Aug. 8, 1944. C. S. ASH 2,355,133

DUAL WHEEL ASSEMBLY

Filed Oct. 12, 1940 3 Sheets-Sheet 1

Fig 1

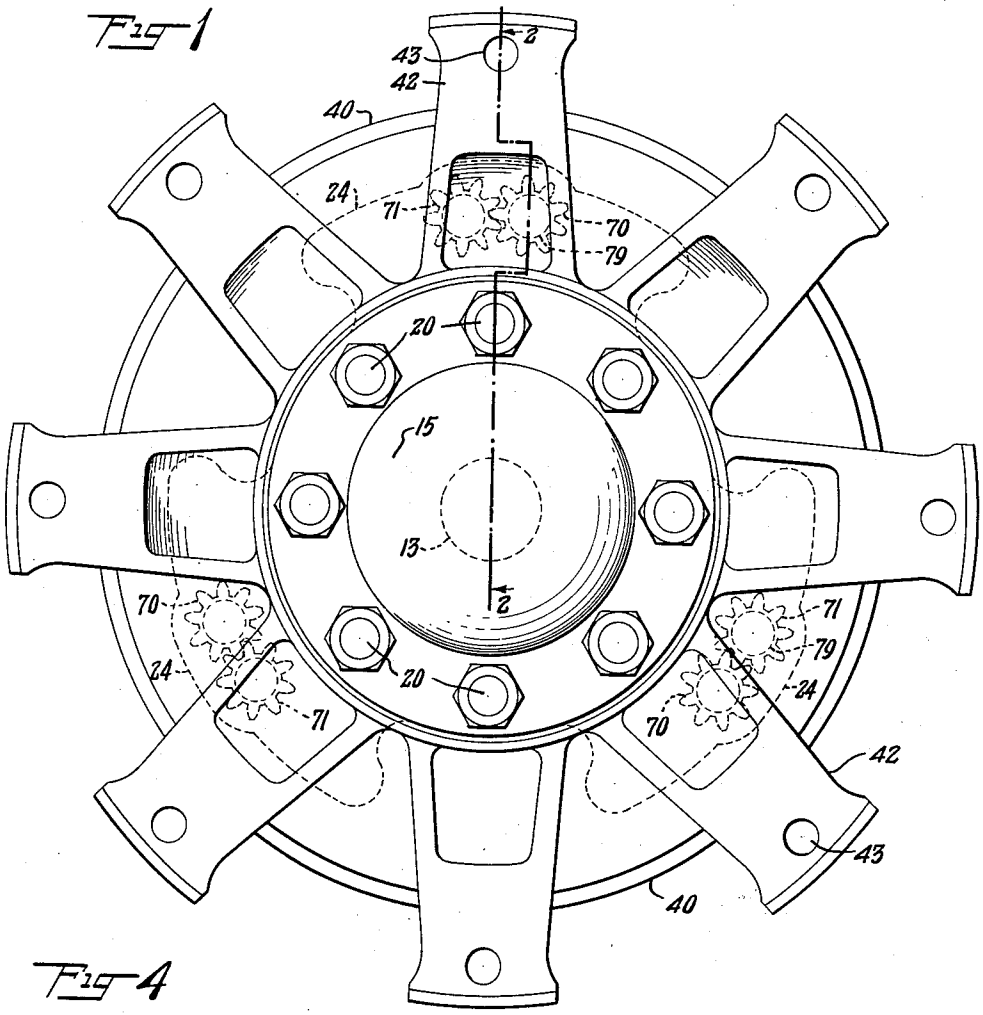
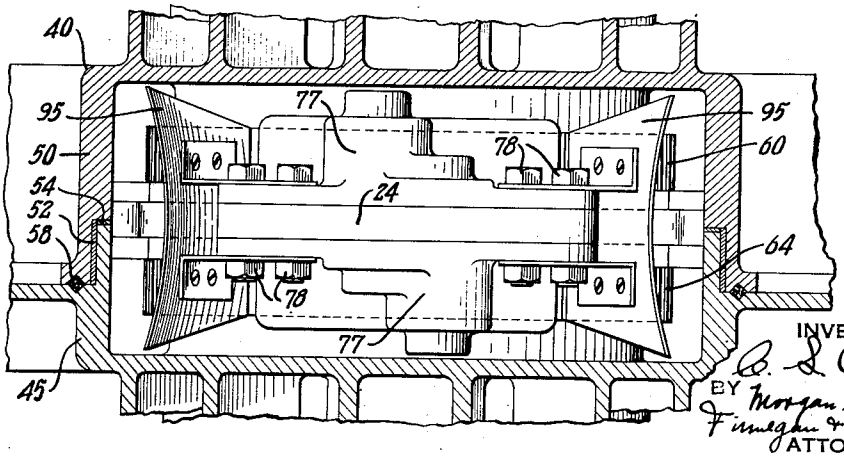


Fig 4



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DUAL WHEEL ASSEMBLY

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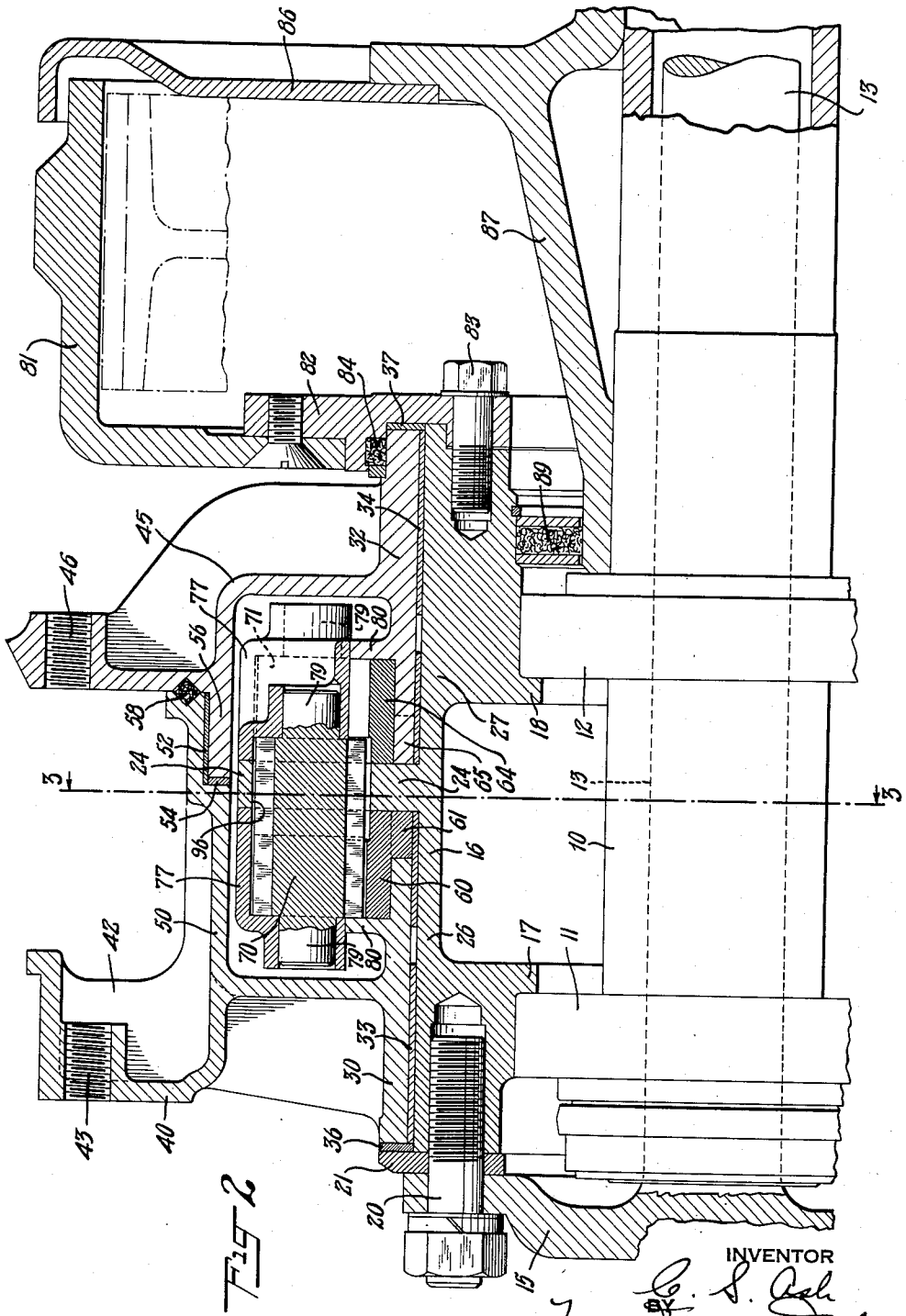


Fig. 2

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DUAL WHEEL ASSEMBLY

Filed Oct. 12, 1940 3 Sheets-Sheet 3

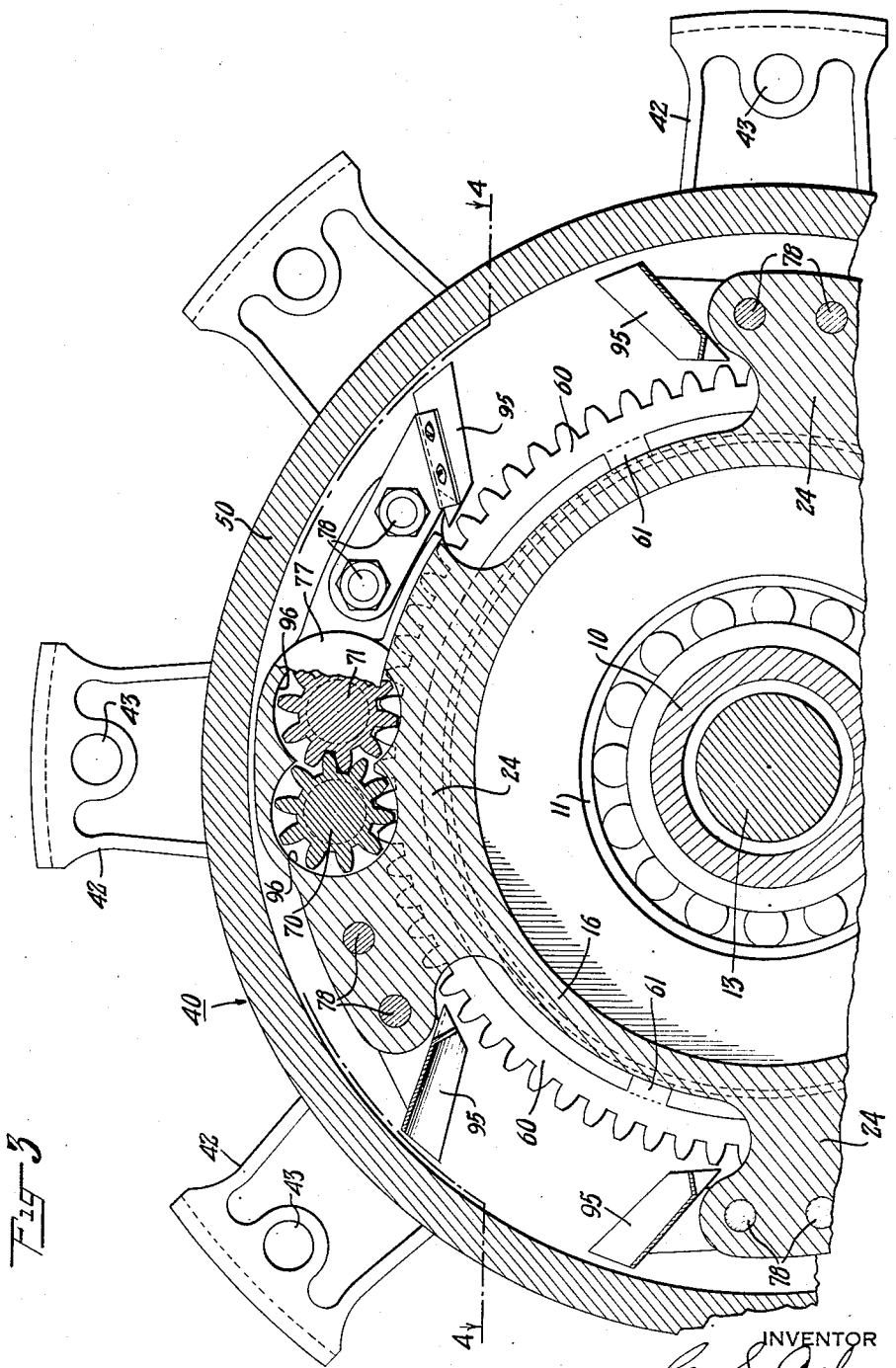


Fig. 3

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2,355,133

DUAL WHEEL ASSEMBLY

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Application October 12, 1940, Serial No. 360,881

12 Claims. (Cl. 180—22)

The present invention relates to new and useful improvements in dual wheel assemblies and more particularly to improvements in driven dual wheel assemblies for automative vehicles.

Objects and advantages of the invention will be set forth in part hereinafter and in part will be obvious herefrom, or may be learned by practice with the invention, the same being realized and attained by means of the instrumentalities and combinations pointed out in the appended claims.

The invention consists in the novel parts, constructions, arrangements, combinations and improvements herein shown and described.

The accompanying drawings, referred to herein and constituting a part hereof, illustrate an embodiment of the invention, and together with the description, serve to explain the principles of the invention.

Of the drawings:

Figure 1 is a side elevation of a typical and illustrative embodiment of the present invention as applied to driven dual wheels of an automotive vehicle;

Figure 2 is a fragmentary diagrammatic sectional view taken on the line 2—2 of Figure 1;

Figure 3 is a fragmentary sectional view taken on the line 3—3 of Figure 2; and,

Figure 4 is a fragmentary sectional view taken on the arcuate line 4—4 of Figure 3.

The present invention is, in certain respects, an improvement upon the independently rotatable wheel construction shown in the patent to Angell, No. 1,959,147 of 1934, but in other respects the present invention is of wider application and may be applied to independently rotatable non-driven wheels as well as to independently rotatable dirigible wheels.

The present invention has for its object the provision of a novel and improved independently rotatable wheel construction in which an increased bearing area is provided without requiring an abnormal elongation of the hub.

The invention also provides an improved form of differential-gear driven dual wheels having a simplified gear construction which can better resist wear and can be produced more economically. Another object of the invention is the provision of driven dual wheel assembly having the wheels individually and independently driven which can be used as a replacement for conventional dual wheels without requiring extensive changes in the axle construction, and in many cases can be substituted for conventional driven dual wheels. A further object of the invention is the provision of an improved differential gear driven dual wheel construction in which spinning of either wheel independently of the other is substantially avoided. Still another object of the invention is the provision of an improved form of independently rotatable dual wheels driven by spur differential gearing in which an equal torque is applied to the wheels for driving and braking.

Referring now in detail to the accompanying drawings where the present invention is shown as incorporated in a non-dirigible dual wheel assembly of relatively heavy duty such as might be used for the rear wheels of a bus, truck or tractor, Figures 1 to 4 illustrate one embodiment of the invention, and as there shown, they are mounted on and used in connection with a conventional type of full-floating rear axle having an axle tube or housing 10, anti-friction bearings 11 and 12 and a drive shaft 13 which is flanged at its end to provide the driving flange 15. Rotatably supported by the bearings 11 and 12 is a relatively long cylindrical sleeve 16 which is held against axial movement by means of the shoulders 17 and 18 and is drivingly connected to the flange 15 by means of the cap screws 20 which also secure the thrust washer 21 in the position shown.

At either side of its central portion 24, the sleeve 16 is formed as cylindrical members 26 and 27 on which are journalled the cylindrically bored hubs 30 and 32 by means of the bushings 33 and 34, while the hubs 30 and 32 are held against axial movement, and their axial thrust is taken by means of the thrust washers 36 and 37.

Hub 30 is formed integrally with the wheel portion 40 forming the mounting member for the outer tire and supporting rim (not shown), and this wheel portion may comprise a plurality of radial spoke members 42 the ends of which are apertured and threaded, as as 43, to receive the rim mounting screws or bolts. Hub 32 is similarly formed with radially extending outward spokes 45 which are also provided with threaded apertures 46 to receive the mounting screws or bolts for the inner rim and tire (not shown).

In order to increase the bearing area, and to also increase the load carrying capacity of the bearing area, permitting easy independent rotation of the inner and outer wheels and hubs 30, 32, 40 and 45, mutual bearing surfaces are provided at a different diameter than the bushings 33 and 34, thereby more effectively resisting any tendency of one wheel to move out of parallelism with respect to the other wheel. As embodied, the outer wheel 40 is provided with an inwardly extending cylindrical portion 50 which is en-

larged and bored to receive a bushing 52 and a thrust washer 54 which are fitted to corresponding portions of the cylindrical extension 56 of the inner wheel 45. Thus the inner and outer wheels are mounted for independent rotation by means of their main bearings and are also held more accurately in proper alinement and are permitted freer relative rotation by means of the larger, telescoping, mutually journalled portions of their hub-like bodies.

Lubricant is retained within the bearings and hub portions of the wheels by means of the sealing packing strip 58 which is fitted into the registering grooves formed on the adjacent faces of the inner and outer wheels 45 and 40. The lubricant may also feed gradually to the bushings 33 and 34 and thrust washers 36 and 37.

When it is desired to have the wheels driven this may be accomplished by means of the construction of the illustrative embodiment of the invention where the driving sleeve 16 is formed with a central portion 24 which forms an interrupted disc-like ring integral with the sleeve and serves as the support for the differential pinion mechanisms by which power is transferred from the sleeve 16 to the wheels.

The outer wheel hub 30 is provided with a sun gear 60 formed as a wide faced ring gear and provided with inwardly projecting splines 61 by which the gear is secured to hub 30, while hub 32 is provided with a similar sun gear 64 splined by teeth 65 to the hub, the two sun gears being of the same pitch diameter and number of teeth.

The planetary pinions of each differential gear comprise the wide face meshing pinions 70 and 71, of which more than one pair may be provided. Pinions 70 mesh with the ring gear 60 but not with the ring gear 64, while the pinions 71 mesh with the ring gear 64 but not with the ring gear 60. Pinions 70 and 71, being in mesh with each other, revolve in opposite directions whenever there is any relative movement between the wheels 30 and 32 and their ring gears 60 and 64, respectively.

Means are provided for journalling the pinions 70 and 71 and for mounting them rotatably with respect to the sleeve 16 and ring 24 by which they are driven and revolve with respect to the ring gears 60 and 64 driven by them. As embodied, boxes 77 are provided, bolted to the ring 24 by means of bolts 78, each of these boxes being provided with bearings to receive the shaft ends or journals 79 of the pinions 70 and 71, the bearings being offset to keep the pinions 70 and 71 in mesh with each other and with their respective ring gears.

The central portions of the boxes 77 are finished for a relatively close fit with respect to the circular ribs 80 formed integrally with the hubs 30 and 32.

As the sleeve 16 is driven by axle 13, the boxes 77 are also driven positively driving the pinions 70 and 71 and transmitting power to the hubs 30 and 32 through ring gears 60 and 64. At the same time, however, due to the differential action of the pinions 70 and 71, and the ring gears 60 and 64, the pinions may revolve, with or without rotation, so as to permit relative rotation of the ring gears 60 and 64 and a corresponding rotation of the wheels 40 and 45.

Means are also provided for braking the wheels 40 and 45, and for this purpose a brake drum 81, to be retarded by means of any conventional brake shoes, is provided and is securely mounted on the inner end of the sleeve 16, being attached thereto by means of the circular member 82 mounted on the inner end of sleeve 16 by means of cap screws 83 and provided with a lubricant retaining packing ring 84 which prevents leakage between the member 82 and the inner end of hub 32. A brake anchor plate 86 and mounting bracket 87 are carried on the axle housing 10 and the space between the axle housing 10 and the inner end of the sleeve 16 is closed by means of a dust and lubricant seal 89.

In order to secure a more effective driving action of the wheels and to prevent excessive relative rotation of the wheels as might be caused by one wheel being lifted off the ground or by one wheel being on more slippery ground than the other, means are provided for restraining free action of the differential and at the same time insuring its adequate lubrication. These means comprise the plows 95 securely attached to the boxes 77 and the ring 24 which run in the lubricant filling the space surrounding the teeth of gears 60 and 64 and scrape the lubricant from the interior surfaces of the cylindrical portions 50 and 56, forcing this lubricant against and into the teeth of the gears 60 and 64 which feed the lubricant to the pinions 70 and 71. Pinions 70 and 71 are rather closely fitted in bores 96 formed in the ring 24 and the boxes 77 so that the pinions 70 and 71 act, together with the gears 60 and 64, as a gear pump tending to prevent free and unrestrained differential action and the extent of this restraint may be varied by varying the clearance between the teeth of pinions 70 and 71 and the bores 96. A pair of plows 95 are provided for each pair of pinions 70, 71 and these plows face in opposite directions so that the lubricant is directed into the gear teeth mesh regardless of the direction of relative rotation between the wheels and the planetary pinions.

The invention in its broader aspects is not limited to the specific mechanisms shown and described but departures may be made therefrom within the scope of the accompanying claims without departing from the principles of the invention and without sacrificing its chief advantages.

What I claim is:

1. In a dual wheel assembly the combination of an axle end, a pair of side-by-side, coaxial, relatively rotatable wheels mounted on the axle end, a driving member, a differential interconnecting the driving member and wheels and including a pair of spur ring gears, one secured to each wheel, and a pair of intermeshing spur pinions, one meshing with each ring gear to differentially drive the wheels from the driving member.

2. In a dual wheel assembly the combination of a pair of side-by-side, coaxial, relatively rotatable wheels, a driving member, differential gearing interconnecting the driving member and wheels, means for retaining lubricant about the differential gearing, and lubricant deflecting members within said last mentioned means and driven by the driving member for forcing lubricant into the meshes of the differential gearing.

3. In a dual wheel assembly the combination of a pair of side-by-side, coaxial, relatively rotatable wheels, a driving member, a differential interconnecting the driving member and wheels and including a pair of spur ring gears, one secured to each wheel, a pair of intermeshing spur pinions, one meshing with each ring gear to differentially drive the wheels from the driven member, a pinion support in which said pinions are journalled closely fitting said pinions and gears,

means for retaining lubricant about said gears and pinions, and lubricant deflecting members within said last mentioned means and driven by the driving member for forcing lubricant into the mesh of said pinions and gears.

4. In a dual wheel assembly the combination of an axle end, a pair of side-by-side, coaxial, relatively rotatable wheels mounted on the axle end, a driving member, a differential interconnecting the driving member and wheels and including a pair of spur ring gears, one secured to each wheel, a pair of intermeshing spur pinions, one meshing with each ring gear to differentially drive the wheels from the driven member, and a pinion support on the driving member and positioned between the wheels.

5. In a dual wheel assembly, the combination of an axle end, a pair of side-by-side, coaxial, relatively rotatable wheels mounted on the axle end, a driving member, a differential interconnecting the driving member and wheels and including a pair of spur ring gears of equal diameter, one secured to each wheel, a pair of intermeshing spur gears, each meshing with one ring gear only and means for drivingly connecting the spur gears and driving member.

6. In a dual wheel assembly, the combination of an axle and a pair of side-by-side, coaxial, relatively rotatable wheels mounted on the axle end, a driving member, a differential interconnecting the driving member and wheels and including a pair of spur ring gears of equal diameter, one secured to each wheel, a pair of intermeshing spur gears, each meshing with one ring gear only, and means for drivingly connecting the spur gears and driving member including a pinion support in which the pinions are journalled and carried by the driving member and between the wheels.

7. In a dual wheel assembly, the combination of a pair of relatively rotatable wheels, a driving member, a differential interconnecting the driving member and wheels and including a pair of spur ring gears of equal diameter, one secured to each wheel, a pair of intermeshing spur gears, each meshing with one ring gear only, and means for drivingly connecting the spur gears and driving member including a pinion support on the driving member, said support having bores closely fitting the pinions and toothed surface of the ring gears.

8. In a dual wheel assembly, the combination of a driven sleeve, a pair of spaced apart wheels independently rotatably journalled on the sleeve, an axially extending cylindrical member connected to each wheel and a differential gearing between the sleeve and wheels including a ring gear carried by each wheel, pinions meshing with the ring gears and carried by a ring between the wheels, said ring being integral with the sleeve and spacing said wheels apart by abutment with said respective cylindrical members.

9. In a dual wheel assembly, the combination of a driven sleeve, a pair of spaced-apart wheels having hub portions respectively journalled on the sleeve at the inner and outer ends thereof, a driving connection between the wheels and sleeve including a flange against which both wheels bear, removable flange members bolted to both ends of the sleeve and forming thrust members at the relatively outer ends of the hubs for holding the hubs against axial movement on the sleeve, one of said flange members having a cylindrical portion surrounding the adjacent hub end, a packing ring between said cylindrical portion of said flange and said hub, and thrust washers between the flange members and relatively outer ends of the hubs.

10. In a dual wheel assembly the combination of an axle end, a driven sleeve journaled on the axle end, a pair of relatively rotatable wheels journaled on the sleeve and a differential interconnecting the sleeve and wheels and including a pair of spur ring gears, one secured to each wheel, and a pair of intermeshing spur pinions carried by the sleeve, one meshing with each ring gear to differentially drive the wheels from the driven member.

11. In a dual wheel assembly, the combination of a pair of relatively rotatable wheels, a driving member, a differential interconnecting the driving member and wheels and including a pair of spur ring gears of equal diameter, one secured to each wheel, a pair of intermeshing spur pinions, each meshing with one ring gear only, means for drivingly connecting the spur pinions and driving member including a pinion support on the driving member, said support having bores closely fitting the pinions and toothed surface of the ring gears and lubricant deflecting members carried by the driving member for forcing lubricant into the meshes of said ring gears and pinions.

12. In a dual wheel assembly, the combination of a pair of relatively rotatable wheels, a driving member, a differential interconnecting the driving member and wheels and including a pair of spur ring gears of equal diameter, one secured to each wheel, a pair of intermeshing spur pinions, each meshing with one ring gear only, means for drivingly connecting the spur pinions and driving member including a pinion support on the driving member, said support having bores closely fitting the pinions and toothed surface of the ring gears, means for retaining lubricant about said pinions and ring gears, and lubricant deflecting members carried by the driving member for forcing lubricant into the meshes of said ring gears and pinions whereby independent rotation of the wheels is retarded.

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