

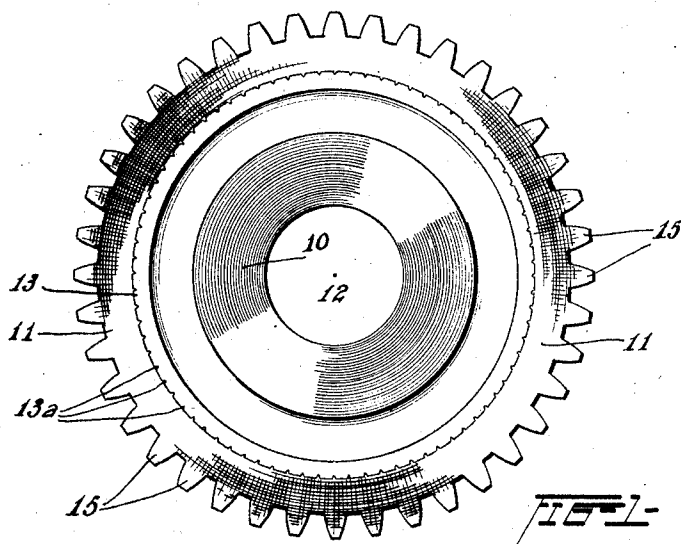
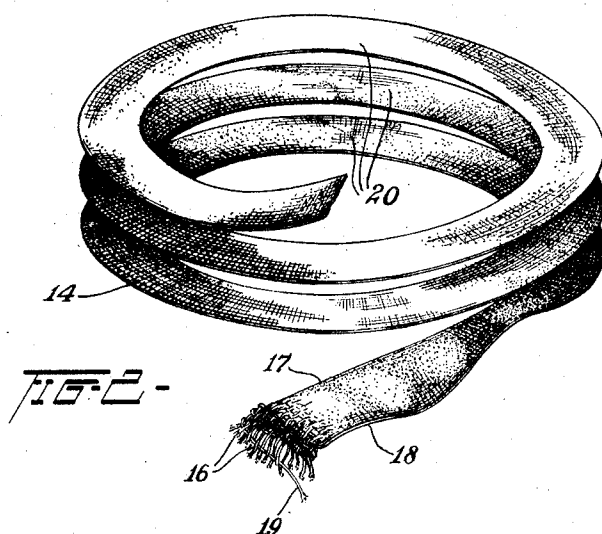
Aug. 9, 1927.

1,638,255

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SILENT GEAR AND METHOD OF MAKING THE SAME

Filed Nov. 8, 1924



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UNITED STATES PATENT OFFICE.

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SILENT GEAR AND METHOD OF MAKING THE SAME.

Application filed November 8, 1924. Serial No. 748,577.

This invention relates to noiseless or non-resonant gears having teeth and adjacent portions made of fabric and a binder and has for an object to provide a gear of this character which shall be economical to manufacture and uniformly strong throughout its periphery. A further object is to provide a method of making such gears with minimum waste of material and expenditure of labor.

Of the accompanying drawings, Fig. 1 is a view inside elevation of a gear illustrating a preferred embodiment of my invention and Fig. 2 is a perspective view of the helically woven fabric tape employed in the production of the outer toothed annulus.

It has heretofore been proposed to construct gear blanks of a plurality of layers of fabric superimposed on one another and bound together to form an integral structure by the impregnation with and the subsequent hardening of a suitable binding material. These prior constructions of fabric gears have, so far as I am aware, involved the laying up of woven fabric in stacks and cutting an annulus therefrom, or the cutting of short segments of the annulus, the chords of the segments aligning with the threads of the fabric, and building up the annulus by hand by superimposing the segments upon each other in overlapped relation. Both of these methods are wasteful of the fabric, the latter particularly is laborious, and the final product lacks capacity to resist uniformly in all directions abrasion and the torsional stresses imposed thereon.

In accordance with the present invention, I employ a metal wheel and secure to its periphery a relatively narrow tooth-forming annulus consisting of a requisite number of convolutions of a continuous fabric strip or tape wound edgewise, or several strips thus wound, each of sufficient length to make one or more complete convolutions. To provide uniform strength and resistance to wear in the teeth, I prefer to utilize a special, arcuately-woven fabric tape having a normal curvature substantially the same as it is to assume in the convoluted annulus. The convolutions of this tape being positioned edgewise to the periphery of the wheel, the warp threads of the fabric lie circumferentially and the weft threads radially of the gear, giving to the fabric structure not only

greater strength but also uniformity in the disposition of warp and weft threads throughout its periphery, with consequent uniformity in the ability of the teeth to resist abrasion and torsional stresses.

Referring to Fig. 1 of the drawing, I show a gear having a central wheel portion 10 and an outer, tooth-forming ring 11. The wheel portion 10 may be made of any suitable rigid material, such as metal, wood, or fiber composition, and preferably has a central opening 12 for the gear shaft and a peripheral surface or rim 13 for the engagement of the tooth-forming portion 11. This rim is roughened by providing it with numerous transverse, shallow notches or grooves 13^a for interlocking engagement with said portion 11. The portion 11 is formed of a fabric tape 14, impregnated or coated with a suitable hardening binder such as rubber, celluloid or phenolic condensation product of the class of bakelite, and wound edgewise onto the periphery of the wheel 10, as on the rim 13, the convolutions being laterally pressed together as the winding proceeds. When a requisite thickness of fabric has been plied up, the fabric annulus is subjected to heavy transverse compression, both to cause it to hug the wheel portion 10 and to consolidate the layers with each other, the pressure being preferably maintained during the hardening of the impregnating material. The result is a substantially rigid gear blank having a tooth-forming portion of hardened binder and fabric of the described character. The teeth 15 are then formed in the annulus 11 by means of any suitable gear-cutting machine.

The fabric tape 14, in this preferred embodiment, is of a special arcuate weave, illustrated in Fig. 2, in which the warp threads 16 are of increasingly greater length from the inner edge 17 to the outer edge 18 of the tape. This is normally effected in the weaving by causing a graduated increase in speed of the warp threads from the inner selvage 17 to the outer selvage 18, the weft threads 19 being as a consequence more widely spaced at the outer edge of tape. As the fabric is delivered from the loom, it assumes a coiled form, the helical convolutions lying smoothly with their flat sides 20 adjacent, the warp threads 16 running circumferentially and the weft threads 19 radially of the convoluted

5 fabric. If desired, the weft threads may be made of a different material than the warp threads, as for example, of a tougher, more abrasion-resistant material, in order to give the gear great durability and strength, the continuous warp threads serving securely to anchor the weft threads in position to prevent distortion of the gear teeth under severe service conditions.

10 In assembling the arcuately-woven tape to make the tooth-forming annulus, I preferably utilize a tape having a normal curvature substantially the same as that of the annulus which it is to form, since this permits an even tension to be given the threads of the fabric and enables the several plies to be wound with smooth contacting surfaces. The plies of fabric may be impregnated before winding to form the annulus, each ply being pressed in place as it is applied, or the tape may be convoluted and then impregnated, as by dipping. In either case, the convoluted fabric is subjected to transverse compression and the impregnating substance solidified, as, where bakelite or vulcanizable rubber are employed, by the application of heat.

30 While I have shown but one form of gear embodying my invention and while I have referred in the specification to forming the fabric annulus directly upon the central wheel portion of the gear, it is obvious that numerous variations and modifications in

the construction of the gear may be made without departing from the principles of this invention, and that the tooth-forming annulus may be made in other ways, as, for example, separate from and detachable with respect to the central wheel portion of the gear. I therefore do not purpose to limit the claims of this application otherwise than as necessitated by the prior art.

I claim:

1. The method of making a gear which comprises weaving in helical form a unitary strip of thread-comprising sheet material with the strip radially disposed in the helix, forming an annulus of the strip by securing successive turns thereof together with a bonding material, and forming gear teeth on the annulus.

2. A gear comprising a helically woven strip of thread-comprising material, the strip being radially disposed in the helix, and bonding means securing successive turns of the strip together in the form of an annulus, the threads in each tooth of the gear having the same disposition with relation to the tooth.

3. A gear as defined in claim 2 in which one set of threads is disposed radially and another set is disposed circumferentially of the gear.

In witness whereof I have hereunto set my hand this 6th day of November, 1924.

JOHN R. GAMMETER.