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(54) SAFETY DROP BRAKE

(71) I, COLIN WILLIAM SKELTON, an Australian citizen of 160 Kilaben Road, Kilaben Bay, New South Wales 2283, Australia, do hereby declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:-

This invention relates to an emergency braking apparatus and in particular to a safety drop brake for use on vehicles having dual wheels on each end of an axle. In this specification reference to a vehicle is to include reference to a trailer.

Many emergency braking systems have been devised which rely on safety braking circuits and the like to ensure the normal brakes can be applied in times of emergency.

However, all these types of systems, no matter how supposedly failsafe, all suffer a common disadvantage, i.e., they all activate the normal brake linings or pads. Thus when such brake linings overheat and/or their coefficient of friction is greatly reduced they cannot effectively brake the vehicle. Often a hydraulic brake line, or seal, may rupture making it impossible to activate the brakes.

In the prior art it has been known to provide an emergency brake which consists of a belt or chains on both sides of the vehicle, one end of each belt or chain being attached to the vehicle, the other end of which is adapted to drop under all of the wheels of the one axle. Whilst this is an independent brake it is not of any real use as it creates an uncontrollable skidding situation which is often more dangerous than having no brakes at all.

It is an object of this invention to provide a braking apparatus independent of the normal braking means and avoiding the problems of the prior art.

According to one aspect of the present

invention there is provided a drop brake for a vehicle, comprising a reinforced belt of flexible material, a support adapted to anchor one end of the belt to the vehicle and releasable holding means mountable on the vehicle being adapted to support the opposite end of the belt and to release it upon actuation of said releasable holding means so that when the drop brake is mounted on a vehicle actuation of said releasable holding means causes said opposite end of the belt to drop and forward motion of the vehicle causes said opposite end of the belt to be run over by one of the wheels of the vehicle thereby to brake further motion of said vehicle.

The principal advantage of this brake is that when mounted on a vehicle it provides an additional brake which is independent of the condition of the brake linings and normal braking system, and can be readily applied in an emergency situation if the normal braking systems have failed.

This brake of the invention is so readily produced that its cost is minimal compared to its lifesaving capabilities.

The concept of this brake is to locate a belt, which is attached to the body of the vehicle, or trailer, between the road surface and, for example, one of the tyres on each side of an axle having dual wheels on each side. The dual wheels on each side are locked together so that if only one wheel is in contact with the ground the other wheel will still rotate. Thus, when the belt of the drop brake is interposed between the road surface and one of the wheels, the other wheel which is in contact with the road surface is forced to rotate due to the momentum of the vehicle. However, as it rotates it drives the other wheel against the surface of the stationary belt. The friction of the wheel being driven against the belt provides the braking action to reduce the speed of the tyre in contact with the road to an eventual

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stop.

Alternatively, the axle may have one side wheel on either end of the axle, instead of the dual wheels. In this instance, the belt is designed so that when it is disposed between the tyre and the road surface it only takes up a portion of the width of the tyre. This ensures that the remaining portion of the tyre will be forced into contact with the road surface to drive the tyre against the fixed belt, thus slowing the vehicle to a stop.

Preferably the belt has at least a three-ply nylon or steel cord core with a rubber overlay on each side of the core.

The invention will now be described by way of example only with reference to the accompanying drawings wherein:-

Figure 1 is a side elevational view of a part of a vehicle embodying the invention;

Figure 2 is a plan view of a part of a vehicle embodying the invention, and not corresponding to Figure 1;

Figure 3 is a diagram of a typical belt as used by the invention.

The safety drop brake in accordance with this invention uses a belt 9 made of any suitable material. The belt 9 is attached at one of its ends to a support member 10 which is rigidly attached to the body 5 of the vehicle. The free (other) end of the belt is releasably attached to holding means which when actuated releases the free end of the belt 9. Once the free end of the belt 9 is released it drops to the ground 8 and is run over by the tyre 4 of wheel 7. The holding means may comprise a pin 12 which protrudes through a hole 17 in the end of the belt 9. The pin 12 has its ends held at receiving member 13 and actuating means 11. Alternately, the holding means may comprise a releasable gripping means. The actuating means 11 may be electrical and/or mechanical and is triggered by the driver of the vehicle in an emergency. The triggering means would preferably comprise a cable or a switch located at a convenient position near the driver's seat.

The belt 9 is also shown by the dashed lines in Figure 1 in its ready for use position 14 and by the unbroken lines in its in use braking position.

The positioning of the support member 10 may be at any point forward of the vertical plane through the axle axis 7, so that when the belt is released its free end drops down and is run over by the tyre to be located between the ground 8 and the tyre 4.

A typical belt 9 is shown in Figure 3. It may have a tread 19 on its road and/or tyre contact surfaces. Alternatively, it may have metal studs or chains at the portion 19 for use in snow or icy conditions. The belt can be attached to a hollow cylindrical member 20 by wrapping it around the member 20 and clamping it back onto itself by means such as a metal plate 18 and studs. The

member 20 can simply be concentrically pushed onto the support member 10 for easy interchange of used belts. Thus, if enough clearance is available between the member 20 and member 10, the member 20 may rotate as the belt is released.

When not in use this brake is usually held as shown by the dashed line in Figure 1, as 14, and also shown in Figure 2.

The drop brake can be supplied for use with one or more of the tyres on a vehicle axle, but preferably on each inside tyre of a dual wheel axle as shown in Figure 2.

When a truck driver is going to sleep in the cabin of his truck he may release the belt 9 of the brake so that if he accidentally kicks the hand brake off and/or the truck out of gear, the truck will only move a few feet before stopping.

If, whilst driving a vehicle, there is a loss of braking and the vehicle cannot be normally brought to a halt, the driver would release the drop brake, by say a button, switch cable or other type of activating means within easy reach of the driving position. The pin 12 would be withdrawn from the hole 7 in the free end of the belt 9 by the actuating means 11. The belt 9 would then drop to the ground 8 and be run over by the inner wheel 4 rotating in the direction shown by the arrow A of Figure 1. Thus, a portion of the belt is disposed between the wheel 4 and the ground 8.

As the outer wheel 15 is still in contact with the ground 8, it continues to rotate and thus prevents a locking up and skidding of the wheels 4 and 15. Both wheels 4 and 15 are mechanically fixed together so that they must rotate at the same speed. As the wheel 4 draws the belt 9 tighter, it exerts a greater tension on the belt 9. Also, on drawing the belt downwards, as shown by P in the vector diagram of Figure 1, the vehicle 5 body is pulled down on the springs by a force F thus increasing the pressure between the tyre 4, the belt 9 and the ground 8, and tyre 15 and the ground 8, respectively, thus increasing the braking on the vehicle.

The braking effect is substantially provided by the tyre 15 in contact with the ground driving the inner tyre 4 against the stationary belt, thus the rate of rotation of the tyre 15 in contact with the road 8 is substantially and gradually slowed which slows the vehicle to a stop. The additional braking is also provided by the friction between the belt 9 and the ground 8.

The drop brake provided by the invention has shown to be an extremely foolproof and effective apparatus in use.

Once the drop brake has been used the belt 9 must be relocated at the pin 12 or replaced if it is excessively worn.

In most instances, it is desirable to provide a drop brake at both the forward and

rear sides of each axle so that provision is made for emergency stopping the vehicle in both forward and reverse directions.

It has been found that the optimum thickness of the belt is 3/8 inches.

This apparatus provides a brake, the condition of which can readily be seen by the vehicle driver and is independent of the normal braking system.

The belt 9 in its ready for use position 14 can also act as a forward mud flap.

Where it is envisaged that the vehicle will be used in mud, snow, ice or similar conditions, studs may be attached to at least one side of the belt at the contact position. The studs provide extra traction, working on the same principle as chains on tyres.

The belt may also comprise a mesh or chain type strip with or without any rubber components.

The belt may have a series of holes for the dissipation of heat generated during stopping the vehicle.

Special hazard warning lights may be added to the rear of the vehicle to indicate when the drop brake has been activated.

It has been found that the area of contact between the belt 9 and the tyre 4 affects the performance of the brake. If the area of contact is too great then the outer wheel 15 will not be able to turn sufficiently and a full skid may occur. This is obviously undesirable.

To overcome this problem the mounting 10 is moved either further forward with respect to the tyre or closer to the ground to reduce the contact area.

Alternately, if there is insufficient contact area and the inner wheel 4 rotates too freely on the belt 9, then the outer wheel 15 will not be slowed down sufficiently quickly. If this is the case, then the mounting 10 is moved higher from the ground or closer to the tyre to increase the contact area.

In the trials that have been carried out it has been found that a contact area covering an arc spanning about 40° of the tyre is optimal.

A further feature which is preferred in some uses is to place stiffening strips along the belt between the mounting point and almost to the tyre contact point, to ensure the belt is properly directed under the tyre and does not flick out to the side of the tyre.

WHAT I CLAIM IS:-

1. A drop brake for a vehicle, comprising a reinforced belt of flexible material, a support adapted to anchor one end of the belt to the vehicle and releasable holding means mountable on the vehicle being adapted to support the opposite end of the belt and to release it upon actuation of said releasable holding means so that when the drop brake is mounted on a vehicle actuation of said releasable holding means causes said opposite end of the belt to drop and

forward motion of the vehicle causes said opposite end of the belt to be run over by one of the wheels of the vehicle thereby to brake further motion of said vehicle.

2. The drop brake as claimed in Claim 1, wherein the belt has at least a three-ply nylon or steel cord core with a rubber overlay on each side of the core.

3. The drop brake as claimed in Claim 1 or 2, wherein the belt has a series of holes in it at the area adapted for contact with the tyre of said one wheel.

4. The drop brake as claimed in Claims 1, 2 or 3, wherein at least the portion of said belt, adapted to be interposed between the road and wheel incorporates chains.

5. The drop brake as claimed in any one of the preceding claims, wherein the belt contact with the tyre spans an arc of 40°.

6. The drop brake as claimed in any one of the preceding claims, further comprising stiffening portions incorporated into the belt to resist sideways movement.

7. A drop brake substantially as hereinbefore described with reference to Figures 1 and 2 or Figure 3 of the accompanying drawings.

8. The combination of a vehicle and a drop brake, wherein the vehicle has a wheel arrangement on two opposite sides thereof, said brake being located on one side of said vehicle and comprises a reinforced belt of flexible material anchored at one end on a support on the vehicle and releasable holding means also on the vehicle for supporting the opposite end of said belt so that when said means is activated said opposite end of said belt is released whereupon the belt drops to the ground and movement of the vehicle towards the belt causes said belt to be run over by a wheel of the vehicle, thereafter said belt acting to brake movement of the vehicle.

9. The combination as claimed in Claim 8, wherein the belt has at least three-ply nylon or steel cord core with a rubber overlay on each side of the core.

10. The combination as claimed in Claim 8 or Claim 9, wherein the belt has a series of holes in it at the area adapted for contact with the tyre of said wheel of the vehicle.

11. The combination as claimed in Claim 8, 9 or 10, wherein at least the portion of said belt adapted to be interposed between the road and the wheel incorporates chains.

12. The combination as claimed in any one of Claims 8 to 11, including two drop brakes one on either side of said vehicle.

13. The combination as claimed in any one of Claims 8 to 12, wherein each wheel arrangement of the vehicle is a multiple wheel arrangement.

14. The combination as claimed in

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Claim 13, wherein said multiple wheel arrangement is a dual wheel arrangement.

5 15. The combination as claimed in Claim 14, wherein the belt is located on the vehicle so that the said opposite end drops under the inner of the dual wheels.

16. The combination as claimed in any one of Claims 8 to 15, wherein the belt contact with the tyre spans an arc of 40°.

10 17. The combination as claimed in any

one of Claims 8 to 16, further comprising stiffening portions incorporated into the belt to resist sideways movement.

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