June 6, 1961 H. J. BUTLER Re. 24,996

DISC BRAKES

Original Filed Feb. 25, 1957

2 Sheets-Sheet 1

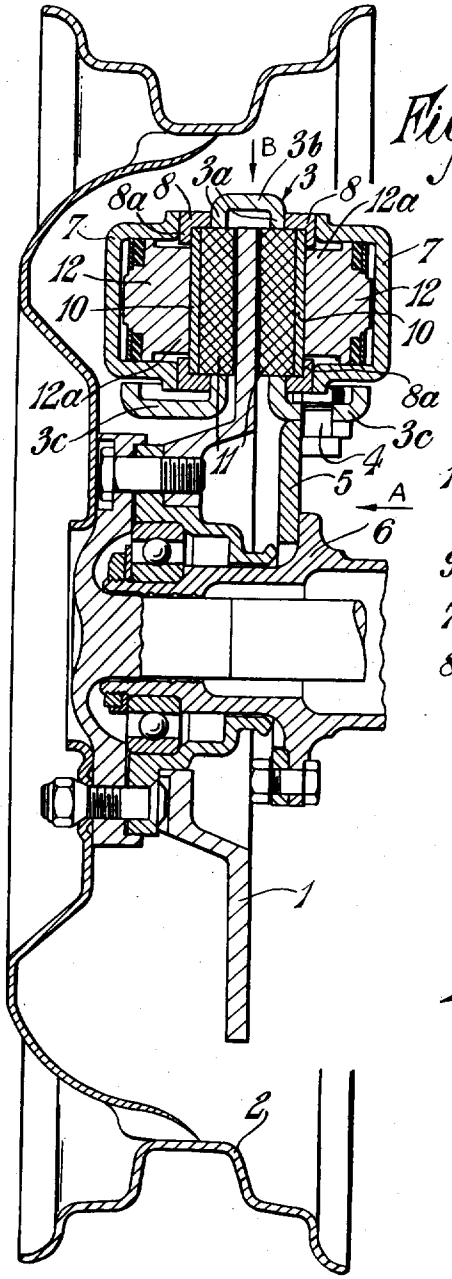


Fig. 1.

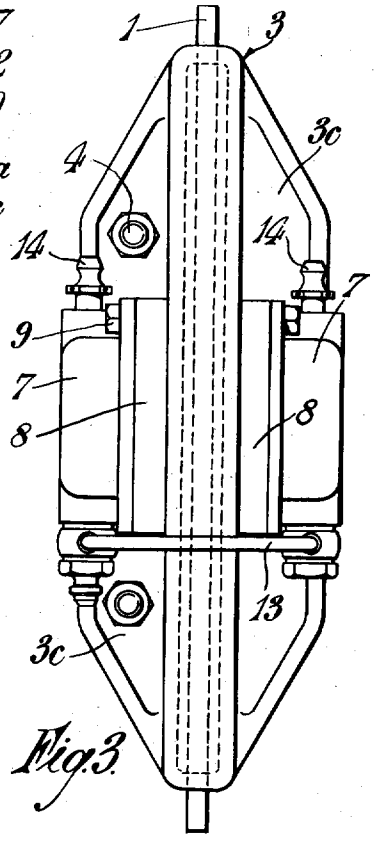


Fig. 3.

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DISC BRAKES

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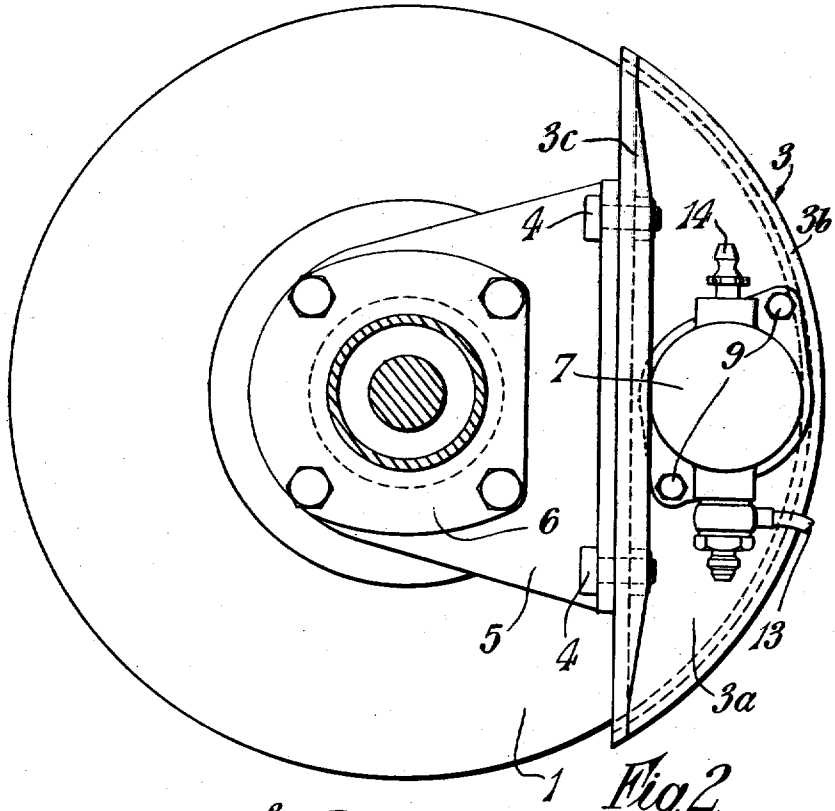


Fig. 2.

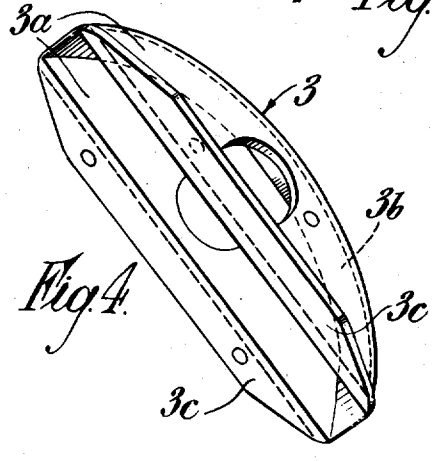


Fig. 4.

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DISC BRAKES

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Original No. 2,894,607, dated July 14, 1959, Ser. No. 642,110, Feb. 25, 1957. Application for reissue Apr. 21, 1960, Ser. No. 23,864

22 Claims. (Cl. 188—73)

Matter enclosed in heavy brackets [ ] appears in the original patent but forms no part of this reissue specification; matter printed in italics indicates the additions made by reissue.

This invention relates to disc brakes of the type comprising a rotatable disc, pads of friction material axially aligned one on each side of the disc to frictionally engage said disc and a mechanism to effect said engagement, and includes disc brakes of the type described in our pending U.S. specification Ser. No. 207,148 filed January 22, 1951, now Patent No. 2,790,516, which comprises a rotatable disc, axially-aligned friction pads one on each side of the disc and a fluid pressure mechanism on each side of the disc to force said friction pads into frictional contact with the disc.

The friction pads and fluid pressure mechanism are carried by a housing which straddles a periphery of the disc and hitherto this housing has usually been machined from a solid block of metal. This method is expensive and also the housing is heavy, which is undesirable when the brake is for use in a vehicle.

Sheet metal housings of arcuate shape have also been proposed, but these require reinforcing with U-shaped ribs to give them the necessary stiffness. This not only increases the cost of production but increases the radial depth of the housing so that, to incorporate such a brake into a wheel of given size, a smaller disc must be employed, thus reducing the efficiency of the brake.

The object of the present invention is to provide a disc brake construction comprising an improved housing which is robust, light in weight and economical to manufacture.

According to the present invention a disc brake comprises a rotatable disc, a non-rotatable housing straddling a periphery of the disc, pads of friction material to frictionally engage the braking surfaces of the disc and means to effect said frictional engagement, wherein said housing comprises a one-piece pressing or stamping of segmental shape enclosing a portion of the disc and the chordwise edges of said housing are provided with reinforcing flanges.

The housing preferably comprises a pair of segmental radially-extending sides each located adjacent a braking surface of the disc and an integral arcuate portion adjacent the outer periphery of the disc. Said arcuate portion may conveniently be slotted to assist cooling of the disc. The reinforcing members preferably comprise integral outwardly-extending flanges, one of which is used to secure the housing to a non-rotatable part of the wheel assembly.

Preferably both of the two radially extending sides of the housing are provided centrally with holes through which cylindrical pads of friction material are slidable to frictionally engage the braking surfaces of the disc. The means to effect said frictional engagement may comprise a lever mechanism actuated by a fluid pressure operated mechanism situated adjacent the outer periphery of the housing. Preferably, however, cylinders are detachably secured to the peripheries of said holes and the friction pads are slidable therein and are urged into frictional contact with the disc by fluid pressure operated plungers working in said cylinders. The cylinders may be provided at one end with annular flanges whereby they may be secured to the housing and they may themselves comprise one-piece pressings or stampings.

The annular disc may be axially slidable within the housing, and in this case only one radially extending wall of the housing may be provided with a hole through which a pad of friction material is axially slidable under the action of operating means to force the axially slidable disc into engagement with a pad of friction material secured to the other wall of the housing.

In order that the invention may be more fully described, reference is made to the accompanying drawings, of which:

FIG. 1 is a section through a wheel and disc brake assembly constructed in accordance with the invention.

FIG. 2 is a view of the brake assembly in the direction of the arrow A of FIG. 1.

FIG. 3 is a view of the brake assembly in the direction of the arrow B of FIG. 1.

FIG. 4 is a perspective view of the brake housing.

A disc brake constructed in accordance with one embodiment of the present invention comprises an annular disc **1** secured at its inner periphery to rotate with a vehicle wheel **2**. Enclosing a part only, of the order of one-quarter of the braking surfaces of the disc, is a housing **3** comprising two segmental radially-extending sides **3a** and an integral arcuated peripheral portion **3b** located adjacent the outer periphery of the disc. The chordwise edges of the housing are each provided with a stiffening flange **3c** which extends axially outwardly away from the disc and is further stiffened by being lipped radially-outwardly at its outer edge. The flanges **3c** are shaped as shown at Fig. 3 to provide the greatest stiffening effect at the center of the chordwise edges of the housing. One of the flanges is provided with a pair of holes whereby the housing is secured by a nut and bolt assembly **4** to a torque plate **5** secured to a non-rotatable part **6** of the wheel axle.

Each segmental radially-extending side of the housing is provided centrally with a circular hole to the periphery of which detachable cylinders **7** are secured, said cylinders thus being axially-aligned one on each side of the disc. Each cylinder is closed at its outer end and flanged at its inner end, said flanges being secured, through an annular, similarly flanged collar **8**, to the housing by nut and bolt assemblies **9**. The internal diameter of the collar **8** is the same as the diameter of the hole in the housing and the end of the collar remote from the disc is provided with an inwardly-extending annular flange **8a**. This flange forms an abutment for a circular pressure plate **10** slidable in said collar and secured to said pressure plate and axially slidable through holes in the collar and the housing is a circular pad of friction material **11**, one side thereof being adapted to frictionally engage an adjacent face of the disc.

A piston **12** is fluid-tightly slidable in each cylinder, said piston being provided on one side with an extension **12a** to abut the pressure plate **10**. The closed outer end of each cylinder is connected by a pipe **13** and are each provided with a fluid-pressure connection **14** leading to a source of fluid-pressure, e.g. a master cylinder (not illustrated).

On pressurizing the system by, e.g. operating the master cylinder, the two pistons are forced axially inwardly toward the disc, thus forcing the friction pads into frictional contact with the disc to decelerate the wheel. Circumferential movement of the friction pads on braking is prevented by the bearing surface together provided by the collar and the housing.

The housing is preferably a one-piece pressing which is easily fabricated, needs no machining and is light and economical to produce. Owing to its shape it is stiff and robust and needs no further reinforcing members. The

cylinders may also be one-piece pressings. Two or more cylinders may be secured to each side of the housing and the friction pads may, e.g. be of arcuate shape and slide in arcuate holes in the housing and collars.

The housing need not necessarily comprise a one-piece pressing; e.g. the chordwise flanges could be welded or otherwise secured to the housing.

Instead of the piston and cylinder mechanism herein illustrated and described, the brake may be operated mechanically, e.g. through a lever mechanism.

Having now described my invention, what I claim is:

1. A disc brake comprising a rotatable disc; a non-rotatable housing straddling a periphery of the disc, said housing comprising a pair of spaced side walls of segmental shape having a chordwise edge, an arcuate wall integrally connecting the arcuate outer edges of said side walls from one end of said chordwise edge to the other end thereof, and a pair of reinforcing ribs one for each said side walls and integral therewith and extending chordwise alongside the chordwise edge of said side walls to define a segmental area between said reinforcement and said arcuate wall; pads of friction material within said segmental area to engage frictionally the braking surfaces of the disc and means mounted on said side walls of said housing within said segmental area to effect said frictional engagement.

2. A disc brake according to claim 1 wherein the radially extending sides of the housing are provided with axially-aligned holes through which friction pads are axially slidable to frictionally engage opposite sides of the disc.

3. A disc brake according to claim 2 wherein a collar is located at the periphery of each of said holes to provide an increased bearing surface for the pads when the brake is applied.

4. A disc brake according to claim 1 wherein a fluid-pressure operated piston and cylinder mechanism is associated with each of said pads to force them into frictional engagement with the disc.

5. A disk brake according to claim 1 wherein the friction pads are cylindrical and the holes through the housing and collars are circular.

6. The disc brake of claim 1 in which said reinforcing ribs are at the chordwise edge of said spaced side walls.

7. The disc brake of claim 1 in which said reinforcement rib is bowed outwardly from its respective side wall to a greater width midway between the ends of said rib to impart greater stiffness thereto.

8. The disc brake of claim 1 in which said reinforcement rib has a flanged outer edge.

9. The disc brake of claim 1 in which said housing and reinforcement are of stamped sheet metal.

10. The disc brake of claim 1 comprising a torque plate having a flange rigidly secured to said reinforcement rib of one of said side walls.

11. A disc brake comprising a rotatable disc, a non-rotatable housing straddling a periphery of the disc, said housing comprising a pair of spaced side walls of segmental shape and having a chordwise edge and an arcuate wall integrally connecting the arcuate outer edges of said side walls from one end of said chordwise edge to the other end thereof, and a pair of reinforcing ribs one for each said side walls and integral therewith and extending chordwise alongside the chordwise edge of said side walls to define a segmental area between said reinforcement and said arcuate wall, said housing being free of stiffening ribs extending about said arcuate wall and inwardly of said side walls transverse to said chordwise reinforcement, pads of friction material within said segmental area to engage frictionally the braking surfaces of the disc and means mounted on said side walls of the housing within said segmental area to effect said frictional engagement.

12. A disc brake comprising a rotatable disc, a non-rotatable structure comprising a pair of supporting elements one on each side of and spaced from a radial side of said disc and extending on a common chord of said disc to project beyond the periphery of said disc and united to each other beyond said periphery to a rigid unitary structure, side supports rigidly fixed on said supporting elements one on each side of and spaced from said disc and extending from the side of said supporting elements remote from the axis of said disc to a distance beyond the periphery of said disc and joined together beyond the periphery of said disc, a pair of friction pads one on each side of said disc slidably mounted on said side to move to and from said disc and means supported on said side supports to move said friction elements into frictional engagement with the sides of said disc.

13. A disc brake comprising a rotatable disc, a non-rotatable housing straddling the periphery of said disc and comprising a pair of chordal plates one on each side of said disc in a chordwise plane normal to the plane of said disc and extending at each end beyond the periphery of the disc and integrally united at their ends beyond the periphery of the disc, face plates one on each side of and spaced from said disc and rigidly joined to the side of said chordal plate remote from the axis of said disc and extending in a direction away from the axis of said disc to a distance beyond the periphery of said disc and means joining said face plates beyond the periphery of the disc, said face plates having guide passages, a friction element guided by said guide passage in each face plate to move to and from frictional engagement with said disc and actuating means mounted on said face plates to move said friction pads to and from engagement with said disc.

14. A disc brake comprising a rotatable disc, a non-rotatable housing straddling the periphery of said disc and comprising sides extending toward the axis of said disc, pads of friction material slidably mounted on said sides of said housing to move towards said disc, means operable to force said friction pads into frictional engagement with opposite sides of said disc and a base plate completely encircling the periphery and radial sides of said disc on a chord thereof, the radially inner ends of the sides of said housing being rigidly secured to said base plate on opposite sides of said disc.

15. A fluid pressure operated disc brake comprising a rotatable disc, a rigid non-rotatable slotted base plate completely encircling the disc on a chord thereof with the edges of the slot close to the surfaces of the disc, a housing having sides rigidly mounted at their ends nearest the axis of said disc on the face of the base plate remote from the center of the disc and located on opposite sides of the slot in the base plate, a friction pad slidably mounted on each side of said housing to slide toward said disc, means for moving said pads into frictional engagement with the sides of said housing and located outside the periphery of the disc.

16. A disc brake according to claim 15 in which the friction pads are supported by the housings for axial movement towards and from said disc.

17. A disc brake comprising a rotatable disc, a friction element on each side of said disc movable to and from engagement with the adjacent radial face of said disc, means to move said friction elements into frictional contact with the adjacent radial faces of said disc, and a stationary supporting means for said friction elements and said moving means, said supporting means comprising a plate element on each side of said disc in a common plane perpendicular to the said radial faces and chordwise to said disc, the plate elements on opposite sides of said disc being joined to each other beyond the periphery of said disc and a housing having sides on opposite sides of said disc and each rigidly mounted at the ends nearest to the axis of said disc on one of said plate elements and projecting in a direction away from the axis of the disc and united beyond the periphery of said disc, said friction elements and said friction moving elements being mounted on said sides of said housing.

18. The disc brake of claim 17 in which said sides are

plate elements in planes paralleling the radial surfaces of said disc.

19. The disc brake of claim 17 in which each of said perpendicular plate elements has a flange at its edge farthest from said disc.

20. The disc brake of claim 18 in which the sides of said housing are integral with said perpendicular plate elements.

21. The disc brake of claim 18 in which said sides of said housing are integrally joined beyond the periphery of said disc.

22. The disc brake of claim 18 in which said sides of said housing are joined in an arc.

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