wound, the edges of the notches are in contact, thus compensating for the difference in diameter between the outer and the inner portions of the strip. The contact portions of the notches, when the strip is cut and wound in the manner described, in effect, form slits, but instead of the slits in the upper portion of the strip being directly above the slits in the lower portion of the strip, as in former practice, they are spaced from each other as shown by the numerals 10 and 11 in Fig. 1 of the drawing. I have found that, when the strip is notched and wound so that the upper and lower slits are in spaced relationship with respect to each other, the rim will be substantially stronger and there will be less tendency for the teeth of the gear to break during the machining operation, and, since the web portion of the gear is of a different texture from that of the rim, a high degree of resilience and flexibility is insured. The notching of the strip material may be accomplished in various ways, as by means of punching dies or rotary cutters and this operation may be made a part of the winding operation, as the strip may be passed through such dies or cutters as it is being wound.

While I have described a specific embodiment of my invention, it will be understood that various modifications may be made therein without departing from the spirit of my invention. For example, the web portion of the gear wheel may be made of metal and the strips wound helically around the metal web. It will also be understood that my improved rim may be utilized in rolls, pulleys, or other articles of manufacture.

Other modifications of my invention will become apparent to those skilled in the art. I desire, therefore, that only such limitation shall be placed thereon as are imposed by the prior art and the appended claims.

I claim as my invention:

1. A composite article, including a rim composed of a helically wound strip of fibrous sheet material folded at its center to form adjacent layers, said layers having a plurality of notches formed therein, each notch of one layer communicating with, but being offset with respect to, a notch on the adjacent layer.

2. A composite article, including a rim composed of a helical strip of fibrous sheet material folded at its center to form adjacent layers, said layers having a plurality of V-shaped notches, each notch on one layer communicating with, but being offset with respect to, a notch on the adjacent layer.

3. A composite article, including a rim composed of a helically wound strip of fibrous sheet material folded at its center to form adjacent layers, each of said layers having a plurality of V-shaped notches, each notch on one layer communicating with, but being offset with respect to, a V-shaped notch in the adjacent layer, said notches being adapted to be closed to form spaced slits when the strip is helically wound to form the rim of the article.

4. A composite article including a rim comprising a helically-wound strip of fibrous sheet material which is folded at its center to form upper and lower layers, the upper and lower layers having slits therein that are in spaced relation with respect to each other.

5. A composite article, including a rim composed of a helically wound strip of fibrous material folded at its center to form upper and lower layers, said strip having a plurality of V-shaped notches in each layer, each of the notches in the upper layer communicating with, but being offset with respect to, a notch in the lower layer so that, when the folded strip is helically wound to form the rim, the V-shaped notches will close to form slits in the upper and lower layers which are in spaced relationship with respect to each other.

6. A composite article including a rim comprising a helically-wound strip of fibrous sheet material folded at its center to form upper and lower layers and having V-

shaped notches extending from the folded edge on each layer, each notch in the upper layer communicating with, but being in offset relation with respect to, a notch in the lower layer.

7. As an article of manufacture, a blank for gears or rolls comprising a rim formed from a strip of fibrous material folded at its center to form adjacent layers, each of said layers having a plurality of V-shaped notches extending from the folded edge, each notch on one layer communicating with, but being offset with respect to, a V-shaped notch in the adjacent layer.

8. As an article of manufacture, a blank for gears or rolls comprising a rim formed from a strip of fibrous material folded at its center to provide adjacent layers, each of said layers having a plurality of V-shaped notches extending from the folded edge, each notch in one layer communicating with, but being offset with respect to, a V-shaped notch in the adjacent layer, said communicating notches being adapted to be closed to form spaced slits when the strip is helically wound to form said rim.

9. As a new article of manufacture, a blank for forming the rim of rolls or gears comprising a strip having a plurality of V-shaped notches extending from the center to adjacent to one edge, each of said notches communicating with, but being offset from, a V-shaped notch extending from the center to adjacent to the other edge, said strip being adapted to be folded at its center and helically wound to form the rim of a roll or gear.

10. A composite article comprising a metal hub, a fibrous web and a rim comprising a strip of fibrous sheet material folded at its center to form adjacent layers and provided with notches extending from the folded edge, each notch in one layer communicating with, but being offset with respect to, a notch in the other layer, said notches being closed to form spaced slits when the strip is helically wound to form the rim of the gear.

11. A composite article comprising a metal hub and a consolidated web and rim, said rim comprising a helically-wound strip of fibrous material folded at its center and provided with notches in its upper and lower layers, said notches being provided to compensate for the difference in diameter between the inner and outer circumferences of said strip when it is helically wound to form the rim and being arranged in such manner that the notches in the respective layers of the strip will be closed to form spaced slits in the formed rim.

In testimony whereof, I have hereunto subscribed my name this 15th day of June, 1928.

FREDERICK J. BANISTER.