PATENT SPECIFICATION

953,082

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Date of filing Complete Specification: July 26, 1960.
Application Date: May 19, 1959. *No.* 16897/59
Complete Specification Published: March 25, 1964.
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Index at Acceptance:—F2 E (2H8A, 2N1A1, 2N1A4A2, 2N1A5, 2N1C2A, 2N1D1, 2N1D2D, 2N1D3B, 2N1D5, 2N1D8B, 2N1D13, 2N1E5, 2N1K1); F2 C1D; F2 L34.

International Classification:—F 06 d.

COMPLETE SPECIFICATION

DRAWINGS ATTACHED

Automatic Adjuster for Vehicle Brakes

We, GIRLING LIMITED, a British Company, of Kings Road, Tyseley, Birmingham, 11., do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement :—

This invention relates to a new or improved automatic adjuster for vehicle brakes of the kind in which one part of a brake actuating mechanism is adjusted automatically when the movement of another part in the application of the brake exceeds a predetermined value.

According to our invention, an automatic adjuster of that kind for adjusting the effective length of a rod and nut assembly of which one part is angularly movable relative to the other and which forms part of a brake actuating mechanism comprises two oppositely acting clutches formed by closely coiled helical springs fitting tightly around the rod or around a cylindrical part of the nut, one spring which is anchored at one end holding the rod or nut against angular movement in one direction and allowing the rod or nut to move freely in the other direction, and a projecting end of the second spring being engaged in a slot or clearance opening in a member which moves relative to the rod and nut assembly in the application of the brake, and the arrangement being such that when the movement of the said member exceeds the clearance provided by the slot or opening, the second spring moves the rod or nut angularly.

In a convenient arrangement the projecting end of the second spring is engaged in a clearance hole or slot in an actuating lever which moves angularly to apply the brake, and an excessive movement of the lever in the application of the brake due to wear of friction members the spring end is engaged by one edge of the hole or slot and moved angularly in a direction to unwind the spring which slips round on the rod or nut, and on the return movement of the lever the spring end is engaged by the opposite edge of the hole or slot and moved angularly in a direction to tighten the spring on to the rod or nut which then moves angularly with the spring as the lever returns to its normal off position.

One practical application of our invention to the automatic adjustment of a mechanically operated disc brake is illustrated in the accompanying drawings in which :—

Figure 1 is a side elevation of the brake assembly ;

Figure 2 is a section on the line 2-2 of Figure 1 ;

Figure 3 is a side elevation of a portion of the brake mechanism incorporating the adjuster ;

Figure 4 is a section of the adjuster on the line 4-4 of Figure 3 ; and

Figure 5 is a diagrammatic perspective view illustrating the operation of the adjuster.

In the disc brake illustrated a mechanically operated disc brake is mounted on one end of the stationary caliper 10 of an hydraulically operated brake of known type, the caliper incorporating opposed hydraulic cylinders 11 in which work pistons adapted to apply friction pads (not shown) to opposite sides of a disc 12 rotating with a wheel or other part of a vehicle transmission, the caliper straddling a portion of the periphery of the disc.

The caliper carries pins 13 on which are pivoted opposed pressure plates 14, 15 lying on opposite sides of the disc, and the pressure plates are adapted to bear on brake shoes 16 carrying friction pads 17 for engagement with the disc, the shoes being

[Price 4s. 6d.]

guided on the pins 13 for movement towards and away from the disc.

An actuating lever 18 is pivoted at 19 on one of the pressure plates and is coupled to the other by a tension rod 21 so that angular movement of the lever draws the pressure plates together to apply the brake shoes to the disc. This brake mechanism forms the subject of co-pending Patent Application No. 23070/59 (~~Serial No. 954083~~) and need not be further described here.

The coupling between the lever 18 and the rod 21 incorporates the automatic adjusting device which forms the subject of the present application and of which the principle is shown diagrammatically in Figure 5.

The rod 21 extends through and is in screw-threaded engagement with a ~~cylinder~~ sleeve nut 22 against one end of which bears a collar 23 which is held against rotation. A helical spring 24 is coiled tightly around the sleeve nut adjacent to the collar and one end 25 of the spring is cranked and engaged in an axially directed hole drilled in the collar. A second spring 26 is coiled tightly in the opposite direction around the sleeve nut and one end 27 of this spring is cranked to extend radially. The two springs form oppositely acting clutches controlling rotation of the sleeve nut 22 relative to the rod. The first spring 24 allows the sleeve nut to rotate in a clockwise direction but holds it against rotation in the opposite direction. If the projecting end 27 of the second spring 26 is moved angularly in an anticlockwise direction the spring slips on the sleeve nut which is held by the first spring, while if it is moved angularly in a clockwise direction it grips and turns the sleeve which slips in the first spring.

In the actual construction shown in Figures 3 and 4, the collar 23 is replaced by a trunnion block 28 mounted to rock in the brake actuating lever 18 of which the upper end is formed by spaced parallel plates. The springs are separated by a spacer sleeve 29 and are enclosed within a thin tubular shell or cover 31. The end 25 of the spring 24 is engaged in a longitudinal hole in the trunnion, and the radially projecting end 27 of the spring 26 lies in an inclined slot 32 in one of the side plates of the lever. The width of the slot is substantially greater than the diameter of the spring wire, and in the off position of the brake the end 27 lies against the upper edge of the slot near its outer end as shown in Figure 3.

When the brake is applied by moving the lever 18 angularly in a clockwise direction (Figures 2 and 4) the slot 32 moves upwardly relative to the end of the spring, and when the friction pads are new the width of the slot is sufficient to allow for the normal brake-applying movement of the lever without affecting the spring. When wear of the friction pads takes place, the brake-applying movement of the lever increases and the end 27 of the spring is engaged by the lower edge of the slot and the spring is moved angularly on the sleeve nut 22 in an anti-clockwise direction, the sleeve nut being held against angular movement by the spring 24. On the return movement of the lever on release of the brake, the end 27 of the spring 26 is engaged by the upper edge of the slot before the lever has completed its return movement and the end 27 is moved in a clockwise direction, and the spring grips the sleeve nut and rotates it through a small angle to screw it up on the rod 21 and so reduce the effective length of the coupling between the pressure plates 14, 15 to compensate for the wear of the friction pads.

The adjustment is completely automatic and takes place in infinitely small steps so that the angular movement of the actuating lever 18 required to apply the brake is kept substantially constant throughout the life of the friction pads.

The initial adjustment and re-adjustment of the brake after replacement of the brake shoes are effected by rotation of the rod 21 relative to the sleeve nut 22. After adjustment the rod is locked against angular movement by a pin 34 detachably mounted in a lug 35 on the pressure plate and engaging in a transverse notch 36 in the head of the rod 21.

The adjusting mechanism is preferably protected by a rubber or other boot 37 fitting over the shell or cover 31 which encloses the springs.

It will be appreciated that if the hands of the two springs are reversed, the adjustment will be effected on the applying movement of the actuating lever instead of the return movement and that the projecting end of the second spring may engage in a clearance opening in the lever instead of a slot.

In an alternative arrangement, the rod may be the rotatable part of the rod and nut assembly in which case the springs fit tightly around the rod, which is moved angularly to effect the required adjustment of the length of the assembly.

WHAT WE CLAIM IS :—

1. An automatic adjuster of the kind set forth for adjusting the effective length of a rod and nut assembly of which one part is angularly movable relative to the other and which forms part of a brake actuating mechanism, comprising two oppositely acting clutches formed by closely coiled helical springs fitting tightly around the rod or around a cylindrical part of the nut, one spring which is anchored at one end holding the rod or nut against angular movement in one direction and allowing the rod or nut to move freely in the other direction and a projecting end of the second spring being en-

guided on the pins 13 for movement towards and away from the disc.

An actuating lever 18 is pivoted at 19 on one of the pressure plates and is coupled to the other by a tension rod 21 so that angular movement of the lever draws the pressure plates together to apply the brake shoes to the disc. This brake mechanism forms the subject of co-pending Patent Application No. 23070/59 (~~Serial No. 954083~~) and need not be further described here.

The coupling between the lever 18 and the rod 21 incorporates the automatic adjusting device which forms the subject of the present application and of which the principle is shown diagrammatically in Figure 5.

The rod 21 extends through and is in screw-threaded engagement with a ~~cylinder~~ cylindrical sleeve nut 22 against one end of which bears a collar 23 which is held against rotation. A helical spring 24 is coiled tightly around the sleeve nut adjacent to the collar and one end 25 of the spring is cranked and engaged in an axially directed hole drilled in the collar. A second spring 26 is coiled tightly in the opposite direction around the sleeve nut and one end 27 of this spring is cranked to extend radially. The two springs form oppositely acting clutches controlling rotation of the sleeve nut 22 relative to the rod. The first spring 24 allows the sleeve nut to rotate in a clockwise direction but holds it against rotation in the opposite direction. If the projecting end 27 of the second spring 26 is moved angularly in an anticlockwise direction the spring slips on the sleeve nut which is held by the first spring, while if it is moved angularly in a clockwise direction it grips and turns the sleeve which slips in the first spring.

In the actual construction shown in Figures 3 and 4, the collar 23 is replaced by a trunnion block 28 mounted to rock in the brake actuating lever 18 of which the upper end is formed by spaced parallel plates. The springs are separated by a spacer sleeve 29 and are enclosed within a thin tubular shell or cover 31. The end 25 of the spring 24 is engaged in a longitudinal hole in the trunnion, and the radially projecting end 27 of the spring 26 lies in an inclined slot 32 in one of the side plates of the lever. The width of the slot is substantially greater than the diameter of the spring wire, and in the off position of the brake the end 27 lies against the upper edge of the slot near its outer end as shown in Figure 3.

When the brake is applied by moving the lever 18 angularly in a clockwise direction (Figures 2 and 4) the slot 32 moves upwardly relative to the end of the spring, and when the friction pads are new the width of the slot is sufficient to allow for the normal brake-applying movement of the lever without affecting the spring. When wear of the friction pads takes place, the brake-applying movement of the lever increases and the end 27 of the spring is engaged by the lower edge of the slot and the spring is moved angularly on the sleeve nut 22 in an anti-clockwise direction, the sleeve nut being held against angular movement by the spring 24. On the return movement of the lever on release of the brake, the end 27 of the spring 26 is engaged by the upper edge of the slot before the lever has completed its return movement and the end 27 is moved in a clockwise direction, and the spring grips the sleeve nut and rotates it through a small angle to screw it up on the rod 21 and so reduce the effective length of the coupling between the pressure plates 14, 15 to compensate for the wear of the friction pads.

The adjustment is completely automatic and takes place in infinitely small steps so that the angular movement of the actuating lever 18 required to apply the brake is kept substantially constant throughout the life of the friction pads.

The initial adjustment and re-adjustment of the brake shoes are effected by rotation of the rod 21 relative to the sleeve nut 22. After adjustment the rod is locked against angular movement by a pin 34 detachably mounted in a lug 35 on the pressure plate and engaging in a transverse notch 36 in the head of the rod 21.

The adjusting mechanism is preferably protected by a rubber or other boot 37 fitting over the shell or cover 31 which encloses the springs.

It will be appreciated that if the hands of the two springs are reversed, the adjustment will be effected on the applying movement of the actuating lever instead of the return movement and that the projecting end of the second spring may engage in a clearance opening in the lever instead of a slot.

In an alternative arrangement, the rod may be the rotatable part of the rod and nut assembly in which case the springs fit tightly around the rod, which is moved angularly to effect the required adjustment of the length of the assembly.

WHAT WE CLAIM IS :—

1. An automatic adjuster of the kind set forth for adjusting the effective length of a rod and nut assembly of which one part is angularly movable relative to the other and which forms part of a brake actuating mechanism, comprising two oppositely acting clutches formed by closely coiled helical springs fitting tightly around the rod or around a cylindrical part of the nut, one spring which is anchored at one end holding the rod or nut against angular movement in one direction and allowing the rod or nut to move freely in the other direction and a projecting end of the second spring being en-

gaged in a slot or clearance opening in a member which moves relative to the rod and nut assembly in the application of the brake, and the arrangement being such that when the movement of the said member exceeds the clearance provided by the slot or opening the second spring moves the rod or nut angularly.

2. An automatic adjuster as claimed in Claim 1 in which the projecting end of the second spring is engaged in a clearance hole or slot in an actuating lever which moves angularly to apply the brake, and on excessive movement of the lever in the application of the brake due to wear of friction members the spring end is engaged by one edge of the slot and moved angularly in a direction to unwind the spring which slips round on the rod or nut, and on the return movement of the lever the spring end is engaged by the other edge of the slot and moved angularly in a direction to tighten the spring on to the rod or nut which then moves angularly with the spring as the lever returns to its normal off position.

3. An automatic adjuster for a vehicle brake, substantially as described with reference to the accompanying drawings. E B

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Berwick-upon-Tweed: Printed for Her Majesty's Stationery Office by The Tweeddale Press Ltd.—1964
Published at The Patent Office, 25 Southampton Buildings, London, W.C.2. from which copies may be obtained.

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20 SEP 1965

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