



Inertia Braking System for Two Wheelers

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Abstract— Each and every parts of a two wheeler has been designed well even though some times the braking system of a two wheelers shows poor performance. When the vehicle comes without brakes it turns the passengers into unsafe situation while riding the vehicle. So we should have a brake in our two wheelers which must deliver an optimum performance. The braking force is mainly depends on the following two factors one is normal reaction of the rear wheels and another one is coefficient of friction between road and tyres. Whenever the vehicle is loaded the normal reaction of the rear wheels also increases. So there is only minimum braking force is requires stopping the vehicle. When the vehicle is running at high speed with fewer loads it will become out of control. If we apply brake in this condition it will make a heavy injury, because the kinetic energy of a vehicle while running stored its total mass. In this paper the inertia force which helps the vehicle while braking without any skidding. Thus the system can deliver an effective braking performance then traditional one.

Keywords— Inertia, internal expanding brakes, friction, torsional spring, sprocket, transmission system, stopping distance.

I. INTRODUCTION

The two wheelers which have 100 or less than 100 cc is used by many peoples. Most of this cc bikes are comes with drum brakes of its front and rear wheels. Sometimes front wheel only comes with disk break. This bikes speed has been limited to 70 Km/h. When we drive this vehicle in 70 or above 70 Km speed the control of the vehicle exists from driver. In this situation any obstacle comes in front of the vehicle the driver must apply brakes first during sudden breaking the driver holds the clutch lever so that the clutch plate de-engaged from the fly wheel. Thus the thing makes the vehicle free to flow on the road. Here the applied break pressure is not equals to the required value and the co-efficient of friction also not exceeds in to possible value so the vehicle get skidding condition along the road. To rescue the driver during this condition an artificial inertia force ought to provided to the rear wheels.

II. INERTIA

Inertia which is known as a tendency of an object tries to reduce their motion and get back that into rest condition. The inertia of an object is mainly depends of its mass. If the object has high mass the inertia would high value. It is also known as opposing force. It is denoted by following manner.

$$I = -ma$$

Where,

I = inertia in N

m = mass of an object in Kg

a = acceleration in m/s^2

Here the negative value denotes it acts in opposite direction of the moving object.

III. LITERATURE SUREVEY

Mansour Hadji, Hosseinlou, Hadi Ahadi and Vahid Hematian^[1]. A large number of studies have shown that accidents on vehicles are the root cause of millions of death each year. Especially, two wheeler accidents are increasing rapidly when compared with four wheeler accidents. Two wheeler accidents are mainly due to sliding and increased stopping distance as two wheelers are less stable when compared to four wheelers.

Lee, C-H., Lee, J-M., Choi, M-S., Kim, C-K. and Koh, E-B^[4]. The stopping distance of a two wheeler is the distance between a point where the brake is applied and to the point where linear velocity of the two-wheeler becomes zero. In order to reduce accidents, minimum stopping distance should be achieved. It is accomplished with the help of maximum deceleration of the vehicle. This maximum deceleration depends on maximum braking force

Hans-christofklein^[3]. If the braking force exceeds the maximum friction limit between tire and ground, sliding will occur due to the locking of wheels.

Mansour Hadji, Hosseinlou, Hadi Ahadi and Vahid Hematian^[1]. Normal reaction on the tire is one of the key factors to be considered for varying the braking force. Because the braking force mainly depends on co-efficient of friction between the tire-ground and normal reaction on the tire.

Ebner H. and Kuhn, W^[6]. As the effective radius of the disc increases the braking force increases in accordance with the pillion load on the two wheeler. The optimum braking force which helps in attaining minimum stopping distance without sliding is obtained.

Jimenez and Felipe^[2]. During the deceleration phase, the load on the front wheel increases while the load on the rear wheel decreases, due to load transfer effect.

Hans-christofklein^[3]. The braking coefficient is the level of tire-road friction needed by the braked tire so that it will just not lock up.

The braking coefficient varies when either braking force or dynamic axle normal force changes and, consequently, it is a vehicle geometry and deceleration-dependent parameter

Chin, Y. K., Lin, W. C., Sidlosky, D. M. and Sparschu, M. S^[5]. Anti lock breaking system helps in preventing the vehicle from sliding but it does not reducing stopping distance for varying speeds at varying loads. But this system achieving minimum stopping distance.

IV. BRAKE

A brake is a device by means of which artificial frictional resistance is applied to a moving machine member, in order to retard or stop the motion of a machine. In the process of performing this function, the break absorbs either kinetic energy of the moving member or potential energy given up by objects lowered by hoists, elevators etc. The energy absorbed by brakes is dissipated in the form of heat. This heat is dissipated in the surrounding air so that excessive heating of the brake lining does not take place. The capacity of a break depends upon the following factors:

- The unit pressure between the breaking surfaces.
- The coefficient of friction between the breaking surfaces.
- The peripheral velocity of the brake drum.
- The projected area of the friction surfaces.
- The ability of the brake to dissipate heat equivalent to the energy being absorbed.

V. MATERIALS FOR BREAK LINING

The materials used for the brake lining should have the following characteristics:

- It should have high coefficient of friction with minimum fading. In other words the coefficient of friction should remain constant with change in temperature.
- It should have low wear rate.
- It should have high heat resistance.
- It should have high heat dissipation capacity.
- It should have adequate mechanical strength.
- It should not be affected by moisture and oil

VI. TYPES OF BREAKS

The brakes according to the mean used for transforming the energy by the braking elements, are classified as:

- Hydraulic brakes
- Electric brakes
- Mechanical brakes

In this article we have been seeing about two wheelers brakes so we only consider about mechanical brakes.

VII. MECHANICAL BRAKES

The mechanical brakes, according to the direction of acting force, may be divided into the following two groups:

- Radial brakes:** In these case brakes, the force acting on the brake drum is in radial direction. The radial brakes may be sub-divided into *external brakes* and *internal brakes*. According to the shape of frictional elements, these brakes may be *block* or *shoe brakes*.
- Axial brakes:** In these brakes the force acting on the brake drum in the axial direction. The axial brakes may be disc brakes and cone brakes. The analysis of these brakes is similar to clutches.

Since we are concerned with only mechanical brakes, therefore, these are discussed especially radial brakes.

VIII. INTERNAL EXPANDING BRAKE

An internal expanding brake consists of two shoes S_1 and S_2 . The outer surface of the shoes are lined with some frictional material to increase the coefficient of friction and to prevent wearing away of the metal. Each shoe is pivoted at one end about a fixed fulcrum O_1 and O_2 and made to contact a cam at the other end. When the cam rotates, the shoes are pushed outwards against the rim of the drum. The friction between the shoes and the drum produces the braking torque and hence reduces the speed of the drum. The shoes are normally held in off position by a spring. The drum encloses the entire mechanism to keep out dust and moisture

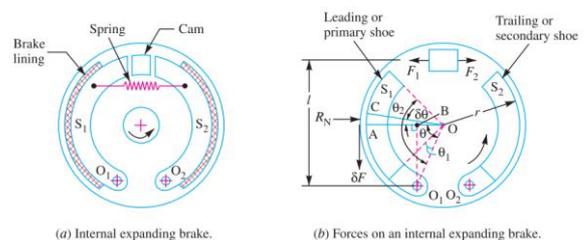


Fig. 8.1. Internal expanding shoe brakes

Let

r = internal radius of the wheel rim

b = width of the brake lining

p_1 = maximum intensity of normal pressure

p_N = normal pressure

F_1 = force exerted by the cam on the leading shoe

F_2 = force exerted by the cam on the trailing shoe

Now for leading shoe taking moments about the fulcrum O_1 ,

$$F_1 * l = M_N - M_F$$

And for trailing shoe, taking moments about the fulcrum O_2 ,

$$F_2 * l = M_N + M_F$$

If $M_F > M_N$ the brakes become self locking.

IX. THEORITICAL APPROACH OF INERTIA BRAKING SYSTEM

Normally this brake works in two wheelers when the brake is applied by the driver the cam which is connected with the lever get pulls the brake shoes to the drums inner surface. Here the friction lining of the shoes are make a contact with the drum surface. Due to the high frictional force between the lining and the surface the total kinetic energy of the drum converted into heat and it is dissipated to atmospheric air. This is the perfect control where the vehicle speed is in limited value. But this control only not suitable for stopping the vehicles when high speeds. We already know if the frictional force exceeds maximum than the normal force the tires become self-locking, this phenomena will cause skidding of vehicle on the road.

So sudden stopping at high speeds may cause injury to vehicle as well as the driver.

To minimize this effect we need an additional protection with a brake which is suitable to control the vehicle at higher speeding conditions.

Here we know in an any emergency situations all suddenly holds the rear wheel breaks only because that only connected with the engines transmission system. By using drum brakes we only try to halt the rear wheel from rotation. This is sufficient when the speed is low, but higher speeds the kinetic energy of the vehicle stored in the total mass of the vehicle. So that conditions when we applies brake the vehicle does not response. Then it will cause an injury.

The inertia braking system is known as at the high speeding conditions of a vehicle when we applies brake the already existing brakes response although the additional arrangement with the rear wheel brake will also response that means the artificial inertia may created to rear wheels trying to change the rotating direction of the rear wheel.

Here the torsional spring is connected with the rear wheels. A sprocket is mounted on the spring and this is connected with the transmission sprocket through drive chain. It is normally rotates as the same direction of the vehicle direction when we apply brake the sprocket connected with the main transmission sprocket gets rotate in opposite direction. This rotation disturbs the spring tension in the opposite direction of the vehicle moment. This spring tension gradually delivers to the rear wheel. So the forward moments of the wheel as well as the transmission system are gradually decreases. The vehicle becomes stopping condition without any injury.

X. CONCLUSION

By producing artificial inertia to the transmission system and to the rear wheels we surely reduce the vehicle speed and also the stopping distance. From the above concept we first try to slow down the vehicle speed in fractions of seconds then we fully stop the vehicle. The gradual retardation of the vehicle never made injury may it is in high speed motion.

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