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Stimson et al.

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[54] **WHEEL ASSEMBLIES**

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[73] Assignee: **Dunlop Limited**, London, England

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[30] **Foreign Application Priority Data**

July 27, 1971 Great Britain 35228/71

[52] **U.S. Cl.** ..... **301/6 A**, 192/55, 192/70.17, 301/6 D, 301/6 E

[51] **Int. Cl.** **B60b 19/00**

[58] **Field of Search** ..... 301/6 R, 6 D, 6 WB, 6 A, 301/6 CS, 6 E; 188/71.5; 192/70.2, 55, 70.17

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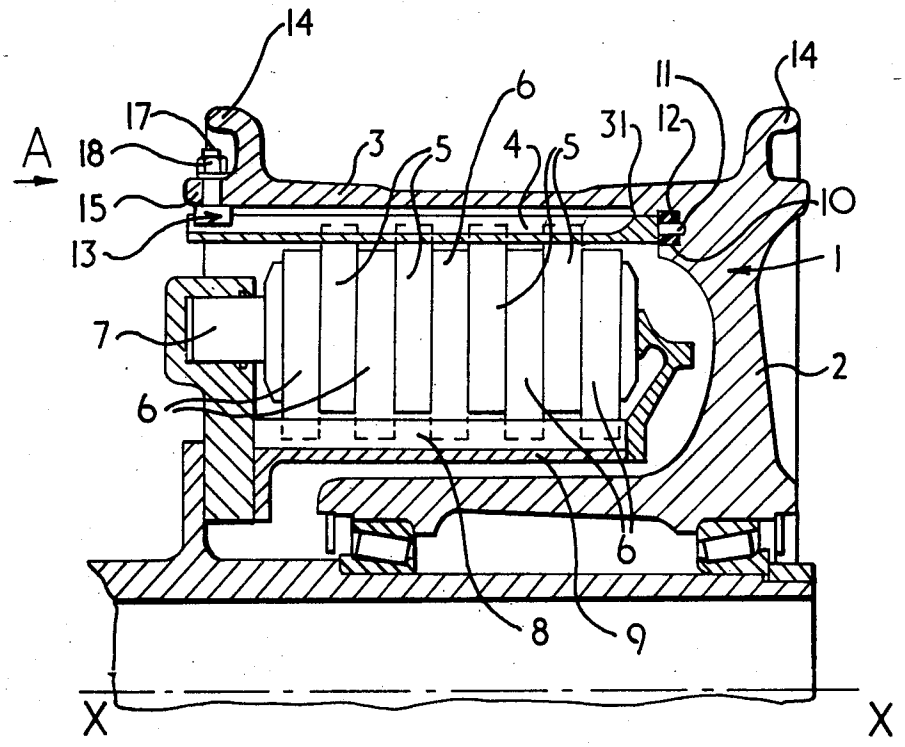
[57] **ABSTRACT**

A wheel assembly comprising a wheel having disc and rim portions and a drive means in the form of a number of circumferentially spaced drive dogs resiliently mounted adjacent the inner periphery of the rim portion of the wheel and arranged to extend substantially parallel to the intended axis of rotation of the wheel.

14 Claims, 10 Drawing Figures



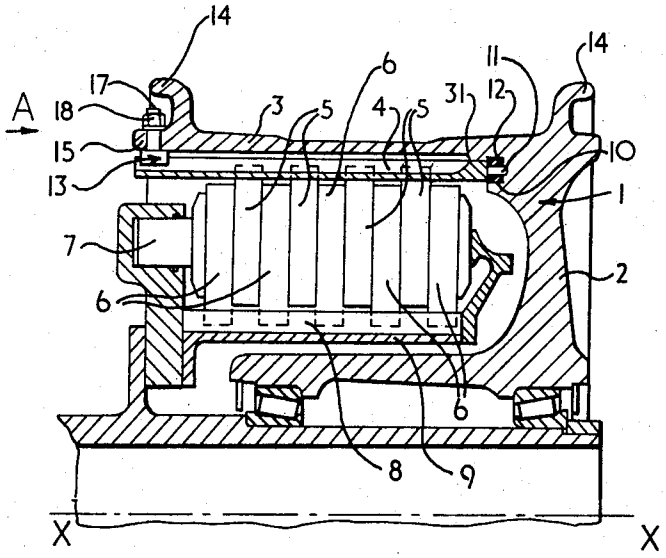


FIG. 1

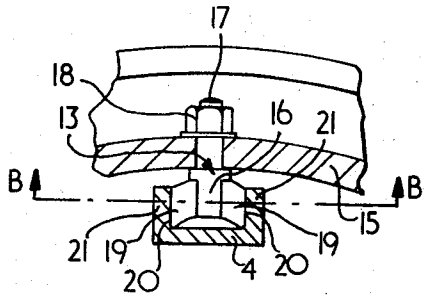


FIG. 2.

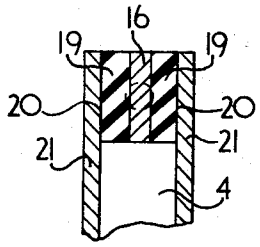


FIG. 3.

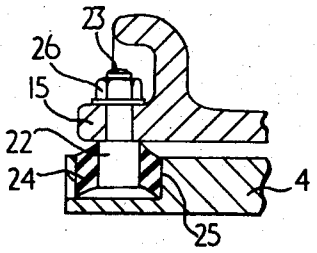


FIG. 4.

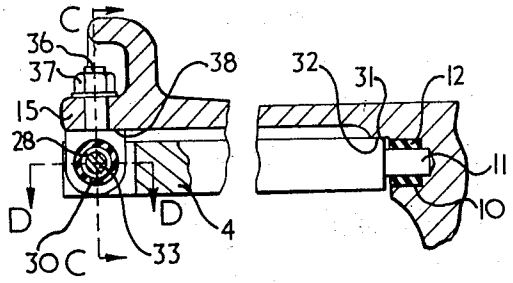


FIG. 5

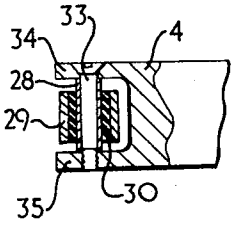


FIG. 7

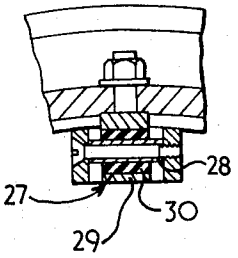


FIG. 6

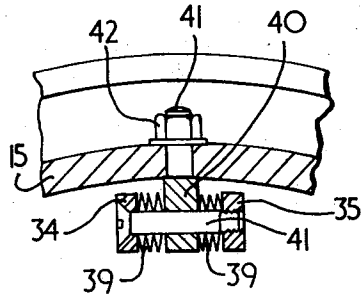


FIG.8.

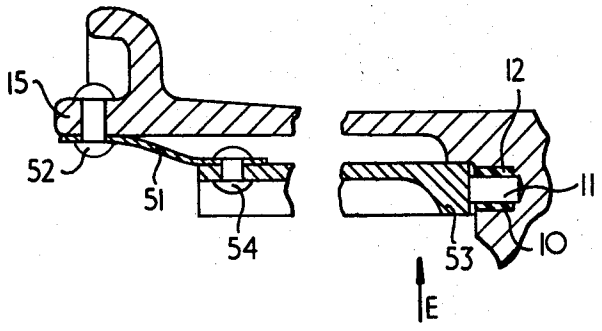


FIG.9.

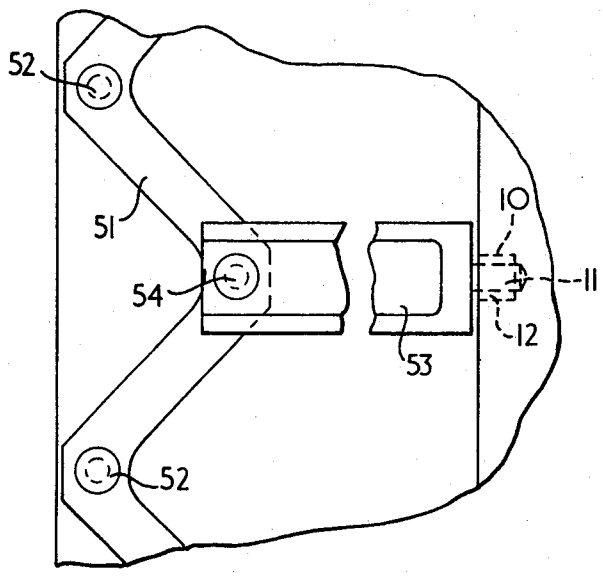


FIG. 10.

WHEEL ASSEMBLIES

This invention relates to wheel assemblies and particularly to aircraft wheel assemblies in which drive dogs are fastened to the inner periphery of the wheel rim to key with notches formed in the outer peripheries of associated brake rotors.

In certain kinds of aircraft brake, drive dogs of the kind described above have been found to cause damage to the rotors, and this effect is seen particularly when brake rotors of fragile materials such as carbon or beryllium are employed.

One object of the present invention is to provide a wheel assembly incorporating a drive dog construction which is less likely to cause damage to the brake rotors than conventional drive dog arrangements.

According to the invention, a wheel assembly comprises a wheel having disc and rim portions and a drive means in the form of a number of circumferentially spaced drive dogs resiliently mounted adjacent the inner periphery of the rim portion of the wheel and arranged to extend substantially parallel to the intended axis of rotation of the wheel.

Several embodiments of the invention will now be described, by way of example, with reference to FIGS. **1** to **18** of the accompanying drawings in which:

FIG. **1** shows a radial half section through a wheel assembly in accordance with the present invention;

FIG. **2** is an end view in the direction of arrow A of FIG. **1**;

FIG. **3** is a sectional view on the line B—B of FIG. **2**;

FIG. **4** is a sectional view of part of an alternative wheel assembly in accordance with the present invention;

FIG. **5** is a radial section of part of a further alternative wheel assembly in accordance with the present invention;

FIG. **6** is a sectional view on the line C—C of FIG. **5**;

FIG. **7** is a sectional view on the line D—D of FIG. **5**

FIG. **8** is a sectional view taken on the same plane as FIG. **6** and illustrating portions of a further wheel assembly; in accordance with the present invention;

FIG. **9** is a radial section of part of a still further wheel assembly in accordance with the present invention;

FIG. **10** is a view in the direction of the arrow E of FIG. **9**;

An aircraft wheel assembly, as shown in FIGS. **1** to **3**, comprises an aircraft wheel **1** having a disc portion **2**, a rim portion **3** provided with tire bead retaining flanges **14** and a number of circumferentially spaced drive dogs **4** resiliently mounted on the wheel adjacent the inner periphery of the wheel rim **3** and arranged to extend substantially parallel to the intended axis of rotation X—X of the wheel.

A brake assembly mounted radially within the wheel rim comprises a series of interleaved rotor and stator discs **5** and **6** in a generally conventional arrangement which incorporates a series of circumferentially-spaced hydraulic actuating piston and cylinder assemblies **7** for squeezing the assembly of discs axially in order to apply the brake.

The rotor and stator discs are of carbon based material, for example carbon fibre reinforced carbon, and

are annular in form. The stator discs **6** are formed with notches on their inner peripheries for engagement with keys **8** formed on an axially extending torque tube **9**, and the rotor discs **5** are formed with notches at their outer peripheries for engagement with the drive dogs **4** attached to the wheel.

Each drive dog **4** is secured at one end in a socket **10** formed in the disc portion of the wheel adjacent the rim, the drive dog having a spigot **11** entering a resilient bush **12**, which can be formed from natural or synthetic rubber, mounted in the socket. The drive dog is of generally rectangular channel section having the open side of the channel facing towards the rim, and at its end remote from the wheel disc a resilient rectangular rubber shear mounting **13** is provided by means of which the drive dog is secured to a portion **15** of the wheel rim which projects axially outwardly beyond adjacent tyre beadretaining flange **14**.

The rubber shear mounting **13** comprises a central metal block **16** secured to the rim by means of an integral screw **17** and a nut **18**, and having a pair of rubber blocks **19** bonded one to each side of the metal block and to the inside faces **20** of the substantially radially extending walls **21** of the associated end of the channel.

In an alternative construction, shown in FIG. **4**, the rectangular rubber shear mounting **13** is replaced by a circular shear mounting comprising a central metal peg **22** provided with an integral screw **33** and bonded to an outer annular rubber block **24**. Block **24** is bonded in a socket **25** formed in the drive dog and the shear mounting is secured to the portion **15** of the wheel rim by a nut **26** which engages screw **23**.

In operation, wheel assemblies of the kind described above may, for example on touch-down, be subjected to radial deflection of the wheel rim which causes it to assume a slightly oval shape flattened in the lower portion of the wheel. This distortion causes the drive dogs on the vertical diameter (the 6 o'clock and 12 o'clock positions) to be moved radially inwardly, while drive dogs near the 4 o'clock or 8 o'clock positions will be moved radially outwardly. Dogs in other positions will be moved in both radial and circumferential directions and will also be caused to twist about their axes. Movements of these kinds, in dogs which are rigidly attached to the wheel rim, have been found to cause considerable damage to the disc structure when used with discs formed from relatively fragile materials such as carbon and may also cause binding of the discs on the drive dogs. It has been found that by employing resilient mountings of the kind described above, sufficient tolerance to radial movement of the disc rim can be provided to enable such damage and binding to be greatly reduced or eliminated.

The twisting of the drive dogs about their axes may be prevented by keying the dogs against rotation at their ends which are secured to the wheel disc. This may be effected for example by providing abutment surfaces **31** on the wheel for engagement by corresponding abutment surfaces **32** formed on each dog adjacent the joint at which the dog enters the associated socket **10** in the wheel disc.

In the arrangements described above the movements of the wheel rim are accommodated largely by radial movement of the ends of the dogs secured to the wheel rim, although a degree of circumferential movement may also be permitted by the shear mountings. In an al-

ternative arrangement now to be described the necessary compliance may be wholly or partially circumferential.

One way in which circumferential compliance may be provided using rubber mountings is shown in FIGS. 5 to 7. In this arrangement the end of the drive dog remote from the wheel disc is mounted on the wheel rim by means of an annular rubber and metal mounting **27** comprising inner and outer metal sleeves **28** and **29** and an intermediate annular rubber member **30** bonded therebetween.

The longitudinal axis of the mounting **27** is arranged to extend substantially circumferentially, that is at right angles to the longitudinal axis of the drive dog, and the mounting is secured within a forked portion of the drive dog by a screw **33** which passes through inner sleeve **28** and engages the arms **34** and **35** of the forked portion of the drive dog. The mounting is secured to the extended portion **15** of the wheel rim by means of an integrally formed screw **36** and a nut **37.** Outer sleeve **29** is provided with a flat abutment surface **38** for clamping engagement with the wheel rim.

In an alternative arrangement, shown in FIG. **8,** for providing circumferential compliance the rubber mounting **27** is replaced by two compression springs **39,** e.g. Belleville washers, flanking a metal block **40,** slidably mounted on a screw **41** spanning the arms **34** and **35** of the fork portion of the drive dog. The metal block is secured to the extended portion **15** of the wheel rim by an integrally formed screw **41** and a nut **42.**

In a further alternative mounting arrangement shown in FIGS. **10** and **11** the ends of the drive dogs remote from the disc portion of the wheel are secured to a continuous metal strip **51** (or series of strips) which extend around the inner circumference of the rim extension **15** and is secured thereto at a series of positions intermediate the dogs. The portion of the strip associated with each dog is of V-shaped form, the ends of the arms of each V-shaped portion being secured to the wheel rim extension **15** by rivets **52** and the apex of the V-shaped portion being arranged to extend towards the wheel disc and being secured to each drive dog **53** by a rivet **54.** The V-shaped portion is also bent radially inwardly towards its apex, and thus provides a radially flexible mounting which is also capable of limited circumferential compliance. The strip may be arranged in various alternative forms (not shown), for example the apices of the V-shaped portions may be linked by a circumferential strip which may be integral with the V-shaped portions.

Although in all the mounting arrangements described above the drive dogs are resiliently mounted at one end on the wheel rim and the other end on the wheel disc it will be understood by those skilled in the art that both ends of the drive dogs could alternatively be resiliently mounted on the wheel rim.

Having now described our invention — what we claim is:

1. A wheel assembly comprising a wheel having disc and rim portions, drive means consisting of a number of circumferentially spaced drive dogs disposed adjacent the inner periphery of the rim portion of said wheel and arranged to extend substantially parallel to the axis of rotation of said wheel, and means for resiliently mounting each dog to said wheel and comprising at least one resilient element disposed between the wheel and the respective one of said drive dogs.

2. A wheel assembly according to claim **1** in which the drive dogs are resiliently mounted at one end on the rim portion of the wheel and at the other end on the disc portion of the wheel.

3. A wheel assembly according to claim **1** in which the drive dogs are resiliently mounted at both ends on the rim portion of the wheel.

4. A wheel assembly according to claim **1** in which each drive dog is resiliently mounted on the wheel by means of at least one rubber element disposed between the drive dog and the wheel.

5. A wheel assembly according to claim **1** in which the ends of the drive dogs adjacent the disc portion of the wheel are each mounted on the wheel by means of a spigot arranged to enter a rubber bush mounted in a socket formed in the disc portion of the wheel.

6. A wheel assembly according to claim **1** in which the ends of the drive dogs remote from the disc portion of the wheel are each mounted on the wheel by means of a rubber shear mounting comprising a central metal block, secured to the rim portion of the wheel and a pair of outer rubber blocks bonded to the metal block and drive dog one on each side of the metal block.

7. A wheel assembly according to claim **6** in which the drive dogs are of a generally rectangular channel section with the open side of the channel facing the rim portion of the wheel and the rubber blocks of the shear mounting are bonded to the inside faces of the substantially radially extending walls of the channel.

8. A wheel assembly according to claim **1** in which the ends of the drive dogs remote from the disc portion of the wheel are each mounted on the wheel by means of a rubber shear mounting comprising a central metal peg secured to the rim portion of the wheel and an outer annular rubber block bonded to the peg and to the drive dog.

9. A wheel assembly according to claim **1** in which the ends of the drive dogs remote from the disc portion of the wheel are each mounted on the wheel by means of an annular rubber and metal mount comprising inner and outer metal sleeves with an intermediate annular rubber member bonded therebetween, the longitudinal axis of the mount being arranged to extend substantially circumferentially with respect to the wheel and the outer sleeve being secured to the wheel rim and the inner sleeve to the drive dog.

10. A wheel assembly accordig to claim **1** in which the ends of the drive dogs remote from the disc portion of the wheel are each mounted on the wheel by means of two compression springs mounted one on each side of a metal block, the longitudinal axes of the springs being arranged to extend substantially circumferentially with respect to the wheel, the block being secured to the rim portion of the wheel and the springs being arranged to act between the drive dog and the block.

11. A wheel assembly according to claim **1** in which the ends of the drive dogs remote from the disc portion of the wheel are each mounted on the wheel by means of a flexible strip of metal secured to the drive dog and to the rim portion of the wheel.

12. A wheel assembly according to claim **11** in which a continuous strip of metal extends around the inner circumference of the rim portion of the wheel, the

drive dogs being secured to the strip at circumferentially spaced positions.

13. A wheel assembly according to claim **12** in which the portion of the strip associated with each drive dog is of V-shaped form, the ends of the arms of the V-shaped portion being secured to the rim portion of the wheel and the apex of the V-shaped portion being arranged to extend towards the disc portion of the wheel and being secured to the drive dog.

14. The wheel assembly in accordance with claim **1** wherein said resilient element provides both radial and circumferential movement of each said drive dog to prevent damage to the disc structure.

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