

Jan. 7, 1930.

R. G. NELSON

1,742,484

METHOD OF MAKING V-PULLEYS AND THE LIKE

Filed Aug. 12, 1927

3 Sheets-Sheet 1

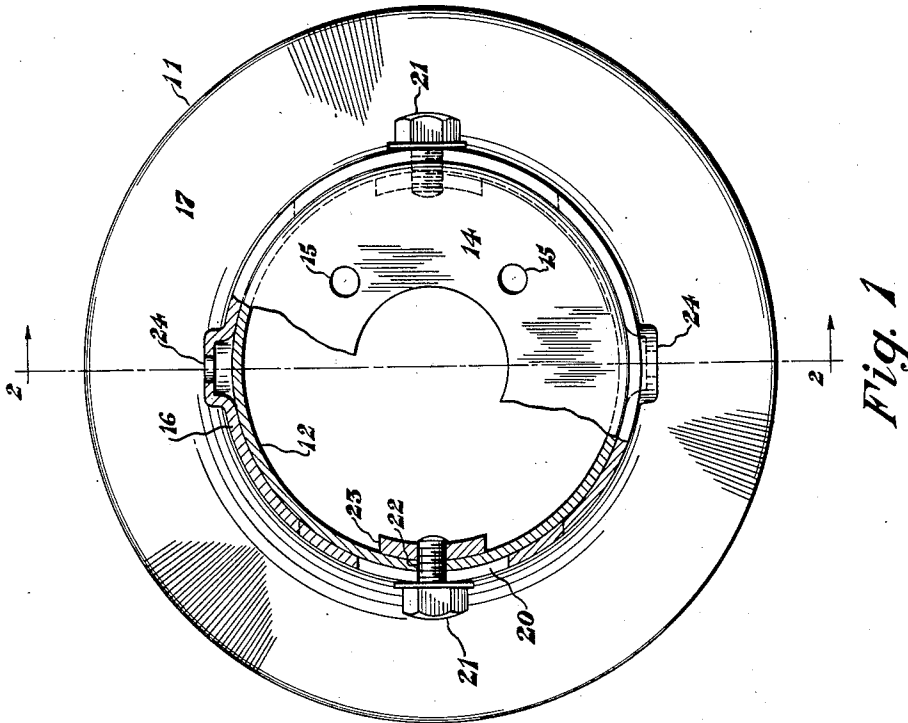


Fig. 1

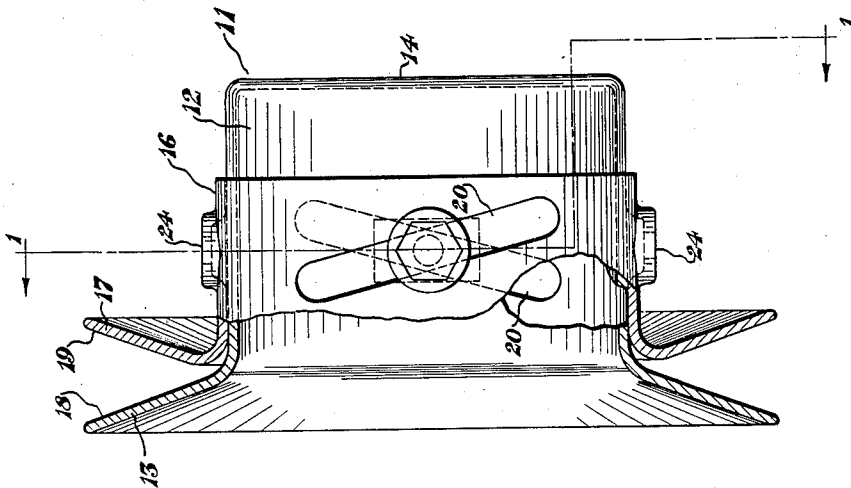


Fig. 2

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3 Sheets-Sheet 2

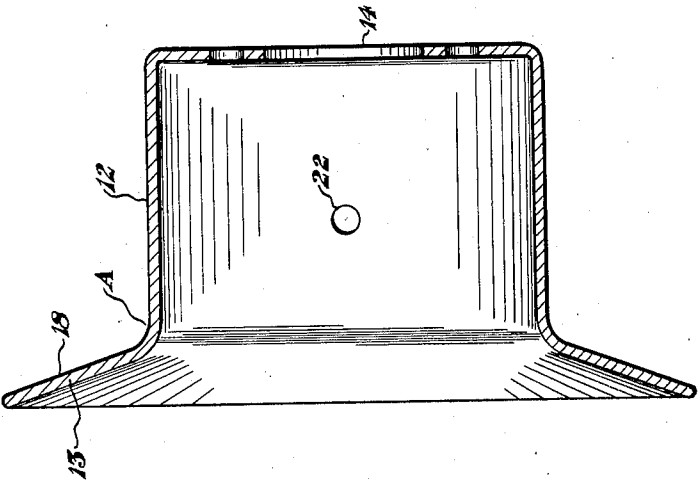


Fig. 5



Fig. 3

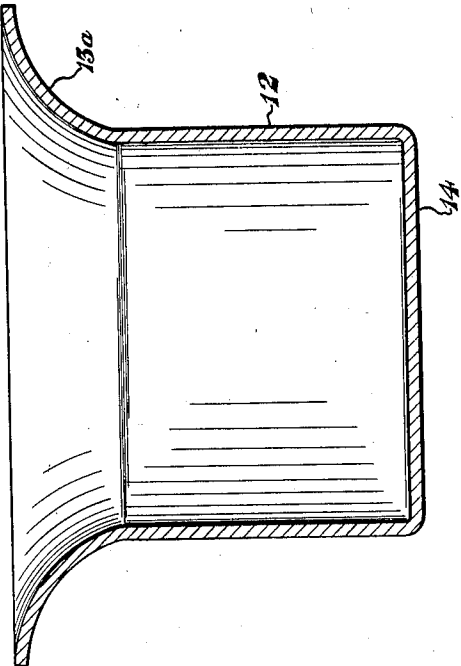


Fig. 4

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3 Sheets-Sheet 3

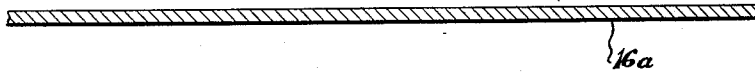


Fig. 6

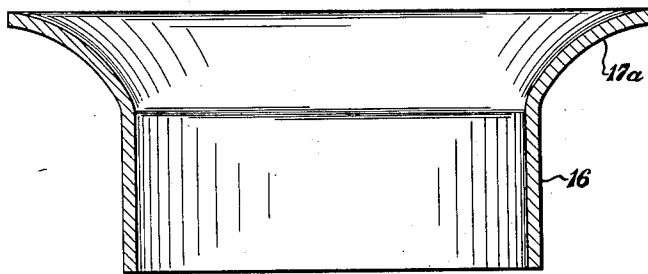


Fig. 7

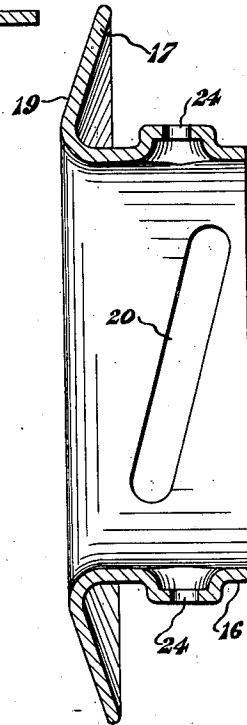


Fig. 8

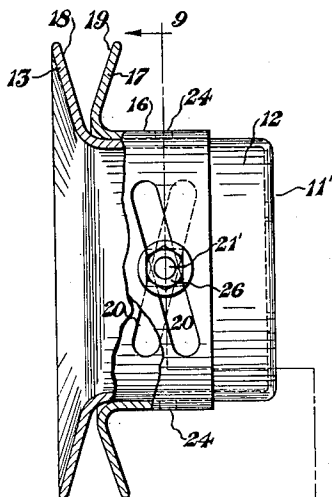


Fig. 10

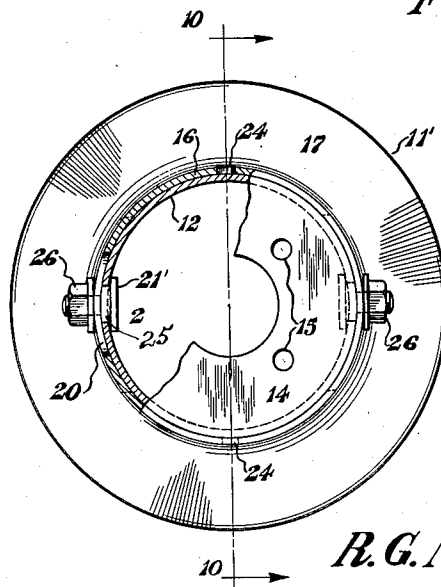


Fig. 9

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UNITED STATES PATENT OFFICE

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METHOD OF MAKING V PULLEYS AND THE LIKE

Application filed August 12, 1927. Serial No. 212,496.

My invention relates to methods of making an article of manufacture within relatively close limits of tolerance by a sequence of operations including roller spinning, and more particularly to methods of making an article of manufacture such as an adjustable V pulley including a tubular body and a peripheral flange extending outwardly therefrom at a definite angle.

Adjustable V pulleys may include an inner cylindric body having an outwardly extending peripheral flange at a suitable angle to the body to form one side of a V pulley groove, and a separate outer cylindric body seated upon the inner cylindric body and having an outwardly extending peripheral flange at a suitable angle to the body to form the other side of the V pulley groove, and the outer body being longitudinally adjustable upon the inner body in order to vary the distance between the flanges forming the V pulley groove.

Such V pulleys have heretofore been manufactured by integrally casting the inner cylindric body and its peripheral flange, and separately, the outer body and its flange, and by machining the pulley faces of the flanges, and threads in the inner and outer bodies for securing the longitudinal adjustment, as well as the bearings and other parts thereof.

Such a cast and machined adjustable V pulley requires a relatively great weight of material in order that the cast walls may be of proper thickness to resist the loads imposed, is relatively expensive to manufacture due to the necessity of machining the same, and is relatively difficult to balance.

In my U. S. Letters Patent No. 1,680,061, of August 7, 1928 for spun metal manufacture and products, I disclose an apparatus and method for spinning integral, non-adjustable, spun metal V groove pulleys from the heavier gauges, as 16 gauge and thicker and including quarter inch sheets or strips, not only of the soft metals such as brass, aluminum, and the like, but also of steel, the spun metal V groove pulleys being completely finished and substantially dynamically balanced.

The metal spinning apparatus and method

of my aforesaid patent is conveniently and immediately adaptable for the manufacture in relatively small quantities entirely by spinning operations from sheet or strip metal of adjustable V pulleys having the same external form and dimensions as those of the present invention, but for quantity production of the same it is preferable to use the improved method of manufacture hereinafter set forth and which includes in its sequence of operations a roller spinning operation which may be carried out by the use of the apparatus and method of my aforesaid prior patent.

On the other hand attempts have been made to stamp or press by means of reciprocating dies, the separate cylindric bodies and peripheral flanges for adjustable V pulleys, but it has been found practically impossible to form by reciprocating dies the flanges on the body with the necessary angle thereto, without buckling the sheet or strip metal in the flanges thus introducing undulations in the wearing surfaces of the pulley flanges, which undulations are undesirable and render necessary a subsequent machining or grinding operation to provide faces for such pressed pulley flanges which will grip a V belt therebetween with the necessary uniformity of pressure.

Moreover by reciprocating pressing operations, the wearing surfaces of the pulley flanges are not densified as is the case when the same are spun, and are not inherently dynamically balanced as the result of the pressing operation as is the case with a roller spinning operation.

It is furthermore difficult by a pressing operation to attain a uniformity of thickness throughout the cylindric body and flange.

Accordingly the objects of the present improvements include:

First, the provision of a method of making an article of manufacture such as an adjustable V pulley including inner and outer cylindric bodies slidable on each other and each provided with an outwardly extending peripheral flange at a fixed angle with its body, the flanges constituting an adjustable V groove for the pulley, and each cylindric

body being made up of longitudinally worked particles and each flange being made up of longitudinally and arcuately worked particles, with the consequent provision of densified and smooth wearing surfaces for the pulley groove, and

Second, the provision of a method of making adjustable V pulleys of the above description from disks of sheet or strip metal preferably steel of 16 gauge or thicker, and which shall be adapted for economical quantity production.

These and ancillary objects are attained by the present improved method of making an article of manufacture such as an adjustable V pulley, which method will be set forth in greater detail hereinafter, and which may be described in general terms as including first the step of finish forming a tubular body and semi-forming a flange from a blank disk by pressing or the like, and then the step of finish forming the flange by roller spinning.

Preferred embodiments of the finished products made according to the method of the present invention, and of the same during successive steps in their manufacture, are illustrated in the accompanying drawings forming part hereof, in which

Figure 1 is an end elevation of one embodiment of the improved adjustable V pulley, with portions broken away and illustrated in cross section as on line 1—1, Fig. 2;

Fig. 2, a side elevation thereof with portions broken away and illustrated in longitudinal axial cross section as on line 2—2, Fig. 1;

Figs. 3, 4 and 5, sectional views illustrating successive steps in the method of making the inner cylindric body and flange for the pulley;

Figs. 6, 7 and 8, sectional views illustrating successive steps in the method of making the outer cylindric body and flange for the pulley;

Fig. 9, a view similar to Fig. 1 of a modified embodiment of the improved pulley, with portions broken away and illustrated in cross section as on line 9—9, Fig. 10; and

Fig. 10, a side elevation thereof with portions broken away and illustrated in longitudinal axial cross section as on line 10—10, Fig. 9.

Similar numerals refer to similar parts throughout the drawings.

The improved adjustable V pulley indicated generally at 11 in Figs. 1 and 2 includes an inner cylindric body 12 provided at one end with an outwardly flaring peripheral flange 13 at a fixed angle with the cylindric body depending on the particular angulation of the V belt with which the pulley is intended to be operated.

The other end of the cylindric body 12 is preferably closed as by the circular end wall

14 provided with suitable apertures 15 therein by which the pulley may be secured to a suitable hub, not shown.

An outer cylindric body 16 is slidable on the inner cylindric body and is provided at its end adjacent the flanged end of the inner cylindric body 12, with an outwardly flaring peripheral flange 17 at an angle to the outer body 16 reverse to that of the angle of the flange 13 to the inner body 12.

The face 18 of the flange 13 opposes the face 19 of the flange 17, and the faces 18 and 19 form a V groove for the pulley in which a V belt is adapted to ride and turn or be turned by the pulley; and for providing adequate gripping pressure on the sides of the V belt, the distance between the opposed faces of the pulley groove is adjustable by longitudinally sliding the outer cylindric tubular body 16 upon the inner cylindric cup body 12.

The preferred means of securing the inner and outer cylindric bodies and their flanges at desired selective positions with respect to each other includes angled slots 20 in the outer cylindric body 16 through which screws 21 may extend and be screwed into suitable threaded apertures 22 in the inner cylindric body and reinforcing plates 23 therefor as may be desired, whereby by unscrewing the screws 21 and rotating the outer cylindric body upon the inner cylindric body, the angled slots 20 will vary the longitudinal distance between the opposed faces 18 and 19 of the V groove faces, and the desired distance between the faces may then be fixed and secured by tightening the screws.

For facilitating rotation of the outer cylindric body 16 by a spanner wrench or the like, suitable spanner wrench sockets 24 may be provided upon the outer cylindric body.

The modified adjustable V pulley 11' illustrated in Figs. 9 and 10 is identical with the embodiment 11 with the exceptions that the means for securing the outer cylindric body upon the inner cylindric body includes bolts 21', instead of screws 21, and each bolt 21' is preferably provided with a squared offset 25 in its head for fitting in a like shaped aperture in the inner cylindric body 12, and each bolt shank extends through one of the slots 20 in the outer cylindric body 16 and a nut 26 is screwed thereon for securing the cylindric bodies in any desired position with respect to each other.

Each of the aforesaid cylindric bodies and integral peripheral flanges have a substantially uniform thickness of material throughout the flange and the body, and each cylindric body is preferably made up of longitudinally worked particles, and each flange is preferably made up of longitudinally and arcuately worked particles and is provided with a densified and smooth wearing surface for the pulley groove.

This arrangement of the particles is at-

tained by subjecting a blank disk or the like of sheet or strip metal to a series of one or more stamping or pressing operations followed by a roller spinning finishing operation for the flange.

5 In Fig. 3, is illustrated a disk 12^a from which is made the inner body 12 and its flange by the improved method hereof.

Fig. 4 illustrates the finished inner body 12 and end wall 14 and the semi-finished flange 13^a, which have been formed from the disk 12^a by subjecting it to one or more pressing or drawing operations as between suitable reciprocating dies of a draw press.

15 By pressing operations it is possible to make the cylindric body 12 sufficiently accurate, but it is practically impossible to accurately form a finished flange thereon which shall have the desired smooth wearing surface and shall be balanced.

20 Accordingly by the pressing operations, the body 12 contains longitudinally worked particles and the semi-finished flange 13^a also contains longitudinally worked particles, and these longitudinally worked particles in the semifinished flange are next subject to arcuate working as by means of the roller spinning apparatus illustrated in my prior application, Serial No. 135,852.

30 This arcuate working is attained by applying the pressure of a rolling spinning tool upon the wearing face 18 of the flange 13 from its intersection with the cylindric body as at A, the other face of the flange being pressed by the spinning tool against a suitable arbor.

35 By these means the flange 13 may be accurately spun against the arbor with a fixed angular relation with the cylindric body, and the wearing face 18 is provided with a smooth densified surface.

In Fig. 6, a disk 16^a is illustrated from which is made the outer body 16 and its flange by the improved method hereof.

45 Fig. 7 illustrates the finished outer body 16 and the semi-finished flange 17^a, which have been formed from the disk 16^a by subjecting it to one or more pressing or drawing and punching operations as between suitable reciprocating dies of a draw press.

50 As the result of the pressing operations, the body 16 contains longitudinally worked particles and the semi-finished flange 17^a also contains longitudinally worked particles, and these longitudinally worked particles in the semi-finished flange are next subject to arcuate working as by means of apparatus as aforesaid, by the pressure of a rolling spinning tool and a suitable angle fixing arbor.

60 The foregoing construction and arrangement provides adjustable V pulleys having a minimum weight of material therein, having a high finish, adaptable for manufacture within relative close limits of tolerance in

quantity production, and substantially statically and dynamically balanced, and these advantages in the product are attained by the improved method of manufacture as hereinbefore set forth.

The product, an adjustable V pulley disclosed, described, but not claimed herein has been made the subject matter of my divisional application filed June 20, 1928, Serial No. 286,979, entitled Spun metal manufacture and products.

I claim:

1. The method of making an article of manufacture such as an adjustable V pulley including a tubular body and an outwardly extending peripheral flange, which includes finish forming the tubular body and semi-forming the flange to one shape from sheet or strip metal and the like by longitudinally working the material as between reciprocating dies, and finish forming the flange to another shape by arcuately working by roller spinning the longitudinally worked material therein.

2. The method of making an article of manufacture such as an adjustable V pulley including a tubular body and an outwardly extending peripheral flange, which includes finish forming the tubular body and semi-forming the flange to one shape from sheet or strip material and the like by pressing the material between dies, and finish forming the flange to another shape by roller spinning the flange against an arbor.

In testimony that I claim the above, I have hereunto subscribed my name.

REYNOLD G. NELSON.