June 11, 1935. C. E. WYRICK 2,004,263

COMPENSATOR

Filed April 18, 1934

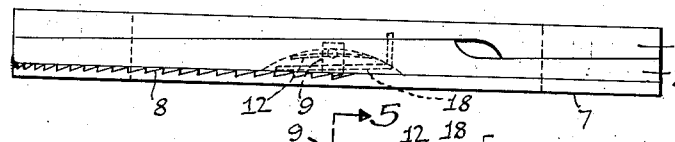

Fig. 2.

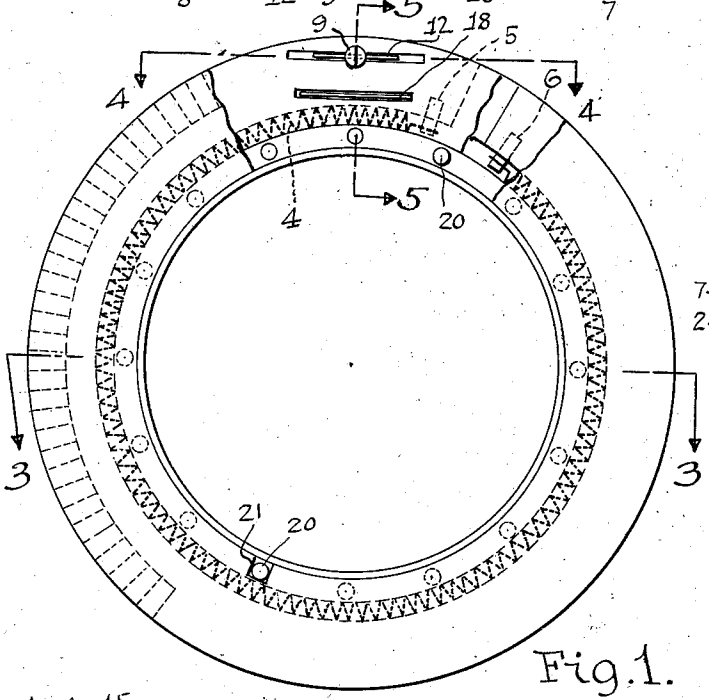

Fig. 1.

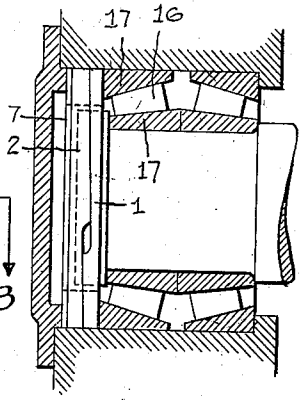

Fig. 6.

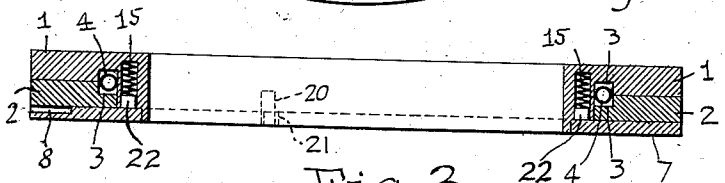

Fig. 3.

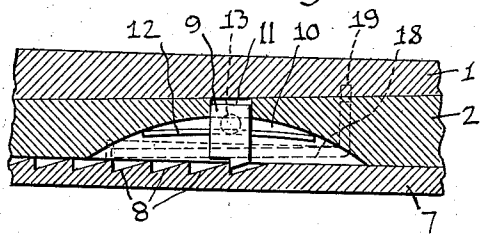

Fig. 4.

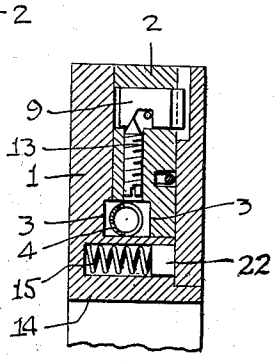

Fig. 5.

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Patented June 11, 1935 2,004,263

UNITED STATES PATENT OFFICE

2,004,263

COMPENSATOR

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Application April 18, 1934, Serial No. 721,238

12 Claims. (Cl. 85—50)

This invention relates to compensators for wear and lost motion and particularly to devices for automatically regulating clearance between relatively moving parts.

A further object is to provide a compensator which will establish and maintain predetermined limits of clearance of play between two relatively moving parts.

In carrying my invention into effect I provide two side by side cam members and a control member with one cam member relatively movable with respect to the other and with respect to the control member. It is an object to employ the two cam members to serve the space filling requirements as wear occurs and to provide a power spring having one end attached to one of the cam members and its other end attached to the other to rotate the one on the other for the purpose of increasing their joint thickness.

Another object is to provide a master cam, a control washer non-rotatable with respect to the master cam, a gauge cam between the master cam and the control washer and rotatable with respect thereto, and to provide preload spring means operable to urge said master cam and said control washer in clearance establishing position but entirely free of said gauge cam so that sensitiveness to relative rotation thereof is obtained.

Another object is to provide a spacer spring between the gauge cam and the control washer in order that all clearance in the compensator may be transferred therebetween rather than between the two cam surfaces.

A further object is to provide a recess in the gauge cam at a suitable point for receiving this spacer spring when the compensator is wound up by tensioning the power spring between the cam members so that assembly of the compensator adjacent a roller bearing, for instance, merely entails placement of the compensator without any pre-tensioning by a purchaser.

Another object is to provide a gauge pin which may be suitably placed adjacent the spacer spring and carried by the gauge cam, the pin being spring-pressed with a retaining means limiting the exposed length thereof to a predetermined amount. The exposed length of this pin determines the amount of clearance possible in the compensator before rotation of the gauge cam to take up additional clearance.

Other objects and advantages either directly described or indirectly implied from the favorable arrangement of parts will become hereinafter more fully apparent as reference is had to the accompanying drawing wherein my invention is illustrated by way of example and in which

Figure 1 is an elevation of the bottom of my improved compensator as shown in Figure 2 with a portion of the control washer broken away,

Figure 2 is a side view of the compensator, that is, looking at it radially,

Figure 3 is a vertical section taken along the line 3—3 of Figure 1,

Figure 4 is an enlarged detail taken along the line 4—4 of Figure 1,

Figure 5 is an enlarged vertical section taken along the line 5—5 of Figure 1, and

Figure 6 is a somewhat diagrammatic illustration of an installation of my improved compensator and a roller bearing.

More particularly, 1 indicates the master cam member formed with a planar upper surface and an inner surface or face which is uniformly inclined throughout substantially the entire 360° to constitute a cam. The control cam member has one surface inclined similarly to the lower face of the member 1 for operating residence thereagainst so that as the cam members 1 and 2 are rotated on each other their joint thickness is increased or decreased. For purposes of causing such rotation, these members are provided with opposed grooves 3 which form a channel for a power spring 4. The spring 4 is anchored at one end to a pin 5 integral with the member 1 and at its other end to a pin 6 integral with the member 2. This spring 4 urges the members 1 and 2 in joint thickness-increasing travel.

Residing against the lower or planar face of the control cam member 2 is a control washer 7 having a plurality of serrations 8 or notches milled or otherwise formed in its inner surface. Cooperating with these serrations 8 is a control pin 9. The control member 2 is provided with an arcuate groove 10 having a well 11 penetrating the member 2, the well 11 serving as a guide for the control or gauge pin 9. A spring 12 urges the pin 9 outwardly of its hole to an amount permitted by the setting of the set screw 13 which projects radially through the control member 2. Thus if the set screw 13 is adjusted to permit the control pin 9 to project outwardly of the member 2 by, say three thousandths of an inch as the members 2 and 7 separate, further separation of the members 2 and 7 in an amount greater than three thousandths of an inch will result in clearance between the end of the pin 9 and the serrations whereupon the power spring 4 will cause relative rotation of the control cam 2 and the master cam 1 by an amount sufficient to cause the pin 9

and serrations 8 to engage thereby reducing the clearance to the predetermined three thousandths of an inch, chosen in the example.

In order that the control cam may be entirely free, that is, highly sensitive, I provide a plurality of pre-load springs between the master cam and the control washer which act entirely independently of contact with the control washer as will now be described. The master cam member 1 is formed with a cylindrical extension 14 integral with its inner periphery. This extension 14 acts as a centering means for the control cam and is reduced in diametric thickness at its outer end to form a centering means also for the control washer 7. The extension 14 has a multiplicity of wells therein each of which receives a small pre-load spring 15 which is preferably equipped with a pad 22 and which acts against the control washer 7.

The pre-load springs transfer all clearance into the compensator. Thus, in Figure 6, if there is clearance between the rollers 16 and the races 17 the preload springs cause relative movement of the races 17 for adjustment, employing a preload pressure suitable for the work as may be predetermined by varying the number and/or strength of the pre-load springs 15. After transferring the clearance into the compensator it then becomes the function of a spring 18 between the members 2 and 7 to maintain the cam surfaces of the members 1 and 2 in constant contact so that all clearance will necessarily appear between the members 2 and 7. The control or gauge pin 9 is thereby in complete control of the time of and amount of relative travel between the cam surfaces.

The spring 18 may be suitably carried by the member 2 for contact with the member 7. It has one end extensible through the member 2 so that when the compensator is wound up for installation, the end of this spring drops into a well 19 in the member 1 maintaining the wound up relation. The pin 9 is always set for some finite amount of constant clearance so that with the compensator in wound up locked position all that is necessary to release the spring 18 from its well 19 is simply to squeeze the compensator as the last act of the installation. This final squeezing by the hand of the operator causes the member 7 to press against the end of the spring in contact therewith thereby pulling the other end out of the well 19. When this manual pressure is relieved, the power spring 4 will cause relative rotation of the members 1 and 2 to take up the clearance of the assembly before the spring 18 can again drop into the well.

In order to maintain the members 1 and 7 against relative rotation lock pins 20 integral with the extension 14 fit into slots 21 formed in the control member 7.

Various changes may be made without departing from the spirit of my invention and I therefore desire to be extended protection as defined by the scope of the appended claims:

What I claim is:

1. A clearance regulator comprising two parts relatively movable with respect to a third part to take up clearance, means urging said two parts and said third part in a clearance take-up movement, and means including a ribbed surface formed on one of said members and a rib engaging pin carried by another of said members for automatically maintaining maximum and minimum limits of clearance established by said regulator.

2. A clearance regulator comprising two members fixed against relative rotation and a third member therebetween rotatable with respect thereto, spring means connected at one end to one of said two members and at its other end to said third member for urging said two parts and said third part in a clearance take-up movement, and means including a ribbed surface formed on one of said members and a rib engaging pin carried by another of said members for automatically maintaining maximum and minimum limits of clearance established by said regulator.

3. A clearance regulator comprising two members fixed against relative rotation and a third member therebetween rotatable with respect thereto, preload spring means urging said two members away from each other, means for urging said members in a clearance take-up movement, and means including a ribbed surface formed on one of said members and a rib engaging pin carried by another of said members for automatically maintaining maximum and minimum limits of clearance as established by said regulator.

4. A clearance regulator comprising two members fixed against relative rotation and a third member therebetween rotatable with respect thereto, preload spring means free of said third member directly urging said two members apart, spring means for urging said two members and said third member in a clearance take-up movement, and means including a ribbed surface formed on one of said members and a rib engaging pin carried by another of said members for maintaining maximum and minimum limits of clearance established by said regulator.

5. A clearance regulator comprising two members fixed against relative rotation and a third member therebetween rotatable with respect thereto, a multiplicity of small preload coil springs carried by one of said two members and pressing directly against the other of said two members to transfer all clearance therebetween, means including a ribbed surface formed on one of said members and a rib-engaging pin carried by another of said members for rotating said third member to take up said clearance, and means for maintaining maximum and minimum limits of clearance between said two members.

6. A clearance regulator comprising two circular members, one of said members having a cylindrical portion at its inner circumference integral therewith of greater length than the thickness of the main body of the ring, said cylindrical portion serving as a positioning means for centering the other of said members when assembled thereon, key pins integral with said cylindrical portion for entering slots in said other member whereby said members are non-rotatable with respect to each other, said cylindrical portion having a multiplicity of wells therein each receiving a spring means for abutment against said other member near its inner periphery, a third member between said two members freely rotatable with respect thereto and having an inside diameter slightly greater than the outside diameter of said cylindrical portion thereby residing free of said spring means, a power spring having one end connected to one of said two members and its other end connected to said third member for relatively rotating said third member with respect to said other two members, to take up the clearance established between said two members by the springs carried by said cylindrical portion.

7. The combination as set forth in claim 6 to-

gether with means for maintaining predetermined maximum and minimum limits of clearance between said two members.

8. A clearance regulator comprising two circular members, one of said members having a cylindrical portion integral therewith, said portion having a multiplicity of wells therein each receiving a coil preload spring, key pins projecting from said portion, a second cylindrical portion integral with and extending outwardly of the first named cylindrical portion constituting a centering means for the other of said members, said other member overlying said preload springs and having slots therein to receive said key pins to fix said members against relative rotation, a third member between said two members, the first named cylindrical portion constituting a hub about which said third member is relatively rotatable, means for rotating said third member in a clearance take-up position in response to clearance established by said preload springs, and means including a ribbed surface formed on one of said members and a rib engaging pin carried by another of said members for maintaining maximum and minimum limits of clearance in the regulator.

9. In a compensator, a cam member, a second cam member movable with respect to the first cam member to increase the joint thickness thereof, power spring means between said cam members for urging relative rotation thereof, a third member adjacent said second cam member, means for urging said third member and said first cam member in clearance establishing movement, and means including a ribbed surface formed on one of said members and a rib engaging pin carried by another of said members between said third member and said second cam member for maintaining predetermined maximum and minimum limits of clearance in the compensator.

10. In a compensator, a first and a second member having opposed cam faces, a power spring between said members urging relative rotation thereof to increase their joint thickness, a third member adjacent said second member and resiliently urged apart from said first member, key means fixing said third member and said first member against relative rotation whereby said second member is free to rotate under the influence of said power spring to take up clearance therebetween, control ribs integrally formed in the surface of said third member, and a spring pressed gauge pin carried by said second cam for engaging said control ribs.

11. In a compensator, a master cam, a gauge cam adjacent thereto and a control washer adjacent said gauge cam, key means for maintaining said master cam and said control washer against relative rotation, preload spring means urging said master cam and said control washer apart, a relatively light spring between said gauge cam and said control washer for transferring all clearance in the compensator therebetween, control ribs formed in the surface of said control washer, and a spring pressed gauge pin carried by said gauge cam for engagement with said control ribs.

12. In a compensator, a master cam, a gauge cam adjacent thereto and a control washer adjacent said gauge cam, key means for maintaining said master cam and said control washer against relative rotation, preload spring means urging said master cam and said control washer apart, a relatively light spring between said gauge cam and said control washer for transferring all clearance in the compensator therebetween, control ribs formed in the surface of said control washer, a spring pressed gauge pin carried by said gauge pin for engagement with said control ribs, and means for limiting the outward travel of said gauge pin, said gauge pin by the amount of projection outwardly of said gauge member determining the amount of clearance possible in said compensator before rotation of said gauge cam under the influence of said power spring.

CLAYTON E. WYRICK.