

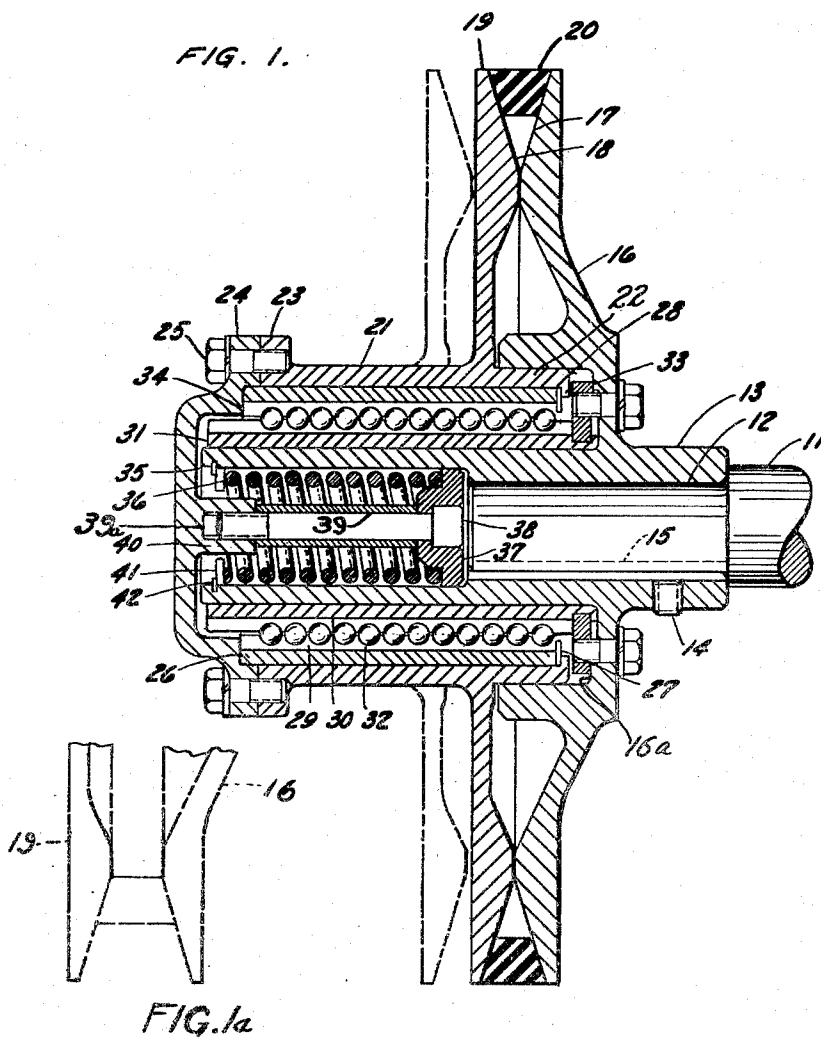
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W. F. HUCK
EXPANSIBLE PULLEYS

2,812,666

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4 Sheets-Sheet 1



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FIG. 2.

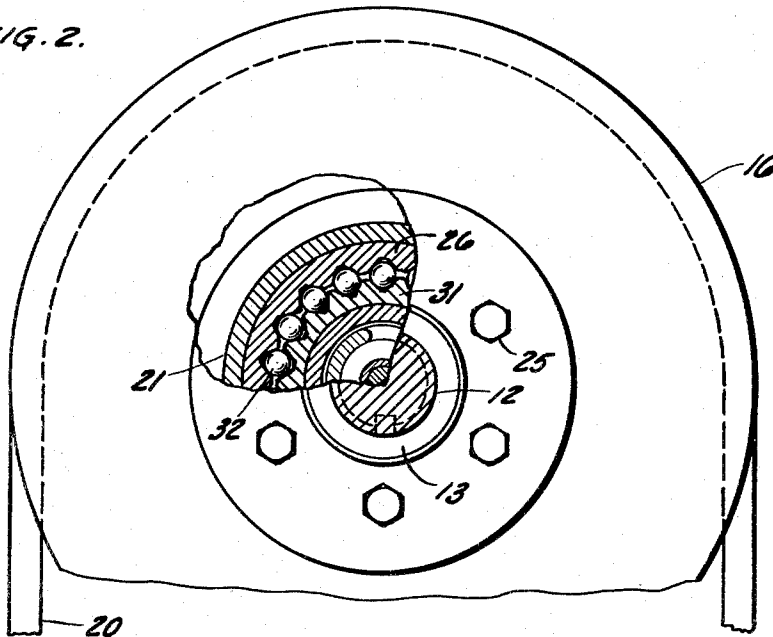
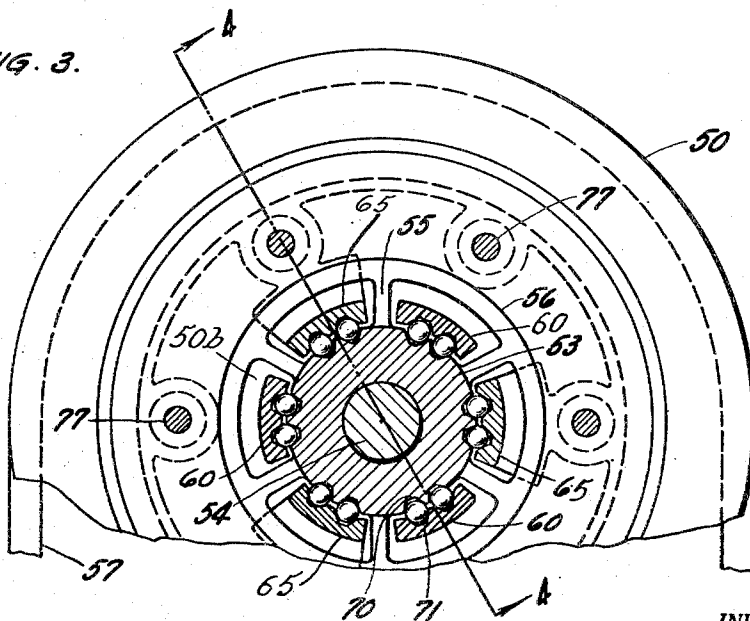


FIG. 3.



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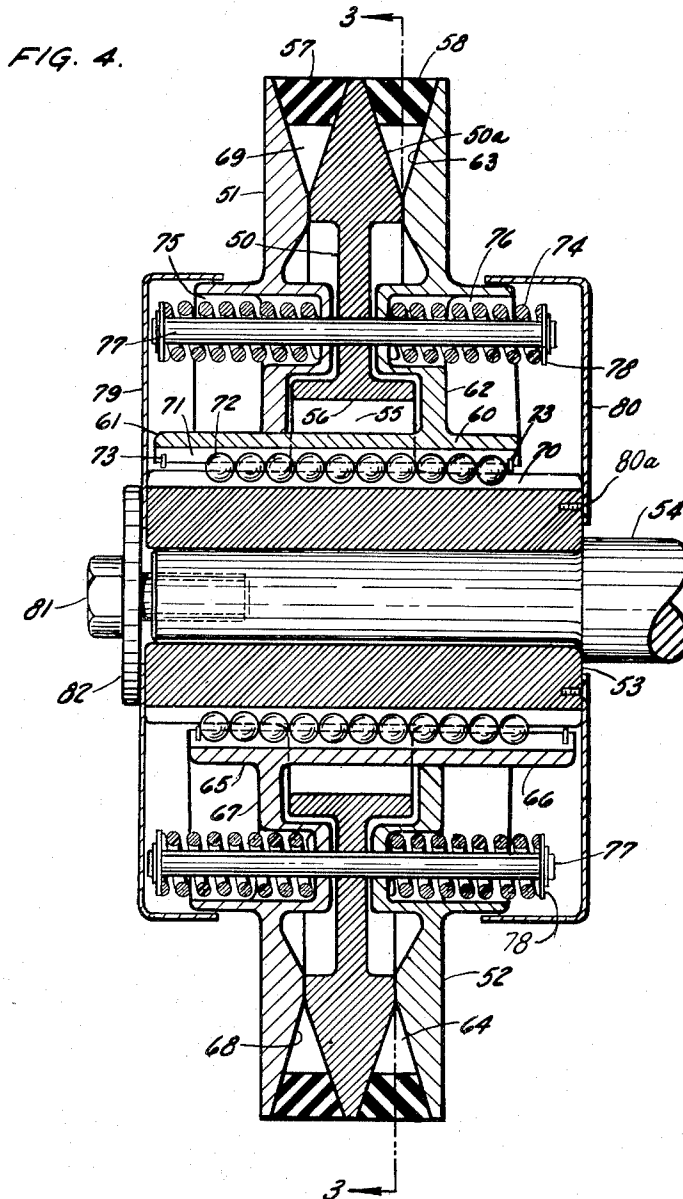
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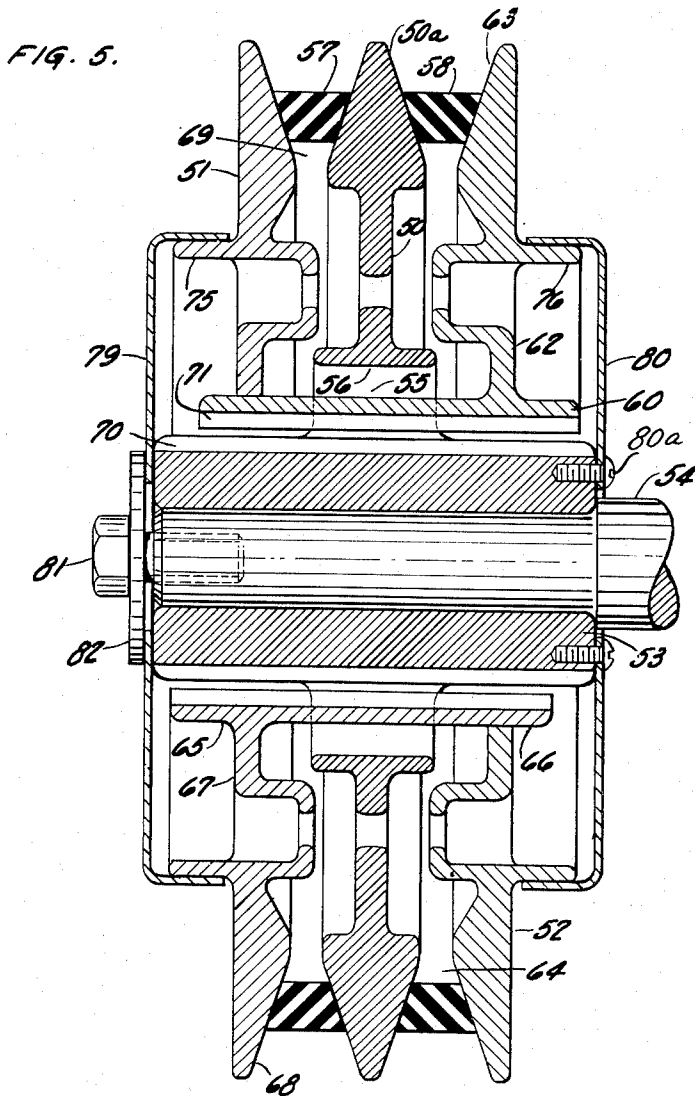
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4 Sheets-Sheet 4



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EXPANSIBLE PULLEYS

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3 Claims. (Cl. 74-230.17)

This invention relates to variable speed pulleys, having for its principal object the provision of an improved V-belt pulley responsive to variations in belt tension with a minimum of friction.

Another object is to provide an adjustable V-belt driving pulley adapted for automatic adjustment to different pitch diameters.

Another object is to provide an adjustable V-belt expansible pulley adapted for drives requiring accurate and delicate response to tension.

Another object is the provision of a variable diameter V-belt pulley responsive to slight changes in belt tension, and wherein rolling friction of parts is substituted for the customary sliding friction of contacting parts.

A further object is the provision of an expansible pulley wherein the exposed parts are accurately maintained in slidable alignment with minimum lengths in the guiding members with a view to the conserving of space.

An additional object is to provide an adjustable pulley assembly wherein the opposed members are axially movable with a minimum of friction in order to assure a highly responsive follow-up and automatic adjustment action even under considerable spring tension.

Other objects and advantages of the design and construction will appear hereinafter and will be best understood when taken in connection with the accompanying drawings wherein:

Figure 1 is a cross-sectional view of a variable speed pulley embodying a preferred form of the invention;

Figure 1a is a fragmentary view, showing in dotted lines the position of the pulley-accommodating parts when the axially-movable component shifts for the effective reduction of the diameter of the pulley;

Figure 2 is a fragmentary end elevational view, partly in section, as viewed from the right hand side of Figure 1, with parts broken away for clarity of illustration, and showing the bearing means for reducing friction of the relatively movable parts;

Figure 3 is a fragmentary, transverse sectional view, taken on line 3-3 of Figure 4, and showing a modified form of the invention;

Figure 4 is a transverse sectional view of the modified form of the invention, taken on the line and as viewed in the direction of the arrows 4-4 of Figure 3; and

Figure 5 is a view similar to Figure 4, with certain parts removed for clarity of illustration, and showing the position of the two outer movable components when shifted axially under a variation of operating tension.

For the transmission of power, the conveyance of material, and in the winding and reeling arts, it is frequently of advantage to have means interposed between the driving and the driven components in order to vary the speed or tension of the associated web or belt in accordance with predetermined values or considerations. In the printing and paper manufacturing industries, for example, it is often essential to provide self-adjusting means that are responsive to variations of belt or web tension. It will be readily understood that if the tension of a running

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web of paper exceeds a certain value, the web will break and/or tear with a consequent appreciable loss of time for replacement and substitution.

It is a feature of this invention to provide an improved pulley assembly assuring a delicate and responsive follow-up to variations of tension, thus obviating the time-consuming and comparatively expensive delays so often encountered in the newspaper and magazine printing industries when the paper web breaks. In accordance, therefore, with the invention, increased operating tension of the running web will cause the V-belt to run at a smaller pitch diameter; and lessened web tension will increase the pitch diameter of the pulley, thus automatically maintaining a substantially constant tension of the web under all normal operating conditions.

Referring now to the drawings, 11 designates a shaft rotatably supported by means (not shown) and having a reduced portion 12 on which a hub or sleeve 13 is concentrically mounted and secured against rotation, as by a set screw 14. Circumferential or torsional slippage of the hub 13 relatively to the shaft 11 is further prevented by a key 15 arranged between the said hub and shaft. The hub 13 has an annular recess or pocket 16a and an outwardly-directed, integral radial extension 16 formed with an inclined or sloping surface, as at 17, that in conjunction with a similarly inclined surface 18 on a second and coaxing disc 19, is adapted to provide a V-shaped space for the operative accommodation of an encircling, similarly-configured V-belt 20.

The second disc 19 is formed as an integral, radially-extending portion of a hub or sleeve 21 having an outwardly-extending tubular extension 22 at its right-hand side, and an enlarged left-hand end portion or flange 23. The flange 23 is provided with a series of holes that register with similar holes in a cover member 24. These registering holes accommodate screw bolts 25 serving to detachably retain the said cover member 24 to the pulley assembly. The cover 24 clampingly retains a sleeve 26 against a washer 27 which is confined between an adjacent end of the said sleeve and an inwardly-directed annular flange 28 at the right-hand end of the hub extension 22.

The sleeve 26 has a series of longitudinally or axially-extending grooves 29 arranged in spaced relation about the inner circumference of the said sleeve 26. The grooves 29 register with a series of similarly spaced grooves 30 arranged on the outer periphery of an inner sleeve 31. The opposed grooves 29 and 30 freely accommodate bearing balls 32 therebetween, so that the hub 21 with its integral disc 19 is smoothly supported for axial movement while secured against angular or rotational movement relatively to the inner hub 13, the latter, in turn, being held against rotation relatively to the shaft 11 by means of the key 15, as mentioned above.

The inner sleeve 31 is retained to the hub 13 by a clamping ring 33, and the sleeve 26 is held to the hub 21 of the axially-movable disc 19 and against the washer 27 by the cover 24 whose shoulder 34 is in engagement with the left-hand end portion of the said sleeve 26. The shoulder 34 and the washer 27 are sufficiently large to retain the bearing balls 32 within the opposed grooves 29 and 30.

The left-hand portion of the hub 13 has a pocket 35 which is open at the left and extends to the end of the reduced portion 12 of the shaft 11. The pocket 35 accommodates a spring 36 that presses against a shouldered washer 37. The shouldered washer 37 is counterbored to provide a recess accommodating the head of a bolt 38 whose shank is received in a spacer tube 39 encircled by the spring 36. The left-hand end of the bolt 38 is threadedly secured in the pocket 39a of an inwardly-directed tubular projection 40 of the cover 24.

The left-hand end of the spring 36 abuts a washer 41

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in turn engaged against a holding snap ring 42 fast in the inner periphery of the pocket 35 at the left-hand outer end thereof. The spring 36, it will be observed, is compressingly confined in the pocket 35 and therefore effective to maintain its urge against any axial movement of the disc 19 via the hub 21, cap 24, bolt 38 and washer 37.

The normal position of the components is shown in full lines in Figure 1, and relative movement of the left-hand disc 19 under an assumed increase of tension from the V-belt 20, is shown in dotted lines, such relative movement being yieldingly resisted by the compression spring 36. The pocket 16a of the right-hand disc 16, it is to be understood, slidably accommodates the right-hand extension 22 of the hub 21 of the left-hand disc 19. This arrangement serves to seal the ball-bearings and their grooves against dust and foreign matter that might interfere with the free rolling action of the said ball-bearings.

The showing of Figures 3, 4 and 5

In the modified form of the invention shown in Figures 3, 4 and 5, an adjustable pulley assembly is depicted that is particularly designed and adapted to transmit power in those cases where two V-belts are required or preferred. This form of the invention employs a fixed centre disc 50 and a pair of associated discs 51, 52 arranged on opposite sides of and axially movable towards and away from the said centre disc 50.

The modified form of pulley assembly further includes a hub 53 mounted on a shaft 54, the hub 53 having a plurality of radially-extending ribs or arms, as at 55 (Fig. 3) integrally joined to an annular portion or ring 56 with which is formed the radially-extending, centrally positioned disc 50 mentioned above and having an enlarged wedge-like outer portion 50a whose tapering opposed sides are normally engageable by the tapered surfaces of a pair of V-belts 57, 58. The centrally-positioned disc 50, as indicated above, is axially fixed in its central position.

The radially-extending ribs or arms 55, six in number, of the above-mentioned hub 53 of the fixed centre disc 50, as best shown in Figure 3, provide spaces therebetween, as at 50b, these spaces being adapted to slidably accommodate adjacent, alternate, spaced segments of the hubs of the movable discs 51, 52, as hereinafter described.

The disc 52 at the right-hand side of the centre disc 50 has a hub concentric with the hub 53 and composed of three spaced segments, each segment having right-hand and left-hand sections 60, 61 integrally formed therewith. The right-hand section 60 is extended radially outward to form a tapering portion, as at 63, whose sloping or bevelled surface coacts with the opposed sloping and adjacent surface of the centre disc 50 to provide a V-shaped space 64 for the reception of the V-belt 58. The segments of the hub of the right-hand disc 52, as mentioned above, are slidably accommodated in the spaces 50b between the arms 55 of the hub 53.

In a similar fashion, the axially movable disc 51 at the left-hand side of the centre disc 50 has a hub concentric with hub 53 and composed of three spaced segments, each segment having right-hand and left-hand sections 66, 65 integral therewith, the hub portion 65 extending radially outward, as at 67, to form an enlarged end portion 68. The portion 68 has a sloping surface, similar to the portion 63, and is adapted to coact with the adjacent opposed surface of the central disc 50 to provide another V-shaped recess 69 for the reception of the V-belt 57. By inspection and comparison of Figures 3, 4 and 5, it will now be understood that adjacent portions of the hub segments of the right-hand disc 52 are slidably accommodated in alternate spaces 50b between the arms 55 extending from the hub 53 of the centre disc 50. Correspondingly, adjacent portions of the hub segments of the left-hand disc 51 are slidably accommodated in the other alternate spaces between the arms 55 of the hub 53.

The hub 53 of the central disc 50 is provided with axially-extending and circumferentially disposed grooves

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or runways 70 that register with similar grooves 71 on the hub portions 60 and 66 of the movable discs 51, 52. The grooves 70, 71 accommodate bearing balls 72 that serve to maintain the two outer discs; i. e., 51, 52 against circumferential movement while permitting them to move in an axial direction and relatively to the fixed central disc 50. The bearing balls 72 are retained in their respective grooves by snap rings 73.

The two outer opposed and axially movable discs 51, 52 are urged inwardly towards the central disc 50 by a plurality of pairs of opposed springs 74 seated in correspondingly opposed pairs of horizontally-aligned pockets, as at 75, 76 provided in the discs 51, 52 respectively. The springs 74 are mounted on and maintained in alignment by pins, as at 77. As best shown in Figure 4, the springs 74 are confined between the innermost portions of their respective pockets and the washers 78 on the outer ends of the pins 77.

Centrally-apertured and removable dust covers 79, 80 are arranged on opposite sides of the assembly composing the modified form of the invention illustrated in Figures 3, 4 and 5. The cover 79 is removably held against the left-hand end of the hub 53 by a screw 81 and washer 82, the screw 81 being threaded into the adjacent reduced end of the shaft 54. The cover 80 is removably held against the right-hand side of the hub 53 by screws 80a. Removal of the said covers, when desired or necessary, permits examination, lubrication and/or adjustment of the components thereunder.

The function and mode of operation of the modified form of the invention is somewhat similar to that of the first form of the invention, but may be summarized as follows:

Assuming the pair of V-belts 57, 58 are transmitting power from a source of mechanical energy (not shown) and are located in substantially the position indicated in Figure 4, it will be apparent that an increase in operating tension by virtue, for example, of an additional load momentarily assumed by shaft 54, will result in the V-belts 57, 58 moving further into the space between the fixed central disc 50 and the axially movable discs 51, 52, thereby decreasing the speed of rotation of shaft 54 and consequently the effective torque required of it. The movement of the discs 51 and 52 away from each other will carry their associated parts into the position shown, by way of example, in Figure 5. This axial movement of discs 51, 52 is facilitated by the anti-friction properties of the roller bearings 72 so that a delicate and responsive action to changes of operating tension is attained.

It is to be understood that the invention may be embodied in other specific forms without departing from the spirit or essential attributes thereof, and it is therefore desired that the present embodiments be considered in all respects as illustrative and not restrictive, reference being had to the appended claims rather than to the foregoing description to indicate the scope of the invention.

What I claim is:

1. In an expansible pulley of the kind described, a hub, a radially-projecting circular extension connected to said hub, a plurality of grooves disposed in spaced relation on the circumference of the hub and extending in an axial direction therealong, a pair of members arranged in opposed relation and between which said circular extension is interposed, each of said pair of members having a plurality of spaced segments symmetrically disposed about the circumference of the hub, said plurality of segments having longitudinally extending grooves arranged in opposed relation to the grooves of the hub, bearing balls slidably mounted in the grooves of the hub and in the grooves of the plurality of segments, a plurality of springs engaging one of the said pair of members, a second plurality of springs engaging the other of the pair of members, and means mechanically connecting in coacting

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pairs the first-mentioned and second mentioned plurality of springs.

2. In a device of the kind described, in combination, a shaft, a pulley arranged on the shaft, said pulley comprising a hub fixed to the shaft, a plurality of arms projecting radially from the hub, said arms having spaces therebetween, an annular member connected to the arms and having a radially-projecting circular extension, ball-bearing means arranged on the hub, a pair of disc-like members arranged on opposite sides of said circular extension, each of said disc-like members having a hub concentric with the first-mentioned hub and composed of spaced segments slidably supported on the ball-bearing means, said segments being movable in the spaces between the plurality of arms, a coil spring engaged with one of the pair of disc-like members, a second spring engaged with the other of the pair of disc-like members, and means operably associating the said coil springs in axially-aligned relation.

3. In a device of the kind described, in combination, a shaft, a pulley arranged on the shaft, said pulley comprising a hub fixed to the shaft, a plurality of arms projecting radially from the hub, said arms having spaces therebetween, an annular member connected to the arms and having a radially-projecting circular extension, a disc-like member having a hub concentric with the first-mentioned hub and composed of spaced segments, said segments being movable in the spaces between the plu-

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ality of arms, a second disc-like member having a hub concentric with the first-mentioned hub and composed of spaced segments, said last-mentioned segments being interspersed between the segments of the first-mentioned disc-like member and also movable in the spaces between the said plurality of arms, said first-mentioned disc-like member and said second disc-like member being arranged in opposed relation and on opposite sides of the circular extension; and a plurality of pairs of coacting opposed springs engaging the pair of members and urging them axially towards the circular extension.

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