

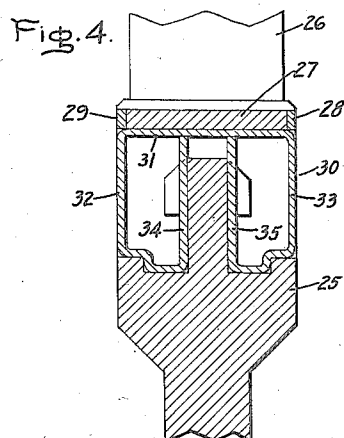
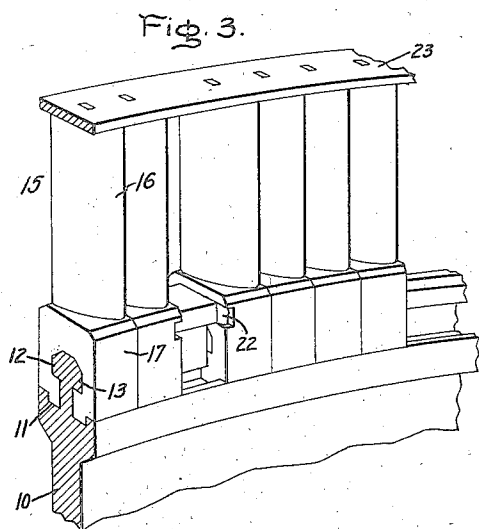
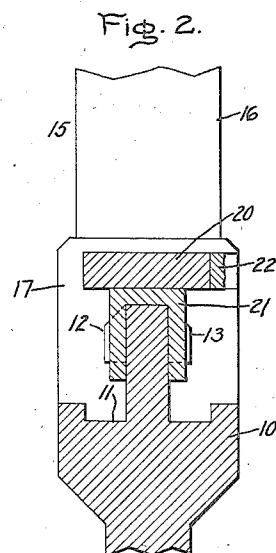
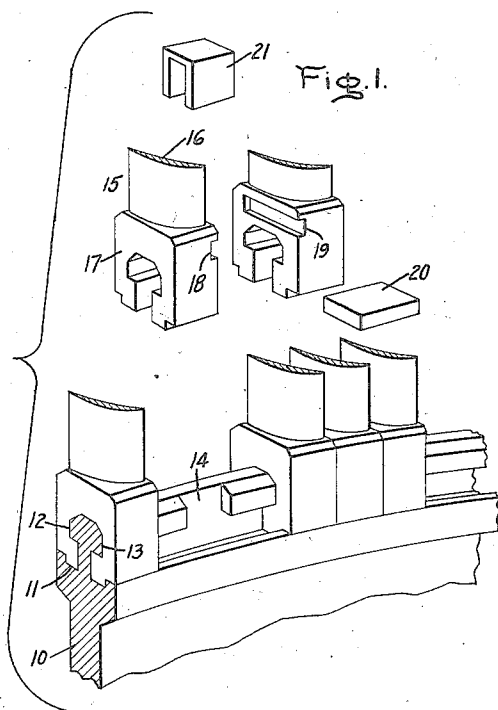
March 31, 1936.

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2,036,083

BUCKET WHEEL

Filed Dec. 24, 1934



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UNITED STATES PATENT OFFICE

2,036,083

BUCKET WHEEL

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Application December 24, 1934, Serial No. 758,972

3 Claims. (Cl. 253—77)

The present invention relates to bucket wheels such as are used in elastic fluid turbines for transforming thermodynamic energy of steam or like elastic fluid into mechanical energy. The invention relates more specifically to the kind of bucket wheels which comprise a disk element and a row or rows of buckets secured to the disk element by a dovetail connection between a base portion of each bucket and the rim of the wheel. In the usual arrangement of this kind, shoulder portions of the dovetail-forming rim portion are cut away defining a notch opening through which the buckets are inserted and slid along the rim during assembly. Difficulties are experienced in closing these notch openings by means of a notch opening bucket or a notch opening block in order to prevent relative movement of the buckets on the rim, and lock them in place and also in order to fill out the contour of the wheel. In modern high speed turbines where the buckets are subjected to considerable centrifugal forces, it is no longer desirable to insert in the notch opening a bucket because of the great centrifugal forces and, in many cases, it is not even desirable to put into the notch opening a heavy block or filler.

The object of the present invention is to provide an improved construction and arrangement of bucket wheels of the type above referred to whereby the buckets are rigidly secured to the rim of the disk and prevented from relative movement thereon.

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

In the drawing, Fig. 1 illustrates an exploded, perspective view of a bucket wheel portion embodying my invention; Fig. 2 is a sectional view through the notch opening of the bucket wheel shown in Fig. 1; Fig. 3 is a perspective view of the assembled bucket wheel; and Fig. 4 shows a sectional view through the notch opening portion of a bucket wheel in accordance with a modification of my invention.

The arrangement shown in Figs. 1 to 3 inclusive comprises a disk or disk member 10 having a grooved rim portion defining a dovetail 11. The dovetail of the rim forms shoulders 12 and 13 which are partly cut away to form a notch opening 14. Buckets 15 comprising blades 16 and base portions 17, which latter define inverted dovetails, are inserted through the notch

opening and slid to the left or right along the rim of the wheel.

In accordance with my invention I provide the adjacent surfaces of the two buckets disposed on opposite sides of the notch opening 14 with grooves 18 and 19. The grooves 18 and 19 run in axial direction of the disk member, that is, parallel to the axis of the disk, and therefore are termed axial grooves. These grooves are cut in a general direction perpendicular to the disk and are located in a radial direction somewhat beyond the rim of the disk. A pin block or plate 20 is inserted in the grooves 18 and 19 to prevent relative movement of the buckets. In order to prevent relative movement between the row of buckets as a unit and the disk, I provide a forked member 21 in the notch opening. The forked member or fork 21 has legs straddling the rim and filling the cutaway shoulder portions thereof. During assembly, the buckets with their bases are slid along the rim of the disk. After all of the buckets have thus been assembled on the disk, the fork 21 is inserted in the notch opening and thereafter the pin block or plate 20 is inserted in the grooves 18, 19 of the two buckets facing the notch opening. The pin block or plate 20 is secured in its position by fused metal such as silver solder 22 (Figs. 2 and 3). The outer ends of the bucket blades are held together in well known manner by a shroud band 23 (Fig. 3). With this arrangement the buckets are rigidly secured to the wheel. They are prevented from relative movement to each other as well as from moving as a unit with respect to the disk member. The elements for closing the notch opening are light weight, an important consideration in high speed turbines because they no longer constitute a danger during the operation of elastic fluid turbines due to the centrifugal forces to which these elements are subjected.

The modification shown in Fig. 4 comprises a disk or disk member 25 corresponding to the disk 10 of Fig. 1 and buckets 26 secured by a dovetail connection to the rim of the disk 25. The means for closing the notch opening comprise in this example a pin block or plate 27 inserted in adjacent grooves of the two buckets facing the notch opening. The arrangement of the pin block 27 in Fig. 4 is similar to that in Fig. 2 except that the pin block is fastened to the bucket bases on opposite sides of the disk by fused metal or welds 28 and 29, the grooves in the faces of the buckets adjacent to the notch opening extending the entire width of the bucket bases. Also in this case the pin block 27 is cut perpendicular to the disk

and located in a radial direction somewhat beyond the rim thereof. The row of buckets as a unit is prevented from relative movement with respect to the rim by a member 30 disposed in the notch opening. The member 30 is made of a strip of metal which is bent to conform to the contour of the rim and the adjacent bucket bases. More specifically, the member 30 comprises an upper wall 31 engaging the lower side of the pin block 27, the side walls 32 and 33 having outer surfaces forming smooth continuations of the outer surface of the rim, and the adjacent bucket bases, and legs 34 and 35 disposed within the notch opening to fill at least partly the cut away shoulder portions of the rim. The member 30 represents in substance a fork corresponding to the fork 21 in Figs. 1 to 3. As pointed out above, the member 30 prevents the row of buckets considered as a unit from moving on the rim of the disk and at the same time forms a smooth continuation of the rim of the disk and the bases of the adjacent buckets, thus giving the bucket wheel the same appearance as that of a massive block filling completely the notch opening.

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. A bucket wheel comprising a disk member having a rim and a row of buckets having bases secured to the rim by a dovetail connection therebetween, the rim having a notch opening

through which the bucket bases are inserted during assembly, a pin block disposed in adjacent axial grooves of the two bucket bases facing the notch opening to prevent relative movement of the buckets, and fused metal securing the pin block to said bases.

2. A bucket wheel comprising a disk member having a rim and a row of buckets having bases forming a dovetail connection with the rim, a portion of the rim being cut away to form a notch opening through which the buckets are inserted during assembly, and means for closing the notch opening to prevent relative movement between the disk member and the buckets, said means comprising a fork having legs disposed in the notch opening, and a pin block having opposite ends projecting into axial grooves of adjacent buckets facing the notch opening to prevent radial movement of the fork.

3. A bucket wheel comprising a disk member having a rim and a row of buckets having bases forming a dovetail connection with the rim, a portion of the rim being cut away to form a notch opening through which the buckets are inserted during assembly, and means for closing the notch opening to prevent relative movement between the disk member and the buckets, said means comprising a member of relatively light weight made from a strip of material bent to conform to the contour of a bucket base to fill the notch opening, and means including a block having opposite ends projecting into axial grooves of adjacent buckets facing the notch opening for retaining said member in position.

ERNEST L. ROBINSON.