

PATENT SPECIFICATION

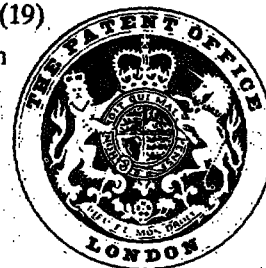
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(19)



- (72) Inventors: Monte Chamberlain
 Glen Shields Comer, Jr.
 Frederick Harlan Elliott

(54) BAND BRAKE AND CONTROL LINKAGE

(71) We, CATERPILLAR TRAC-
 TOR CO., a corporation organized and
 existing under the laws of the State of
 California, United States of America, of 100
 N.E. Adams Street, Peoria, Illinois 61629,
 United States of America, 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 particu-
 larly described in and by the following
 statement:-

In brake systems employing brake bands,
 particularly those used in, for example,
 crawler type vehicles employing steering
 clutches, unfailing smooth braking action
 has often been an elusive quality. The fact
 that the direction of rotation of the element
 to be braked is frequently changed, coupled
 with wear of brake elements and/or improper
 adjustment can result in slackness occur-
 ring in the control linkage and/or braking
 components which is not conducive to
 smooth braking action.

In accordance with the invention, a band
 brake has an actuating lever provided with a
 pair of anchor pins, a brake band which is
 arranged to be trained about a rotary ele-
 ment to be braked in either direction of
 rotation and which has its opposite ends
 connected to respective ones of the anchor
 pins, an anchor bracket having slots opening
 in opposite directions, with each slot loosely
 receiving a respective one of the pins to pro-
 vide a fulcrum for the actuating lever, and
 means resiliently biasing one of the pins into
 engagement with the bottom of its associ-
 ated slot, wherein one of the slots opens
 downwardly and the resilient means is
 directly operative on the pin received in that
 one slot.

The means provided for resiliently biasing
 one of the pins into engagement with the
 bottom of its associated slot may preclude
 relative motion between the slot and the pin
 during the initial phases of a braking action
 which could cause rough braking. Accord-
 ingly, smooth braking is facilitated.

Since the slots open upwardly and down-
 wardly and since the biased one of the pins is
 that received in the downwardly opening
 slot, this is particularly useful when an
 adjustment bracket is connected to the pin
 on which the resilient means is operative
 and the corresponding end of the band is
 connected to the adjustment bracket.

Preferably, the resilient means comprise a
 spring which may extend to the side of the
 pin and the spring is connected to the pin by
 a link configured to maximise the vertical
 component of the biasing force applied to
 the pin.

The actuating lever may be in the form of
 an inverted T and has an actuating link con-
 nected to its upper end. A further spring is
 connected to the actuating linkage and
 serves to bias both pins into engagement
 with the bottoms of both slots.

An example of a brake constructed in
 accordance with the invention is illustrated
 in the accompanying drawings, in which:-

Figure 1 is a side elevation;

Figure 2 is an enlarged fragmentary view
 as seen approximately from the line 2-2 in
 Figure 1.

The band brake illustrated in Figures 1
 and 2 is particularly suited for use in vehicles
 employing steering clutches as for example,
 crawler type tractors. However, it is to be
 understood that use of the invention is not
 limited to such vehicles.

As seen in Figure 1 a brake band 10 is trained about a rotary element 12 to be braked, which element is disposed on a shaft 14. Typically the element 12 will be a steering clutch and, of course, the shaft 14 will undergo bidirectional rotation. One end 16 of the brake band 10 terminates in a bifurcated yoke 18 (Figure 2) impaled on an anchor pin 20. The other end 22 of the brake band 10 is connected to an adjustment bracket 24. The adjustment bracket 24 carries a plate 26 having a bore 28 through which a threaded shaft 30 loosely extends. The shaft 30 is connected to a bifurcated yoke 32 also having its arms impaled by an anchor pin 34.

An adjustment rod 36 having a handle 38 at its upper end and a hexagonal formation 40 at its lower end includes a threaded bore 42 in the hexagonal end 40 threadably receiving the shaft 30 above the plate 26. Consequently, by appropriately rotating the shaft 36, the effective length of the band 10, that is, the peripheral distance between the anchor pins 20 and 34, can be varied as desired.

The assemblage also includes a leaf spring 44 which bears against the hexagonal end 40 to maintain the shaft 36 in any desired position of rotary adjustment relative to the plate 26.

The control linkage includes an actuating lever 50 in the form of an inverted T. The anchor pins 20 and 34 are connected to the actuating lever on opposite ends of the cross bar 52, while a pivot 54 is provided at the upper end of the arm 56 of the actuating lever 50. A link 58 is connected to the pivot 54 and is pivotally connected at 60 to an arm 62 secured to a rotary shaft 64.

The shaft 64 mounts a further arm 66 which is pivotally connected at 68 to a link 70 extending to an actuating pedal 72 or the like. The pedal 72 is pivotally connected to the link 70 by a pivot pin 74 and to a stationary element such as the floor of the vehicle cab by a pivot pin 76.

A tension spring 78 is connected to the arm 66 to bias the same in a counterclockwise direction with the consequence that the link 58 is urged downwardly and the actuating lever 50 urged in a clockwise direction.

A bifurcated anchor bracket 80 is secured by any suitable means to the vehicle frame and each arm thereof includes oppositely directed, aligned slots. As seen in Figure 1, generally upwardly opening slots 82 receive the anchor pin 20 while generally downwardly open slots 84 receive the anchor pin 34. Depending upon the direction of rotation of the rotary element 12 when braking force is applied via operation of the pedals 72, the bottom of one or the other of the slots 82 and 84 serves as the pivot point for the actuating lever 50. The resulting pivot-

ing of the actuating lever 50 about one or the other of the points tightens the band about the rotary element 12 to apply braking force thereto generally in the manner described in US Patent Specification No. 2854858.

As will be apparent to those skilled in the art, the weight of the adjustment bracket 24 as well as wear in the brake band 10 will tend to cause the anchor pin 34 to move downwardly out of its slot 84. The resulting slack in the linkage, that is, the amount of movement required before the anchor pin 34 seats against the bottom of the groove 84 is not conducive to smooth braking action.

To provide for smooth braking action, the anchor pin 34 is continuously biased upwardly into engagement with the bottom of its associated groove 84. To this end, a stationary bracket 90 is secured by any suitable means to the vehicle frame and may be provided with a series of apertures 92 for selective receipt of the end of a tension spring 94. The spring 94 is connected to the anchor pin 34 to bias the same upwardly as mentioned via a link 96 terminating in a bifurcated yoke 98 impaled by the pin 34.

As can be seen in Figure 1, the spring 94 extends upwardly and to the side of the anchor pin 34. In order to maximize the vertical component of the biasing force applied to the anchor pin 34, the link 96 is bent as illustrated. The resulting biasing force assures that the pin 34 will always be positively seated within its groove 84. At the same time, the weight of the actuating lever 50 as well as the bias in a clockwise direction applied thereto from the spring 78, will cause the pin 18 to seat in its groove 82.

As a consequence, there is no lost motion during the initial phases of a braking operation regardless of the direction of rotation of the rotary element 12 so that smooth braking will always occur.

Additionally, it should be noted that spring 94 affords only sufficient supplemental force to counteract the affect of gravity on the linkage mass.

WHAT WE CLAIM IS:-

1. A band brake having an actuating lever provided with a pair of anchor pins, a brake band which is arranged to be trained about a rotary element to be braked in either direction of rotation and which has its opposite ends connected to respective ones of the anchor pins, an anchor bracket having slots opening in opposite directions, with each slot loosely receiving a respective one of the pins to provide a fulcrum for the actuating lever, and means resiliently biasing one of the pins into engagement with the bottom of its associated slot, wherein one of the slots opens downwardly and the resilient means is directly operative on the pin received in that one slot.



As seen in Figure 1 a brake band 10 is trained about a rotary element 12 to be braked, which element is disposed on a shaft 14. Typically the element 12 will be a steering clutch and, of course, the shaft 14 will undergo bidirectional rotation. One end 16 of the brake band 10 terminates in a bifurcated yoke 18 (Figure 2) impaled on an anchor pin 20. The other end 22 of the brake band 10 is connected to an adjustment bracket 24. The adjustment bracket 24 carries a plate 26 having a bore 28 through which a threaded shaft 30 loosely extends. The shaft 30 is connected to a bifurcated yoke 32 also having its arms impaled by an anchor pin 34.

An adjustment rod 36 having a handle 38 at its upper end and a hexagonal formation 40 at its lower end includes a threaded bore 42 in the hexagonal end 40 threadably receiving the shaft 30 above the plate 26. Consequently, by appropriately rotating the shaft 36, the effective length of the band 10, that is, the peripheral distance between the anchor pins 20 and 34, can be varied as desired.

The assemblage also includes a leaf spring 44 which bears against the hexagonal end 40 to maintain the shaft 36 in any desired position of rotary adjustment relative to the plate 26.

The control linkage includes an actuating lever 50 in the form of an inverted T. The anchor pins 20 and 34 are connected to the actuating lever on opposite ends of the cross bar 52, while a pivot 54 is provided at the upper end of the arm 56 of the actuating lever 50. A link 58 is connected to the pivot 54 and is pivotally connected at 60 to an arm 62 secured to a rotary shaft 64.

The shaft 64 mounts a further arm 66 which is pivotally connected at 68 to a link 70 extending to an actuating pedal 72 or the like. The pedal 72 is pivotally connected to the link 70 by a pivot pin 74 and to a stationary element such as the floor of the vehicle cab by a pivot pin 76.

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of the actuating lever 50 about one or the other of the points tightens the band about the rotary element 12 to apply braking force thereto generally in the manner described in US Patent Specification No. 2854858.

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As a consequence, there is no lost motion during the initial phases of a braking operation regardless of the direction of rotation of the rotary element 12 so that smooth braking will always occur.

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WHAT WE CLAIM IS:-

1. A band brake having an actuating lever provided with a pair of anchor pins, a brake band which is arranged to be trained about a rotary element to be braked in either direction of rotation and which has its opposite ends connected to respective ones of the anchor pins, an anchor bracket having slots opening in opposite directions, with each slot loosely receiving a respective one of the pins to provide a fulcrum for the actuating lever, and means resiliently biasing one of the pins into engagement with the bottom of its associated slot, wherein one of the slots opens downwardly and the resilient means is directly operative on the pin received in that one slot.



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2. A brake according to claim 1, wherein an adjustment bracket is connected to the pin on which the resilient means is operative and the corresponding end of the band is connected to the adjustment bracket. 15
- 5 3. A brake according to claim 2, wherein the resilient means comprises a spring connected to the one pin. 20
- 10 4. A brake according to claim 3, wherein the spring extends to the side of the one pin and is connected to the one pin by a link shaped to apply a predominantly vertical biasing force to the one pin. 25
5. A brake according to any one of the preceding claims, wherein the actuating lever is generally in the shape of an inverted T, an actuating linkage is connected to the upper end of the lever, and a spring is connected to the actuating linkage to bias the same such that both pins are directed toward the bottom of their slots.
6. A brake according to claim 1, substantially as described with reference to the accompanying drawings.

GILL, JENNINGS & EVERY,
53/64 Chancery Lane,
LONDON WC2A 1HN
Agents for the Applicants