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PATENT SPECIFICATION

DRAWINGS ATTACHED

L159.102

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COMPLETE SPECIFICATION

Improvements in and relating to Disc Brakes

We, GIRLING LIMITED, a British Company, of Kings Road, Tysley, Birmingham, 11, Warwickshire, 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 concerns disc brakes and relates more particularly to spot type disc brakes of the kind in which only one of the friction elements is directly moved into engagement with the brake disc or other rotor, the other friction element being displaced as a result of the reaction forces set up by such engagement and for this purpose being carried by a member which is slidable in consequence of those reaction forces.

In disc brakes of the kind described, the slidable member often takes the form of a so-called caliper or housing for the friction elements and for actuating means such as a hydraulic piston and cylinder arrangement, the caliper being slidably supported by a fixed part of the brake and being displaceable by the reaction of the actuator means during a braking operation.

Problems can arise in disc brakes as, for example when a vehicle is moving over irregular surfaces, in that unstable conditions can occur and the caliper can oscillate on the fixed part which supports it. The invention seeks to provide a brake which is of more stable construction and less liable to such oscillation than presently available brakes and which is thus more reliable in service. The invention further seeks to provide a brake which is economical to manufacture, simple to service and which employs, so far as possible, standardised parts which may be used on either hand of brake.

According to the present invention, a sliding caliper disc brake of the kind described comprises a fixed torque plate having at least a

portion parallel to and adjoining a braking face of the brake rotor, an axially directed pin located solely on one side of the disc and extending between the caliper and the torque plate and slidably supporting the caliper on the torque plate for movement towards and away from the brake rotor and means circumferentially spaced from said pin and operatively connecting the caliper and the torque plate for restraining rotation of said caliper about said pin.

The connecting means is preferably a second pin circumferentially spaced from the first pin and extending between the caliper and the torque plate. Conveniently, the two pins may be received in apertures in the torque plate, the second pin being preferably secured to the caliper and engaging in a torque plate aperture having the form of a circumferentially directed slot.

The invention will be described further, by way of example, with reference to the generally diagrammatic drawings accompanying the Provisional Specification in which:—

Fig. 1 is a front elevation of a disc brake embodying the invention,

Fig. 2 is a section taken on the line II—II of Fig. 1,

Fig. 3 is a side elevation,

Fig. 4 is a section taken on the line IV—IV of Fig. 3,

Fig. 5 is a detail in perspective,

Fig. 6 is a front elevation of a second embodiment of the invention,

Fig. 7 is a section taken on the line VII—VII of Fig. 6,

Fig. 8 is a side elevation,

Fig. 9 is a section taken on the line IX—IX of Fig. 8 and

Fig. 10 is a detail in perspective.

The disc brake construction shown in Figs. 1 to 5 employs a generally U-shaped caliper having limbs which are arranged to straddle

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the brake disc and in this embodiment, a caliper having limbs 86 and 88 joined by a bridge piece 90 will be seen to be slidably mounted on a detachable pin 92 carried between axially spaced arms 96 of a torque plate 94 adapted for securing to a fixed part of the vehicle. The rear limb 86 of the caliper is cylindrically bored to receive a hydraulic actuator piston 98 for moving a directly operated friction element comprising a friction pad 100 and a backplate 102 into engagement with the brake disc, while an indirectly operated friction element is carried by the front caliper limb 88 and comprises a friction pad 104 mounted on a backplate 106. A recess 108 conforming to the shape of the backplate 102 is provided in a front wall of the torque plate 94 and the sides of the recess 108 thereby serve to guide the directly operated friction element in its movement towards and away from the brake disc, the drag from this friction element being directly absorbed by the torque plate. The indirectly operated friction element seats in part-circular recesses 110 formed in bifurcations 89 of the caliper front limb 88 and both friction elements are prevented from rotating in their respective seatings by a pin 112 which traverses the caliper bridge piece 90. Conveniently the bridge piece 90 has an opening 91 through which the friction pads 100 and 104 may be inspected or removed.

As will be more evident from Figs. 4 and 5, the torque plate 94 comprises a front wall 95 which at its leading edge constitutes one of the arms 96 and is there bent into a U shape to provide the second arm 96 axially spaced from the first one. At the upper part of the trailing edge region of the torque plate front wall 95 is formed a slotted hole 97 wherein slides a pin 114 fixed to the caliper limb 86 and projecting into the space defined between that limb and the other caliper limb 88. Two circumferentially spaced holes 93 are provided in the lower edge region of the torque plate 94 to enable the plate to be secured to a vehicle. The caliper is thus slidably supported in the plane of the front wall 95 of the torque plate by the engagement of the pin 114 in the hole 97 and by the pin 92 which passes through the front one of the arms 96 and is secured to the rear one of the arms 96.

A modification of the preceding embodiment of the invention is shown in Figs. 6 to 10 inclusive, in which similar reference numerals are employed wherever appropriate to denote similar parts. In the brake shown in Figs. 6 to 10, the principal difference is that the directly and indirectly operated friction elements are respectively supported in a radial direction by ledges provided on the torque plate 94 and on a platform 116 bolted between the bifurcations of the front limb of the caliper. For this purpose the caliper limb 88 is provided with somewhat foreshortened bifurcations 118 with the platform 116 received

across their free ends, and the rear edge of the platform 116 is formed at its ends with lateral ledges 120 which engage in corresponding grooves cut in the lateral edges of the backplate 106 to support the indirectly operated friction element. In order to support the directly operated friction element, the sides of the recess 108 in the torque plate are provided towards their upper ends with rebates defining ledges 122 and the back plate 102 is modified to present complementary shoulders which rest on the ledges 122. In all other respects, the construction and operation of this embodiment of the invention is identical with that of the embodiment previously described.

Attention is drawn to co-pending patent application No. 15801/69 (Serial No. 1,159,103) which relates to a sliding caliper disc brake of the type described comprising a fixed torque plate member having at least a portion parallel to and adjoining a brake facing of the brake rotor an axially directed first pin extending between the caliper members and the torque plate members and slidably supporting the caliper members on the torque plate member for movement towards and away from the brake rotor and a second pin secured to one of said members in circumferentially spaced relation with said first pin and engaging in an aperture in the other of said members for operatively connecting said members to restrain rotation of the caliper member about said first pin, said aperture having at least one dimension which is substantially greater than the width of said second pin.

WHAT WE CLAIM IS:—

1. A sliding caliper disc brake of the type described comprising a fixed torque plate having at least a portion parallel to end adjoining a braking face of the brake rotor, an axially directed pin located solely on one side of the disc and extending between the caliper and the torque plate and slidably supporting the caliper on the torque plate for movement towards and away from the brake rotor and means circumferentially spaced from said pin and operatively connecting the caliper and the torque plate for restraining rotation of said caliper about said pin.

2. A disc brake as claimed in claim 1, in which the connecting means is a second pin circumferentially spaced from the first pin and extending axially between the caliper and the torque plate.

3. A disc brake as claimed in claim 2 in which the pins are received in apertures in the torque plate.

4. A disc brake as claimed in any one of claims 1 to 3, in which the first-mentioned pin is fixed to the torque plate.

5. A disc brake as claimed in any one of the preceding claims, in which the caliper is generally U-shaped and has a pair of radial limbs situated one on each side of the brake



the brake disc and in this embodiment, a caliper having limbs 86 and 88 joined by a bridge piece 90 will be seen to be slidably mounted on a detachable pin 92 carried between axially spaced arms 96 of a torque plate 94 adapted for securing to a fixed part of the vehicle. The rear limb 86 of the caliper is cylindrically bored to receive a hydraulic actuator piston 98 for moving a directly operated friction element comprising a friction pad 100 and a backplate 102 into engagement with the brake disc, while an indirectly operated friction element is carried by the front caliper limb 88 and comprises a friction pad 104 mounted on a backplate 106. A recess 108 conforming to the shape of the backplate 102 is provided in a front wall of the torque plate 94 and the sides of the recess 108 thereby serve to guide the directly operated friction element in its movement towards and away from the brake disc, the drag from this friction element being directly absorbed by the torque plate. The indirectly operated friction element seats in part-circular recesses 110 formed in bifurcations 89 of the caliper front limb 88 and both friction elements are prevented from rotating in their respective seatings by a pin 112 which traverses the caliper bridge piece 90. Conveniently the bridge piece 90 has an opening 91 through which the friction pads 100 and 104 may be inspected or removed.

As will be more evident from Figs. 4 and 5, the torque plate 94 comprises a front wall 95 which at its leading edge constitutes one of the arms 96 and is there bent into a U shape to provide the second arm 96 axially spaced from the first one. At the upper part of the trailing edge region of the torque plate front wall 95 is formed a slotted hole 97 wherein slides a pin 114 fixed to the caliper limb 86 and projecting into the space defined between that limb and the other caliper limb 88. Two circumferentially spaced holes 93 are provided in the lower edge region of the torque plate 94 to enable the plate to be secured to a vehicle. The caliper is thus slidably supported in the plane of the front wall 95 of the torque plate by the engagement of the pin 114 in the hole 97 and by the pin 92 which passes through the front one of the arms 96 and is secured to the rear one of the arms 96.

A modification of the preceding embodiment of the invention is shown in Figs. 6 to 10 inclusive, in which similar reference numerals are employed wherever appropriate to denote similar parts. In the brake shown in Figs. 6 to 10, the principal difference is that the directly and indirectly operated friction elements are respectively supported in a radial direction by ledges provided on the torque plate 94 and on a platform 116 bolted between the bifurcations of the front limb of the caliper. For this purpose the caliper limb 88 is provided with somewhat foreshortened bifurcations 118 with the platform 116 received

across their free ends, and the rear edge of the platform 116 is formed at its ends with lateral ledges 120 which engage in corresponding grooves cut in the lateral edges of the backplate 106 to support the indirectly operated friction element. In order to support the directly operated friction element, the sides of the recess 108 in the torque plate are provided towards their upper ends with rebates defining ledges 122 and the back plate 102 is modified to present complementary shoulders which rest on the ledges 122. In all other respects, the construction and operation of this embodiment of the invention is identical with that of the embodiment previously described.

Attention is drawn to co-pending patent application No. 15801/69 (Serial No. 1,159,103) which relates to a sliding caliper disc brake of the type described comprising a fixed torque plate member having at least a portion parallel to and adjoining a brake facing of the brake rotor an axially directed first pin extending between the caliper members and the torque plate members and slidably supporting the caliper members on the torque plate member for movement towards and away from the brake rotor and a second pin secured to one of said members in circumferentially spaced relation with said first pin and engaging in an aperture in the other of said members for operatively connecting said members to restrain rotation of the caliper member about said first pin, said aperture having at least one dimension which is substantially greater than the width of said second pin.

WHAT WE CLAIM IS:—

1. A sliding caliper disc brake of the type described comprising a fixed torque plate having at least a portion parallel to and adjoining a braking face of the brake rotor, an axially directed pin located solely on one side of the disc and extending between the caliper and the torque plate and slidably supporting the caliper on the torque plate for movement towards and away from the brake rotor and means circumferentially spaced from said pin and operatively connecting the caliper and the torque plate for restraining rotation of said caliper about said pin.

2. A disc brake as claimed in claim 1, in which the connecting means is a second pin circumferentially spaced from the first pin and extending axially between the caliper and the torque plate.

3. A disc brake as claimed in claim 2 in which the pins are received in apertures in the torque plate.

4. A disc brake as claimed in any one of claims 1 to 3, in which the first-mentioned pin is fixed to the torque plate.

5. A disc brake as claimed in any one of the preceding claims, in which the caliper is generally U-shaped and has a pair of radial limbs situated one on each side of the brake

rotor and bridged by means straddling said rotor and adjoining said limbs, said torque plate comprising a pair of axially spaced limbs, and in which said first-mentioned axially directed pin is carried between said torque plate limbs.

5 6. A disc brake as claimed in claim 5, in which the torque plate comprises a front wall having one end bent back into a U-shape to define said axially spaced torque plate limbs.

10 7. A disc brake as claimed in any one of the preceding claims, in which the first-mentioned axially directed pin is of circular cross-section.

15 8. A disc brake as claimed in claim 2, in which said second pin is of smaller diameter than said first pin.

9. A disc brake as claimed in any one of the preceding claims, in which the or each pin extends from the portion of said torque plate adjoining said brake rotor and away from the adjacent braking surface thereof. 20

10. A disc brake as claimed in claim 1 and constructed and arranged substantially as hereinbefore described with reference to and as illustrated in Figs. 1 to 5 or Figs. 6 to 10 of the drawings accompanying the Provisional Specification. 25

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