June 3, 1930. L. T. FREDERICK 1,761,114

COMPOSITE GEAR

Filed June 17, 1927

Fig. 1.

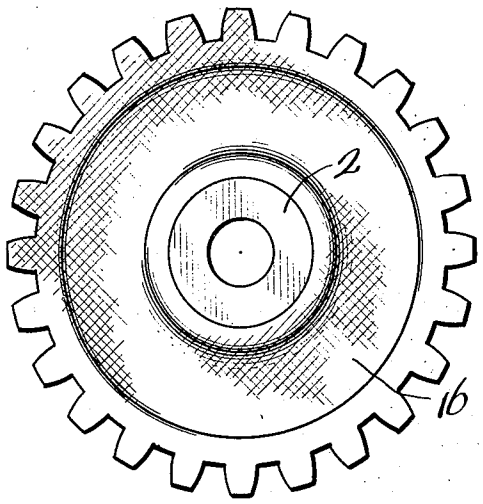


Fig. 2.

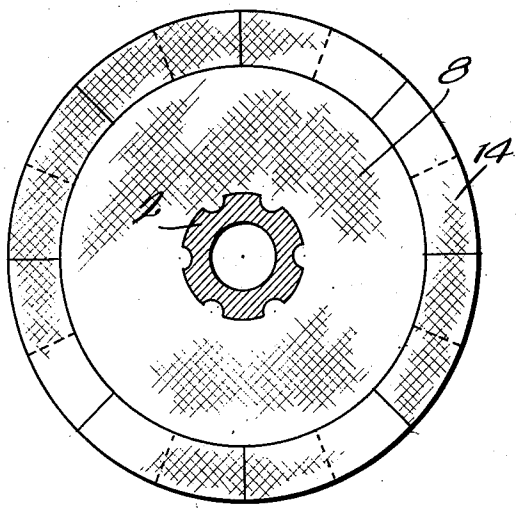


Fig. 3.

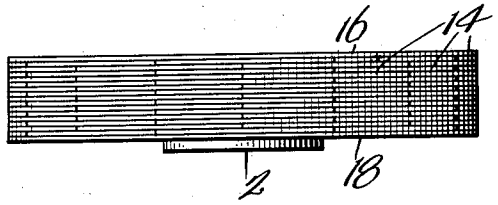
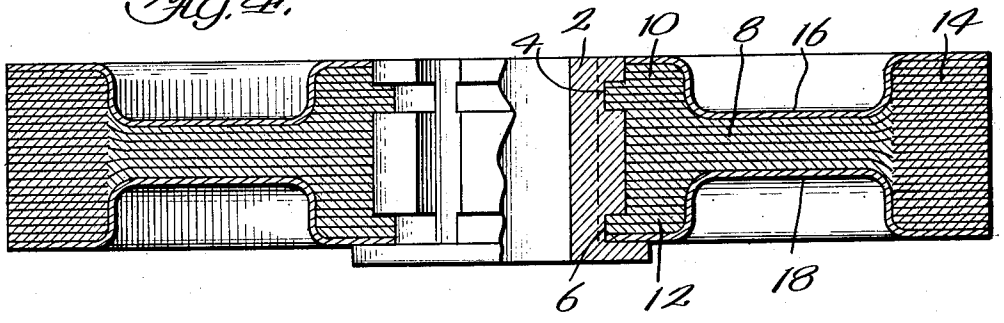


Fig. 4.



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UNITED STATES PATENT OFFICE

LOUIS T. FREDERICK, OF VALPARAISO, INDIANA, ASSIGNOR TO FIBROC INSULATION COMPANY, OF VALPARAISO, INDIANA, A CORPORATION OF INDIANA

COMPOSITE GEAR

Application filed June 17, 1927. Serial No. 199,493.

My invention relates to composite gears consisting of fibrous material and a binding substance such as a phenol condensation product of the general character set forth in Baekeland Patent 1,160,364.

It is desirable in many cases, especially in gears of the larger sizes or in gears of either large or small sizes in which the available room on the shaft is limited, and also in those cases where it is desired to lighten the gear, to reduce the thickness of the central portion of the gear, thus producing a rim section of the full width or thickness of the gear and a central or web section which is thinner. Various methods have been attempted for producing such gears having a reduced web section.

According to one method the surplus material is machined away, but this method is expensive by reason of the waste of the material which is removed. According to another method, rings of fabric have been employed and these have been inter-leaved or alternated with complete discs, the rings thickening the rim portion and building up the gears at this part. This method, however, is undesirable in that the sheets of fabric are distorted during manufacture, and it is impossible, commercially speaking at least, to produce a gear wheel in which the density will be uniform. If it is not uniform the gear when rotating will tend to run out of true. The gear being unbalanced will have a tendency to "wobble" and this will result in excessive wear at certain points, thus rendering the gear noisy and short-lived.

The object of my present invention is to produce a gear having a web section of lesser thickness than that of the rim, and/or of the hub but which will lend itself to ready manufacture and will make it possible under commercial conditions to produce a gear in which the cross section on any given plane will be symmetrical and the sections on all diametral planes will be the same.

Another object of my invention is to provide a machine element blank, and particularly a gear blank, of the character described, wherein the web and rim portions are formed of separate stacks of layers with the layers of the rim stack centrifically enclosing those of the web stack and the joint between the layers of each stack being substantially free from interleaving, whereby the building up of the blank is facilitated and whereby the finished blank is free of distortion and warping and will be more suitably constructed for receiving the pressure in the compression operation of the formation of the blank.

These and other objects of my invention will be apparent from a perusal of the following specification when taken in connection with the accompanying drawings wherein,

Figure 1 is a side view of my completed gear,

Figure 2 is a similar view before the gear teeth have been cut and with the face plates removed,

Figure 3 is an end view thereof, and

Figure 4 is a partial sectional view showing the manner in which the laminations of the rings and washers are positioned.

In the preferred embodiment my improved gear comprises a metal hub 2 preferably formed with spaced circumferential grooves 4 and 6 by which means the condensation treated material forming the inner portion of the web, or the hub, of the blank proper, may more easily be molded permanently to the metal hub. The web portion is of lesser thickness, being formed of a stack of plurality of superposed relatively large layers 8, may be disks, rings or notched strips and which preferably extend from the metal core or hub 2 outwardly in parallel relation and terminate at the rim portion. The notched strips herein referred to are disclosed in my

copending application, Serial No. 174,688, filed March 11, 1927. The hub of the blank is formed of greater thickness than the web proper and in order to provide a construction which will not warp and suffer distortion during manufacture, I provide a plurality of rings, sections, or notched strips 10 of smaller diameter which are adapted to overlie and to also underlie the upper and lower faces of the larger layers 8 comprising the web portion. Certain of these smaller layers 12 are of increased diameter, or in other words are of a diameter intermediate to the larger and smaller whereby such intermediate sized layers 12 will project into the grooves 4 and 6 of the metal core or hub as hereinbefore described.

The rim of the blank is formed by a stack of superimposed rings, segments or notched strips 14 which are piled in solid formation the entire thickness of the rim. The layers 8 forming the web portion of the blank preferably do not extend into the rim section, which is a more desirable construction since this makes the gears easier to manufacture and because as I have discovered, that gear blanks can be made in this manner without leaving a line of cleavage between the outer ends of the web layers 8 and the inner ends of the rim layers 14. During the molding of these meeting portions, the treated fabric will unite to form a solid integral structure with no line of cleavage and no inherent weakness.

In the preferred form of my invention I provide upper and lower face plates, 16, 18 of treated fabric, for not only providing additional strength but also imparting a finished and pleasing appearance to the gear.

The gear blank herein shown and described is a modification of the blank shown in a copending application filed by me and wherein I claim the article shown and described but not claimed in my prior Patent 1,626,230 issued April 26, 1927.

In the present structure I may mold and press the blank so that rim, hub and web portions are of equal density and hardness in the manner set forth in such patent or I may form the blank so that the rim is of greater hardness than the web, which construction is most practicable since the rim is formed of independent segments, notched strips or rings and may be of different material or subjected to treatment best adapted to produce the desired degree of density.

It is clear that in regard to certain aspects of my invention, the hub may be formed of the same thickness as the web in which instance it would not be necessary to provide the smaller layers at the hub.

As a result of the foregoing it is evident that I have provided a most economical gear blank, which can be built up most expeditiously and without liability of warping when subject to heat and pressure during its process of manufacture. This is due in the main to the fact that the laminations or layers are free of any interleaved arrangement and all lie in parallel planes. So too, the present construction is best adaptable to providing a gear in which the cross section on any given plane will be symmetrical and the sections on all diametral planes will be the same.

My improved construction is much more economical in manufacture since the various layers are formed of full sized rings, disks, segments or notched strips which may be easily laid in the mold by simply piling them up to the desired thicknesses without the difficult interleaving operation which was heretofore considered necessary.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A laminated gear comprising a metallic hub provided with a circumferential groove, a plurality of layers of condensation product treated fabric having their inner edges contacting with said metallic hub, and a plurality of smaller layers of similar material disposed in stacks and overlying and underlying the first mentioned layers, certain of said smaller layers being of decreased internal diameter and projecting into the circumferential groove to form a bond with the metallic hub.

2. A laminated gear comprising a hub provided with grooves, a web formed of a layer of superposed fabric discs arranged about said hub member and having portions entering the grooves of the hub, a rim formed of a separate thicker layer of fabric sheets arranged around the peripheral edge of the web, and a stack of layers of fabric of small diameter overlying and underlying the web adjacent the hub and having portions entering grooves formed in the hub, said fabric being treated with a binder of a phenolic condensation product and the whole being consolidated and hardened into a solid integral mass.

3. A composite gear comprising a hub provided with grooves, a web formed of fibrous material extending outwardly of said hub and having portions entering certain of the grooves of the hub, and a stack of layers of fabric overlying and underlying the web adjacent the hub and having portions extending into at least one of the grooves to form a bond with the hub.

4. A composite gear comprising a hub provided with a groove, a web of fibrous material extending outwardly of the hub and a stack of fabric layers overlying the web adjacent the hub and having portions extending into and interlocking in the groove to form a bond with the hub.

5. A composite gear comprising a hub

provided with axial and circumferential grooves in its peripheral face, a web of fibrous material extending outwardly of the hub and having portions extending into said axial grooves to lock same with the hub in order to prevent relative rotation between the hub and web, said web also having portions extending into and interlocking in the circumferential grooves to form a bond with the hub whereby to prevent relative axial movements between hub and web.

In witness whereof, I have hereunto subscribed my name.

LOUIS T. FREDERICK.