PATENT SPECIFICATION

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COMPLETE SPECIFICATION.

Means for Securing Bodies on Rotating Shafts.

I, GEORGE CONSTANTINESCO, British subject, of "Carmen Sylva", Beechwood Avenue, Oatlands Park, Weybridge, in the County of Surrey, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention consists in a method and means for securing wheels, dynamo armatures, rotors, cams, propellers, fans and the like, on rotating shafts by which an automatic tightening of the grip is secured with increased torque. It can be used to replace keys, splines, cone attachments and similar known methods of fixing shafts.

In my prior Specification 255,943 I have described the use of curved wedges as elements in means for converting reciprocating into unidirectional motion. The present method relates to the use of similarly formed wedges as means for fixing bodies on shafts.

The method consists in making the bore of the part, a rotor, for example, to be fixed on the shaft somewhat larger than the diameter of the shaft so as to leave a concentric cylindrical space all round between the shaft and the rotor. This cylindrical gap is then filled with thin superposed segments each made of two curved wedge-shaped elements which fit one over the other so that the thin end of one element lies adjacent to the thick end of the other, the resultant segment having a uniform total thickness equal to or very slightly under the available cylindrical gap between the shaft and the rotor. These circular wedge-shaped double segments are then inserted one adjacent to the other so as to fill completely the cylindrical space between the shaft and rotor.

The faces of contact between the rotor and the shaft with the segments are pickled in acid, roughed or provided with very fine serrations so as to increase the coefficient of friction, while the inner surfaces of gliding between the two elements of each segment are polished, tinned, or oiled, so as to reduce the coefficient of friction. The segments are made with such an initial curvature that when inserted the outer elements are tight on the rotor and the inner ones on the shaft.

It will be found that when an attempt is made to turn the rotor in one direction, the rotor will be comparatively free to rotate relatively to the shaft, while in the reverse direction it will lock itself very tightly. The more the rotor is forced in the locked direction, the more tightly it will grip. To unlock it, it is sufficient to reverse forcibly the relative rotation between the rotor and the shaft. The locking occurs on account of the tendency of the wedge-shaped elements to slide one over the other. In this movement a very high pressure is created radially between the rotor and the shaft which secures a perfect grip which increases when the torque increases and therefore makes slipping between the rotor and the shaft impossible. In order to make sure that the shaft and the rotor remain concentric after locking, two locating rings may be fitted in the cylindrical space on each side of the annular space filled by the locking segments.

The above arrangement is suitable for fixing pulleys, rotors, and any parts which are subjected to torque in one direction and only a relatively small torque in the opposite direction, for instance, fly-wheel on petrol engines, magneto drives, pulleys, couplings between two coaxial transmission shafts, etc.

If it is desired to transmit torque in both directions, two adjacent but independent sets of segments locking in opposite directions may be used. In such case, locking occurs in both directions, but it will be impossible to unlock unless adequate means are provided to that effect. A simple way is to use two independent rotors bolted together, each rotor locking in opposite directions. To unlock, it is sufficient to remove the bolts holding the two rotor parts together and then unlock each rotor part separately.

The angle of inclination of the locking wedges should be small; an angle of about 1/40, for example, is suitable. The thick-

[*Price* 1/-]

ness of the segments should be, say 1/20 or less of the diameter of the shaft, so that these may be made easily from flat sheets.

The preferable method of manufacture of the segments is to grind straight rectangular strips made from flat sheets so that their section becomes triangular with an angle of, say, 1/40. The strips are then curved with suitable tools until they take the circular form.

The strips can be made of steel or any other metal or material such as fibre, ebonite, or celluloid. If made of relatively soft materials, this method of fixing provides a ready means for acting as a safety device against overloading the shafts, as in case of overload the strips are crushed without damage to other parts.

In the accompanying drawings, which illustrate the invention, Figures 1 and 2 are respectively a longitudinal and a cross section of the form in which one pair of segments is used; Figures 3 and 4 are similar views showing two pairs of segments; Figure 5 shows a form in which two pairs of segments are used with the addition of keys. Figure 6 shows a duplex securing means adapted to jam for both directions of rotation.

Referring to Figures 1 and 2, 1 is a rotating shaft, 2 is a body which has to be fixed to it, called for convenience the rotor. A clearance is left between the shaft and the rotor, and this clearance is occupied by two concentric curved wedge shaped bodies 3, 4, fitting together so as to form a cylindrical shell of uniform thickness equal to or slightly less than the clearance, their thick ends being adjacent to one another as shown. The outer faces of these bodies are roughened or otherwise treated so as to increase the friction between them and the shaft or rotor, while their adjacent faces are smooth and may be treated with a lubricant so as to reduce the friction as far as possible. On either side of the wedges rings or collars 5 and 6 are shown, but their use is optional. They fit against the rotor and shaft filling up the clearance and acting as locating pieces to keep the shaft and rotor concentric. It is evident that when the shaft is rotated in the direction of the arrow, the torque on the rotor being in the opposite direction, the wedges tend to slide relatively to one another and thus to tighten the grip.

Figures 3 and 4 are views similar to Figures 1 and 2 of a form in which two pairs of wedge shaped pieces are shown, each pair extending half way round the shaft. The disposition and action will be obvious without further description. There may be any number of such pairs according to the size of the parts.

In Figure 3 the rings or collars 5 and 6 are formed on the shaft, but this arrangement is shown by way of illustration only, as the collars may be separate as in Figures 1 and 2.

Figure 5 shows an arrangement which affords absolute security against slip. In this form the thick ends of the wedges 3 and 4 abut against keys 7 and 8 which occupy keyways in the rotor and the shaft respectively.

Figure 6 shows in longitudinal section an arrangement in which two sets of wedges are used to lock the rotor against rotation relative to the shaft in both directions. Two oppositely directed sets of wedges of the form shown in Figures 1 and 2 are shown each set consisting of a single pair of wedges, though the number of pairs in each set is immaterial. The set composed of the wedges 31 and 41 grip when the shaft turns in the direction of the arrow, Figure 2, and the set 32 and 42 grip in the opposite direction. To enable the parts to be disassembled the rotor is preferably made in two parts 11 and 12 held together by bolts 13 as shown. When the bolts are withdrawn the parts of the rotor can be removed separately by forcing them round in the direction opposite to that in which the wedges tend to grip.

The above described methods of fixing rotors on shafts may be used in the case of split belt pulleys or other bodies, the parts of which are divided longitudinally of the shaft on which they are mounted, and held together by bolts in the usual way. The effect of the wedging strips is to restore automatically the grip between the shaft and the pulley should the holding bolts not be tightened sufficiently during the assembly of the two halves on the shaft. In the case of the duplex arrangement described with reference to Figure 6, it is of course unnecessary to divide the pulley transversely.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

1. Means for fixing a rotor or like body on a shaft, characterised by concentric curved wedges inserted in a clearance space between the rotor and the shaft so as to surround the latter, such wedges forming when assembled a cylindrical sleeve of uniform thickness, the friction between the wedges and the rotor and the shaft being greater than that between the wedges themselves so that the wedges tend to jam together under the influence of the driving torque, substantially as described.

2. Means for fixing a rotor or like body on a shaft as claimed in Claim 1, in which the clearance space between the shaft and the rotor is partly occupied by collars or rings which fit against both the shaft and the rotor and are adapted to abut against the ends of the cylindrical sleeve, substantially as described.

3. Means for fixing a rotor or like body on a shaft, as claimed in Claim 1, characterised in that the cylindrical sleeve consists of two or more curved wedges both or all of which surround the shaft, substantially as described.

4. Means for fixing a rotor or like body on a shaft as claimed in Claim 1, in which the curved wedges are retained in place by keys held in keyways in the rotor and the shaft respectively and abut against the thick edges of the wedges, substantially as described.

5. Means for fixing a rotor or like body on a shaft comprising two sets of fixing devices as claimed in any of the preceding claims, one set being adapted to jam for one direction of rotation and the other set to jam for the other direction, substantially as described.

6. Means for fixing a rotor or like body on a shaft, as claimed in Claim 5, in which the rotor is divided into two parts transversely of the shaft, the parts being bolted together, one part engaging with one set of fixing devices and the other part with the other set, substantially as described.

7. Means for fixing a rotor or like body on a shaft substantially as described with reference to the accompanying drawings.

Dated the 31st day of March, 1927.

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W.C. 2.

Fig. 1

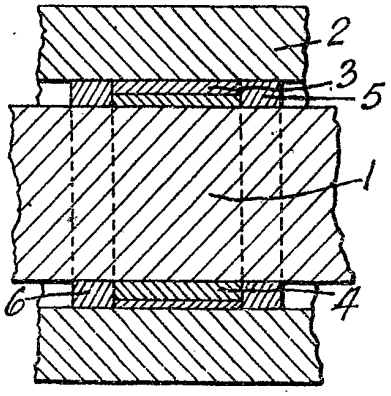


Fig. 2.

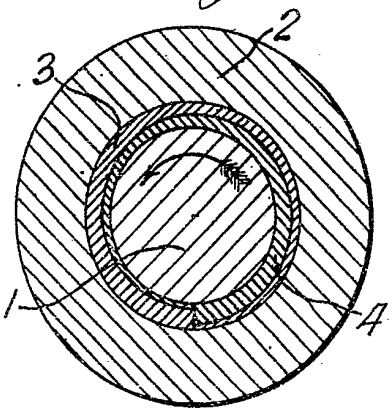


Fig. 3

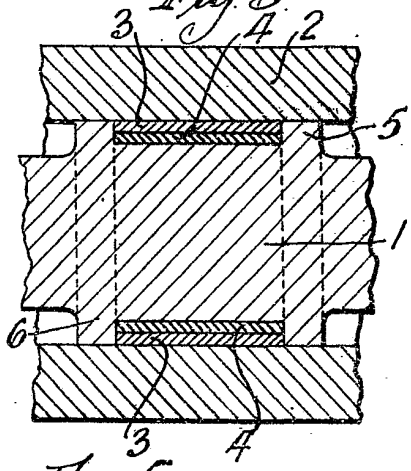


Fig. 4

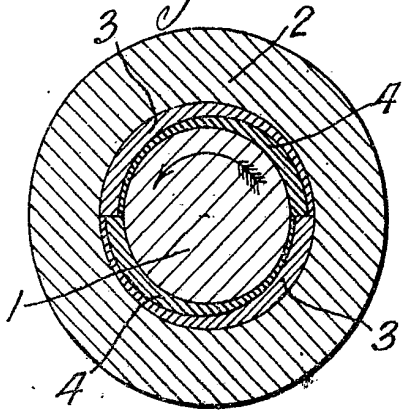


Fig 5

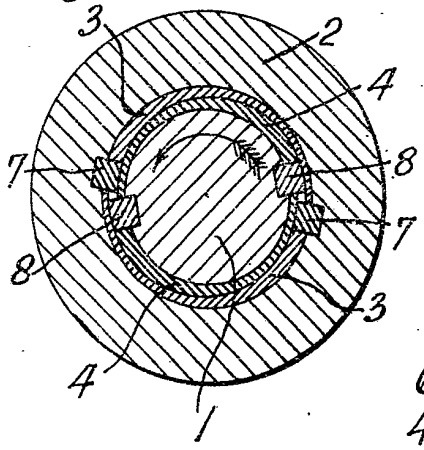
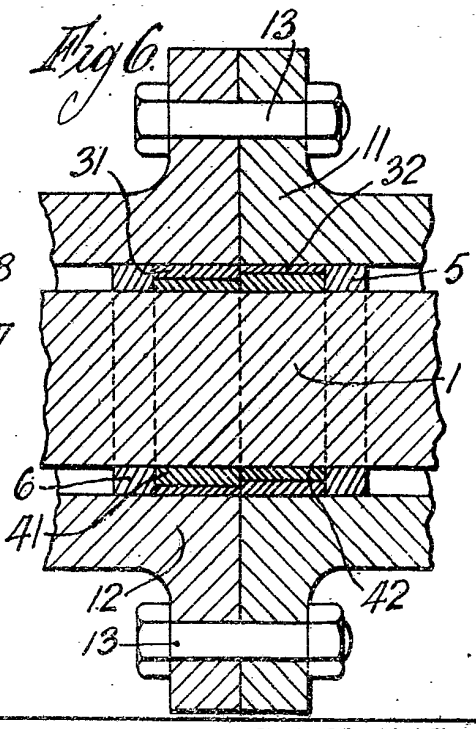


Fig 6.



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