F. H. JOHNSTON AND J. C. CHRISTENSEN.

PULLEY AND LIKE ELEMENT.

APPLICATION FILED OCT. 14, 1918.

1,331,156. Patented Feb. 17, 1920.

Fig. 1.

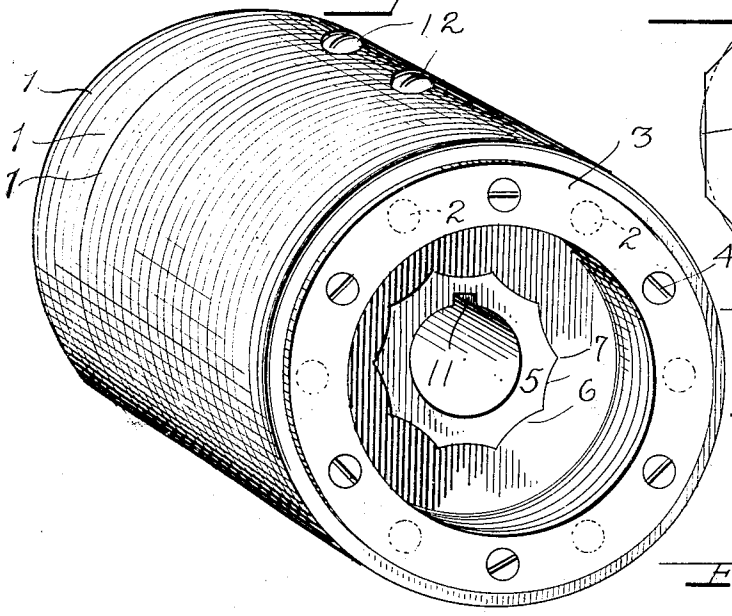


Fig. 5

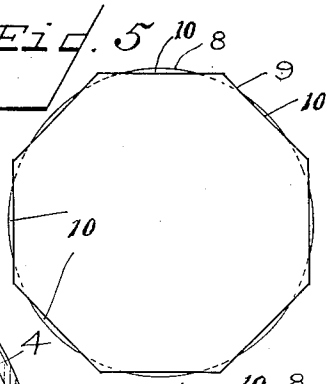


Fig. 6

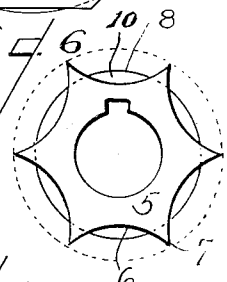


Fig. 3

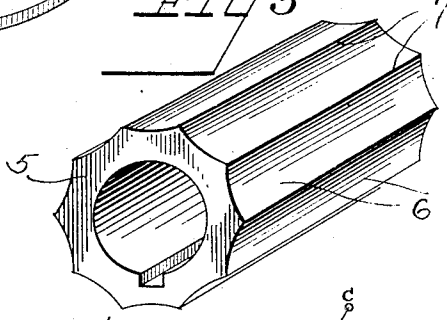


Fig. 2

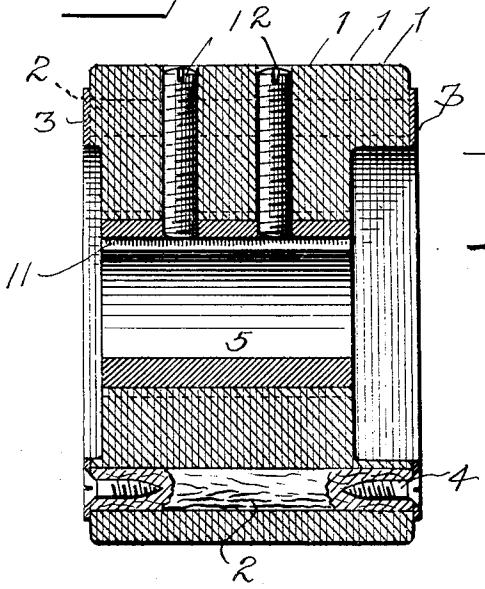
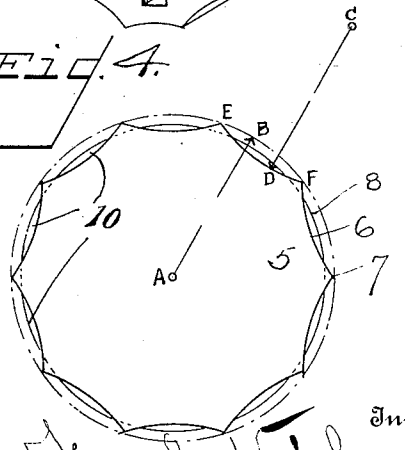


Fig. 4.



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PULLEY AND LIKE ELEMENT.

1,331,156. Specification of Letters Patent. Patented Feb. 17, 1920.

Application filed October 14, 1918. Serial No. 258,031.

To all whom it may concern:

Be it known that we, FRANK H. JOHNSTON and JAMES C. CHRISTENSEN, both citizens of the United States, residing at Indianapolis, in the county of Marion and State of Indiana, have invented certain new and useful Improvements in Pulleys and like Elements, of which the following is a specification.

Our invention relates to improvements in laminated pulleys, commonly known as "paper pulleys." friction disks and wheels, and more particularly to hubs or cores therefor and the means for providing driving engagement between the succession of laminæ and the hub or core.

The object of the invention is to simplify and improve the structure of such machine elements whereby they will not only be cheapened in construction, but will be more efficient in operation, positive in driving action, easily assembled, and unlikely to get out of repair.

A further object of the invention is to provide a new form of hub or core, having peripheral contact surface substantially equal to that of the usual form of cylindrical core of equivalent size, but so shaped and arranged as to afford increased driving engagement or resistance to torsional strains.

A further object of the invention is to provide a hub or core which will tend to reduce to minimum the bursting strain or expansion of the surrounding laminæ.

With the above primary, and other incidental objects in view as will more fully appear in the specification, the invention consists of the features of construction, the parts and combinations thereof and the mode of operation, or their equivalents, as hereinafter described and set forth in the claims.

Referring to the drawings, Figure 1 is a perspective view of an assembled pulley of the sleeve type, embodying the invention forming the subject matter hereof. Fig. 2 is a longitudinal sectional view thereof. Fig. 3 is a perspective view of the hub or core before being embodied in the pulley. Figs. 4 and 5 are diagrams indicating the relative shapes and proportions of the hub and laminæ. Fig. 6 is an end view, somewhat diagrammatic of a modification of the hub or core.

Like parts are indicated by similar characters of reference throughout the several views.

Laminated pulleys, known generally as paper pulleys, and friction disks, and wheels of like construction are in common use at the present time. The present invention relates to a hub or core therefor which affords increased driving engagement by a series of concave faces, which may be of any desired number or extent, and further obviates the bursting strain by affording sufficient space into which the material of the rim or sleeve may expand to compensate for the displacement of such material by the angles of said core.

In constructing the pulley as shown there are employed a plurality of annular laminæ 1—1—1 assembled side by side and cemented together or adhering one to another. Extending transversely through the laminæ are a series of dowels or pins 2—2 which may be of wood or metal. The laminæ 1—1 may be of paper, card or straw board, tarred board, leather, fiber, fabric or other suitable material according to the conditions of use to which it will be subjected and the availability of materials. These pulleys are usually constructed from alternating sections of straw board and tarred board, but may be wholly of either of these materials, or other material of the character mentioned. Likewise, it is to be understood that the hub hereafter described is not limited to such laminated construction, but may be employed in a molded or otherwise formed homogeneous body, or fiber, paper pulp, wood, or similar material.

In the construction shown in Fig. 1 annular end plates 3 of metal are provided which serve to protect the intermediate material, and to receive the hammer blows incident to driving the pulley onto and off of a shaft. These metallic end plates 3 are attached to alternate dowel pins 2 by screws 4.

The assembly of laminæ is bored out concentrically, the bore being cylindrical in form. Into this bore is pressed a hub or core 5, of equilateral polygonal shape, the faces of which are arcuate and indented as at 6. This affords at the juncture of adjacent arcuate faces longitudinal ridges or beads 7.

While the arcuate faces may be of any de-

sired number and of any proportionate radius in relation with the diameter of the hub, it has been found by experiment that, for ordinary conditions of use, indented arcuate faces the radius of which is equal to the maximum radius of the hub at one of the ribs or ridges 7 affords a serviceable and convenient form. This relation of the curvature of the faces to the size of the hub is best illustrated in the diagram Fig. 4 in which the radius A—B is equal to the radius C—D. The radial proportions mentioned afford an indented peripheral surface exactly equal to that of a cylinder having the maximum diameter A—B, indicated by the exterior dot and dash line in Fig. 4.

Throughout the drawings the hub or core has been shown as decagonal in cross section, ten sides having also been found by experiment and experience to be a serviceable and convenient number.

It is to be understood that a greater or less number of sides differing in radius from that of the hub may be used. In Fig. 6 there is shown a modification in which the hub is of hexagonal form the radius of the sides being much less than that of the hub, thus affording indented faces of greater depth. Such form of hub would be desirable in the event material of comparatively soft or yielding character is employed for the rim.

In fitting the rim or sleeve to receive the hub, the rim is bored to a size intermediate the maximum and minimum diameters of the hub as indicated at 8, Figs. 4, 5, and 6. The bore is thus of less radius than the maximum radius of the ridges or ribs 7, but greater than the medial points of the indentations 6. The ribs 7 bite into or embed themselves in the material of the rim or sleeve thus increasing the driving engagement. The displacement of material is compensated for by the indentations 6 into which the material is crowded, thus completely filling the indented faces and making a continuous peripheral contact with the hub. The frictional resistance is thus materially increased over that of a cylindrical surface.

In Fig. 5 there is shown a modification in which the polygonal hub is shown with flat faces as at 9. The bore of the rim or sleeve is shown at 8 as greater than the diameter across the "flats" but less than the diameter at the angles. The overlapping of the relative shapes of the hub and bore in this figure as well as in Figs. 4 and 6 affords a space 10 into which the material is crowded by the angles or ridges in their displacement of material, whether the faces be flat or indented.

In the drawings the bore of the hub has been shown splined or recessed at 11 to received a key by which it is fixed upon a shaft. There are also shown two set screws 12 extending through the laminated rim or sleeve and adapted to engage a shaft.

It is to be understood that the invention is not limited to pulleys of small size but may be applied to large wheels.

The solid hub or core may be made of any desired diameter. To save weight and material the core or filler may comprise a rim or flange having the polygonal indented exterior periphery, or the succession of flat faces as mentioned, which rim or flange may be connected to a central sleeve or hub by a series of arms or spokes similar to an ordinary covered pulley, except that the latter does not have the polygonal periphery. Such enlarged construction being obvious in view of the foregoing disclosure it is not necessary to be illustrated.

We are aware that polygonal hubs *per se*, *i. e.*, square hubs, are not new in this art, but as heretofore constructed, the bore or opening in the pulley body and the hub have been accurately proportioned and shaped to agree exactly one with the other, whereas in the present instance a polygonal hub is pressed into a round hole the periphery of which is overlapped by the angles of the hub. The form of hub above described has the additional advantage that the exterior of the hub or core requires little or no machine operations to adapt it for use.

From the above description, it will be apparent that there is thus provided a device of the character described, possessing the particular features of advantage before enumerated as desirable, but which obviously is susceptible of modification in its form, proportions, detail construction or arrangement of parts without departing from the principle involved or sacrificing any of its advantages.

While in order to comply with the statute, the invention has been described in language more or less specific as to certain structural features, it is to be understood that the invention is not limited to the specific details shown, but that the means and construction herein described comprise but one mode of putting the invention into effect, and the invention is therefore claimed in any of its possible forms or modifications within the legitimate and valid scope of the appended claims.

Having thus described our invention, we claim:

1. A bushing for machine elements comprising a rigid polygonal body having concave faces and a central bore, substantially as specified.

2. In an element of the character described, a main body and a rigid poylgonal bushing inclosed therein, the faces of which are concaved.

3. In an element of the character described, a main body of yielding material,

a rigid bushing inclosed therein, a series of longitudinal ribs upon said bushing and recesses intermediate the said ribs into which material forming said main body is forced to compensate for the material displaced by said ribs.

4. In an element of the character described, a main body of yielding material, and a bushing inclosed therein, said bushing having an undulating periphery, the yielding material of said body being expanded into the depressions of the undulating periphery by the compression of intermediate separate areas of material by the ridges of said undulating periphery.

5. The herein described method of providing bodies with bushings consisting in inserting within a main body of yielding material, having an opening therein, a polygonal bushing proportioned differently from said opening, the diameter of said opening of the main body being one intermediate the minimum and maximum diameters of the poylgonal insert.

6. A bushing for machine elements comprising a rigid polygonal sleeve, the exterior faces of which are arcuate to a radius substantially equal to a peripheral radius of the polygonal sleeve.

7. The herein described method of constructing machine elements by forcing into an opening in an inclosing body, a polygonal insert, the angles of which overhang the periphery of the opening, and beyond the faces of which the opening extends.

8. The herein described method of constructing machine elements including, inserting in an opening of a given shape in a main body an insert of different shape, the dimension of which in one direction is greater than the like dimension of the opening and the dimension of which in a different direction is less than the like dimension of the opening, whereby the material of the inclosing body will be displaced into conformity with the insert, substantially as specified.

9. The herein described method of providing bushings in bodies without subjecting the body to bursting strain, consisting in forming in the body an opening to receive the bushing, which opening is of less diameter than the maximum diameter of the bushing, forming said bushing with reduced portions intermediate the points of maximum diameter, said reduced portions being of less radius than that of the opening, and pressing said bushing within the opening, whereby the material of the body will be expanded into close engagement with the reduced portions of the bushing to compensate for the displacement of material by those points of the bushing of maximum diameter.

10. The herein described method of providing bushings in bodies consisting in forming an opening in the body to receive the bushing, so proportioning and positioning the bushing and opening in relation one with the other that the periphery of the bushing will extend beyond the opening at spaced intervals, and the opening will extend beyond the periphery of the bushing at intermediate points, and pressing the unregistered bushing into such opening whereby the material displaced by the overlapping portions of the bushing will be compensated for by the expansion of the material of the body at those points at which the opening initially extends beyond the periphery of the bushing.

In testimony whereof, we have hereunto set our hands this 17th day of August A. D. 1918.

FRANK H. JOHNSTON.
JAMES C. CHRISTENSEN.

Witnesses:
C. L. COEN,
S. A. CLINCHENS.