

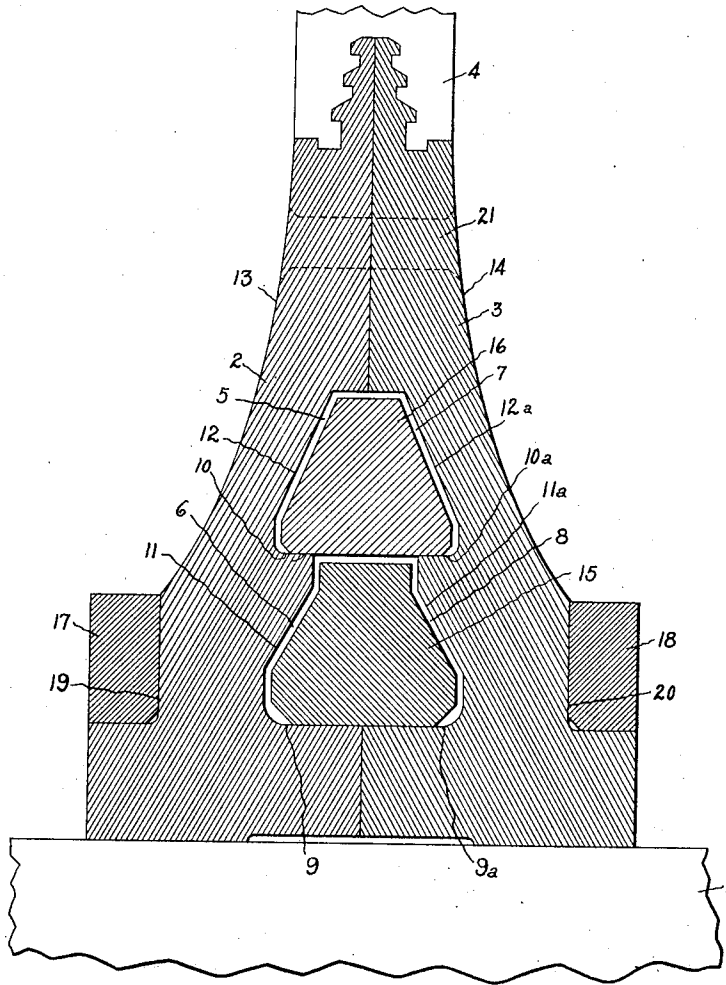
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E. L. ROBINSON

1,884,252

ROTARY DISK, TURBINE BUCKET WHEEL, OR THE LIKE

Filed May 19, 1931



Inventor:  
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## UNITED STATES PATENT OFFICE

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## ROTARY DISK, TURBINE BUCKET WHEEL, OR THE LIKE

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My invention relates to rotary disks or like articles, particularly bucket wheels, although it is not necessarily limited thereto.

Large machine members, such as rotary disks, are often preferably composed of two or more parts in view of the difficulty in manufacturing single, large integral units. In steam turbines, for instance, the bucket wheels which are rotary, disk-like members for carrying a series of blades at their periphery, often reach a considerable size. In order to satisfactorily heat-treat such disks it is advantageous to make them of two separate parts after which it is necessary to properly unite these parts.

The object of my invention consists in an improved construction for uniting such parts.

This is achieved according to my invention by the providing of annular or endless grooves in surfaces of these parts engaging each other and by the provision of a shrink ring or rings in said grooves for holding these parts together and at the same time to cause a more uniform distribution of stresses exerted throughout these parts.

For a better understanding of what I believe to be novel and my invention, attention is directed to the following description and claims in connection with the drawing appended thereto.

Referring to the drawing, in which I have illustrated in cross-section, by way of example, a part of a bucket wheel for an elastic fluid turbine embodying my invention, 1 designates a turbine shaft for carrying the bucket wheels. 2 and 3 are the two halves of one bucket wheel being fastened together by means which will be hereafter described and being secured to the shaft by any suitable means, such as keys, not shown in the drawing, and being adapted to carry blades 4 on its periphery.

According to my invention, as shown in the present instance, each of the two halves has a plane surface which engages the corresponding surface of the other half. Provided in part 2 are annular grooves 5 and 6 registering with corresponding grooves 7 and 8 of part 3 whereby the grooves of both halves define two concentric, annular chan-

nels. The inner sides 9, 10 and 9a, 10a of these grooves are concentrically arranged with the shaft of the turbine and the bottoms 11, 12 and 11a, 12a are inclined to the center of the bucket wheel and substantially parallel with the outer inclined, curved sides 13 and 14 of the wheel respectively. 15 and 16 represent shrink rings provided in these grooves engaging sides or seats 9, 10 and 9a, 10a respectively of the grooves and being adapted to hold the two halves together and to cause more uniform distribution of stresses throughout the bucket wheel, and furthermore to prevent undesirable concentration of stresses toward the bore of the wheel. It is understood that the rings and the grooves are formed the same. They may be circular, as in the present instance, or elliptical, or of any other desirable form. It is understood that the word "ring" has to be interpreted in its broader sense as an endless band or strip.

In assembling my bucket wheel I heat the two shrink rings which have an inner diameter a little less than the corresponding diameter of the inner surfaces 9, 9a and 10, 10a respectively and insert these rings in one of the parts, for instance, part 2 whereafter I properly place part 3 such that its plane side makes contact with the corresponding plane side of part 2. It will be readily understood that the contraction of the heated rings causes shrinking fit with the corresponding seats 9, 9a and 10, 10a for these rings. An important feature of my invention is that the shrink rings engage with their inner surfaces the inner seating surfaces of the two halves. With such an arrangement the shrink rings exert forces on the two halves which are directed towards the axis thereof. This is particularly important in the case of disks such as bucket wheels subject to high centrifugal forces during their operation. 17 and 18 are two other shrink rings provided in suitable recesses 19 and 20 of the outer walls of the two halves and being adapted to prevent undesirable stresses within the material of the bucket wheel. 21 represents a number of rivets which I may provide preferably near the periphery of the wheel in order to assure

equal expansion of the two halves of the wheel under stress when it comes to speed.

Having described my invention, together with the apparatus which I now consider to represent the best embodiment thereof, 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. Rotary member comprising two halves each having a plane side with concentric grooves therein and another side inclined to said first side, said halves being arranged such that said plane sides engage each other whereby said grooves register with each other and define concentric channels, and shrink rings provided within said channels and seated on the inner walls thereof for holding the two halves together and being adapted to cause uniform distribution of forces exerted on the rotary member and to prevent undesirable stresses within the rotary member.

2. Rotary member comprising two halves each having a plane side with a groove therein and another side inclined to said plane side, said grooves having bottoms which are substantially parallel to the corresponding inclined sides of said halves, said halves being arranged such that said plane sides engage each other whereby said grooves register with each other and define a channel, a shrink ring provided within said channel and seated on the inner surface thereof for holding the two halves together.

3. The combination with a rotary shaft of a disk comprising two halves having inner surfaces engaging each other and outer surfaces inclined to said inner surfaces, an annular groove provided in each of said inner surfaces registering said grooves with each other and defining a channel, each of said grooves having an inner side concentrically arranged with said shaft and a bottom substantially parallel to the corresponding inclined outer surface, a shrink ring located within said channel and having an inner surface engaging the inner sides of said grooves for holding said halves together and for causing uniform distribution of stresses throughout said disk, and a plurality of rivets extending through axial holes in the outer portions of the two halves for preventing unequal radial expansion of the two halves.

4. The combination with a rotary shaft of a disk comprising two halves having inner plane surfaces engaging each other and outer inclined surfaces with recesses therein, shrink rings provided in said outer recesses, annular grooves provided in each of said inner surfaces registering with each other and defining concentric, annular channels having bottoms substantially parallel to the corresponding outer inclined surfaces of said halves and inner seating surfaces concentric with said

shaft, and shrink rings engaging said seating surfaces for holding said halves together.

5. The combination with a turbine shaft of a bucket wheel comprising two halves engaging each other and having outer curved surfaces and annular grooves in each of said engaging surfaces registering with each other and defining concentric, annular channels, each of said channels having one inner side concentric with said shaft and bottoms substantially parallel to the corresponding curved outer surface of said halves, a shrink ring provided within each of said annular channels engaging said concentric surfaces for holding said halves together, recesses provided in said outer curved surfaces, shrink rings provided in said last named recesses for preventing undesirable stresses within said halves.

In witness whereof, I have hereunto set my hand.

ERNEST L. ROBINSON.

CERTIFICATE OF CORRECTION.

Patent No. 1,884,252.

October 25, 1932.

ERNEST L. ROBINSON.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 2, line 41, claim 3, strike out the words "said grooves" and insert the same before the word "registering" in same line and claim; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 29th day of November, A. D. 1932.

(Seal)

M. J. Moore,  
Acting Commissioner of Patents.