Dec. 27, 1932. C. W. MANSUR 1,891,937

NONMETALLIC GEAR WHEEL

Filed March 27, 1928

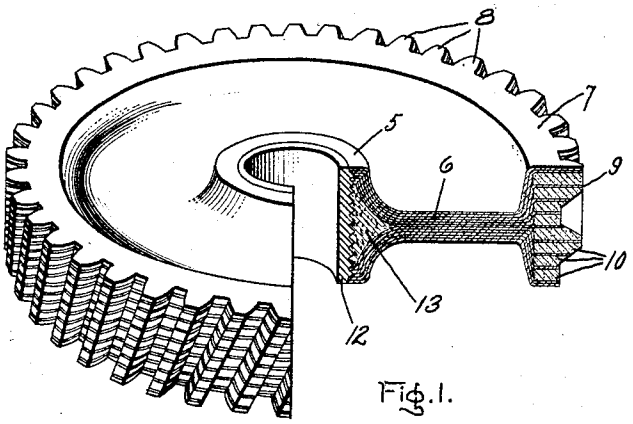


Fig. 1.

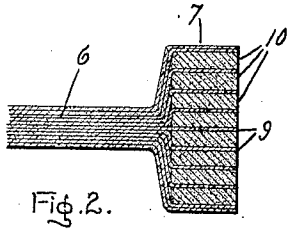


Fig. 2.

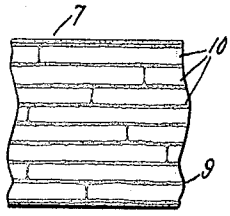


Fig. 3.

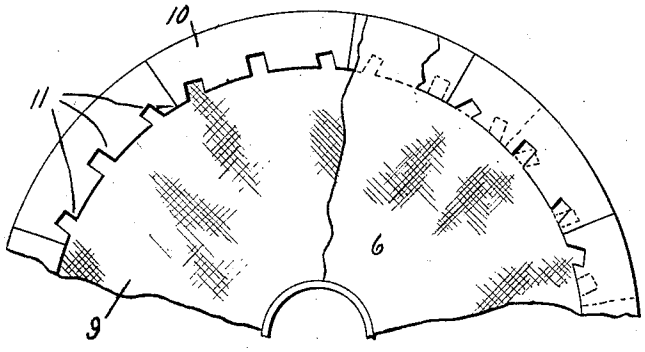


Fig. 4

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UNITED STATES PATENT OFFICE

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NONMETALLIC GEAR WHEEL

Application filed March 27, 1928. Serial No. 265,166.

The present invention relates to gear wheels of the type termed usually non-metallic or noiseless gear wheels, and has for its object to provide an improved gear wheel of this character.

For a consideration of what I believe to be novel and my invention, attention is directed to the accompanying description and the claims appended thereto.

In the drawing wherein I have illustrated one embodiment of my invention, Fig. 1 is a perspective view, partly in section, of the completed gear wheel; Fig. 2 is a sectional view through the rim and adjacent web portion of a gear blank; Fig. 3 is a face view of a portion of the rim, and Fig. 4 is a side view, partly broken away, illustrating the manner in which the gear wheel blank is formed.

Referring to the drawing, the gear wheel comprises a hub 5, a web 6 and a rim 7, the rim in a completed gear wheel being provided with teeth as is indicated at 8.

According to one embodiment of my invention, I construct the web of the gear wheel or gear wheel blank from spinnable textile fibers, preferably in the form of woven cotton fabric, united by an adhesive of a character such that the web has a certain desired degree of hardness and flexibility. Preferably as an adhesive I utilize rubber, the rubber being so compounded that when vulcanized under pressure there results a web structure which has the desired degree of hardness and flexibility. I then construct the rim or at least the toothed portion of the rim from a plurality of pieces of non-metallic material having a degree of hardness greater than that of the web, the pieces being embedded in and held by material the same as that of the web. Preferably the pieces are in the form of rings formed from segments. The segments may be formed with advantage from spinnable textile fibers united by an adhesive such as a phenolic condensation product. In the drawing, 9 indicates the sheets of woven fabric which make up the web of the gear wheel or gear wheel blank and 10 indicates the segments of the rim.

In constructing the gear wheel blank, I take what is known in the trade as "rubberized cloth", this being cloth coated with unvulcanized or partially vulcanized rubber and cut from it annular sheets of a size such that in a completed gear wheel or gear wheel blank, they will extend from the hub to the periphery of the rim. I then stack such sheets one on another after the manner illustrated in Fig. 4, and intersperse among them at their peripheries rings of segments 10, the segments being placed end to end and spaced slightly apart. Preferably, also the segments are provided with notches 11 at their inner edges. The segments are of a width equal to the thickness of a number of sheets of the "rubberized cloth". This is clear from Fig. 2. Segments 10 may be cut from sheets of material comprising spinnable textile fibers united by an adhesive binder such as a phenolic condensation product, such sheets having been previously constructed in known manner. For example, they may be constructed after the manner disclosed in the patent to Guay, reissue No. 16,201, dated Nov. 3, 1925. Or, I may utilize segments formed from spinnable textile fibers which have been treated with an adhesive such as a phenolic condensation product, but have not been finally cured or hardened. The hub may be formed in any desired manner. In the present instance, I have shown it as comprising a metal bushing 12. A suitable filler 13 is provided to enlarge the hub to the desired size. Preferably, I utilize a rubberized material for filler member 13 because such material forms a good bond with the metal hub. After the parts have been assembled, this being done preferably in a suitable mold, the mold is placed in a press, the structure consolidated, and the rubberized cloth cured or vulcanized by heat. For this purpose I may use a pressure of the order of 1500 pounds per sq. in., and a temperature of the order of 160° C. The notches 11 and the spaces between the ends of the segments 10 become filled with the rubberized cloth material so that in the completed structure there is provided a rim comprising segments of a harder non-metallic material embedded in a slightly softer non-metallic material. The segments of harder material, being surround-

ed by the softer material, are in a way, yieldably supported so they may float or move in any direction, it being understood, of course, that the movement which may actually take place is of a minute character. It is sufficient however, to take care of such tooth inaccuracies as are met with in modern gear practice and to render the structure capable of absorbing vibrations. The notches 11, filled with the rubberized cloth material, serve to anchor the segments 10 at spaced points and to provide a good bond between them and the rubberized cloth.

The gear wheel may be covered with a suitable protective coating, such as a phenolic condensation product, which has superior qualities in so far as resistance to atmospheric conditions and to oil are concerned, although in actual practice I have found this not to be necessary.

To this end, I may place phenolic condensation product in powdered form in the mold in which the gear wheel blank is to be made, the powder being spread over the surfaces of the mold. Then when the mold is filled with the material from which the gear wheel blank is to be made and the same is vulcanized and cured, the powdered substance forms a coating on the outer surface of the blank, the powdered substance fusing into and forming a unitary part of the structure.

By the above described arrangement I provide a gear wheel or gear wheel blank wherein the web and the gear teeth each comprise materials of a degree of hardness and flexibility best suited for the stresses to which they are subjected. In this connection, the web has flexibility sufficient to take care readily of slight inaccuracies which may be present in the tooth structures and gear alignment. At the same time it is formed from a material capable of absorbing vibration and deadening noises. Likewise, the gear teeth, owing to the interspersed slightly softer material between the segments of harder non-metallic material, have the desired degree of flexibility and good sound deadening properties. At the same time, they have excellent wearing qualities.

It will be noted that in the tooth structure itself, after the teeth are cut, there are present alternate layers of the harder and softer materials as indicated particularly in Fig. 1, which give to the individual teeth a certain flexibility or yielding quality.

In accordance with the provisions of the patent statutes, I have described the principle of operation of my invention, together with the apparatus which I now consider to represent the best embodiment thereof, but I desire to have it understood that the apparatus shown is only illustrative and that the invention may be carried out by other means.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. A non-metallic gear wheel or gear wheel blank comprising a web and a rim, the web being formed from spinnable textile fibers united by an adhesive to form a material of one degree of hardness and the rim being formed from individual segments of non-metallic material placed end to end and having a degree of hardness greater than the material of the web between which is interspersed material the same as that forming the web whereby the segments are embedded in material the same as that forming the web.

2. A non-metallic gear wheel having a toothed portion comprising segments of non-metallic material of one degree of hardness between which is interspersed a non-metallic material of a degree of hardness less than that of the segments.

3. A non-metallic gear wheel having a toothed portion comprising segments of non-metallic material formed from spinnable textile fibers united by a phenolic condensation product between which is interspersed non-metallic material comprising a rubber compound, said segments being placed end to end.

4. A non-metallic gear wheel having a toothed portion comprising segments of non-metallic material separated by a non-metallic material comprising rubber compound, said segments being placed end to end and having a degree of hardness greater than that of the said rubber compound by which they are held.

5. A non-metallic gear wheel or gear wheel blank comprising a web and rim, the web being formed from woven textile material united by a rubber compound, and the rim being formed from segments of non-metallic material between which are interspersed the sheets which form the web, said segments being formed from material having a degree of hardness greater than that of the web material.

6. A non-metallic gear wheel or gear wheel blank having a toothed portion comprising layers of non-metallic material between which is interspersed material comprising rubber compound, said first-named material having a degree of hardness greater than that of the interspersed material.

7. A non-metallic gear wheel or gear wheel blank having a toothed portion comprising layers of non-metallic material between which is interspersed material comprising rubber compound, said first-named material having a degree of hardness greater than that of the interspersed material, said gear wheel or gear wheel blank being covered with a phenolic condensation product.

8. A non-metallic gear wheel having a toothed portion comprising layers of non-metallic material formed from spinnable textile fibers united by a phenolic condensation product between which is interspersed non-

metallic material comprising a rubber compound.

9. A non-metallic gear wheel or gear wheel blank having a toothed portion comprising layers of non-metallic material of one degree of hardness held by a non-metallic material of a degree of hardness less than that of the first-named material which is interspersed between said layers.

10. A non-metallic gear wheel or gear wheel blank comprising a web and a rim, the web being formed from woven textile material united by a rubber compound, and the rim being formed from layers of non-metallic material interspersed between the sheets which form the web said last named material having a degree of hardness greater than that of the web material.

11. A non-metallic gear wheel having a rim portion comprising rings of individual segments of non-metallic material of one degree of hardness the segments of each ring being placed end to end in abutting relation, and a non-metallic material of a degree of hardness less than that of the rings of segments interspersed between the rings of segments for holding the rings of segments in position.

12. A non-metallic gear wheel or gear wheel blank comprising a web and a rim, the web being formed from woven textile material united by a rubber compound, and the rim being formed from a plurality of rings of individual segments arranged end to end in abutting relation to each other between which are interspersed the sheets which form the web, the material from which the rings are formed having a degree of hardness greater than that of the web material.

13. A non-metallic gear wheel or gear wheel blank comprising a web and a rim, said web being formed from textile material united by a compound of one degree of hardness, and said rim being formed from segments of non-metallic material arranged end to end and separated from each other by material the same as that from which the web is formed, said segments being formed from material having a degree of hardness greater than that of the web material.

14. A non-metallic gear wheel having a toothed portion comprising layers of textile material, alternate layers being treated with a phenolic condensation product and with a rubber compound respectively.

15. A non-metallic gear wheel having a toothed portion comprising alternate layers of textile material treated with adhesives of different degrees of hardness.

16. A non-metallic gear wheel having a toothed portion comprising layers of non-metallic material separated by layers of non-metallic material comprising rubber compound, said first-named layers comprising a material having a degree of hardness greater than that of the material by which they are separated.

17. A non-metallic gear wheel or gear wheel blank comprising a web and a rim, the web being formed from sheets of woven textile material united by a rubber compound, and the rim being formed from layers of woven textile material united by a phenolic condensation product between which are interspersed the sheets which form the web.

18. A non-metallic gear wheel or gear wheel blank having a rim portion formed from layers of woven textile material, alternate layers being treated with a rubber compound and with a phenolic condensation product respectively.

In witness whereof I have hereunto set my hand this 24th day of March, 1928.

CLARENCE W. MANSUR.