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Roy et al.

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(54) **LUBRICATION SYSTEM**

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(58) **Field of Search** **184/6.12, 50.2, 184/55.1, 58, 59**

(56) **References Cited**

U.S. PATENT DOCUMENTS

2,541,129	2/1951	Taber et al. .	
3,877,547	4/1975	Willuweit et al. .	
4,027,743	* 6/1977	Deller et al.	184/6.4
4,448,285	5/1984	Burgbacher .	
4,511,016	4/1985	Doell .	
5,004,407	4/1991	Hutchison .	
5,188,196	2/1993	Mezzedimi .	
5,582,271	12/1996	Mielo .	
5,623,870	4/1997	Daniel .	
5,653,310	8/1997	Young .	
5,676,173	10/1997	Conrad et al. .	
5,709,627	* 1/1998	Teraoka	475/86
6,092,628	* 7/2000	Hinton et al.	184/6.22

* cited by examiner

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(57) **ABSTRACT**

A lubrication system includes a fluid reservoir, a housing having an interior with an inlet and an outlet fluidly coupled to the reservoir, a fluid pump configured to pump fluid from the reservoir to the interior of the housing through the inlet and a fluid conduit between the fluid pump and the inlet of the axle housing. The conduit has an inflow portion, an outflow portion, a throat and an aspiration passage. The inflow portion has a first cross sectional area. The outflow portion has a second cross sectional area. The throat extends between the inflow and outflow portions, has an exit proximate the outflow portion and has a third cross sectional area less than the first and second cross sectional areas. The aspiration passage extends from a location proximate the exit of the throat to a source of air. Fluid pumped through the first and second internal portions of the fluid conduit by the fluid pump draws air into the outflow portion through the aspiration passage to aerate the fluid. The aerated fluid expels fluid from the interior of the housing through the outlet and back to the fluid reservoir. A method for lubricating and cooling an axle within a housing includes the steps of pumping fluid from a reservoir through a first passage having a first cross sectional area, through a second adjacent passage having a second smaller cross sectional area and through a third passage having a third cross sectional area greater than the second cross sectional area to the interior of the housing. The method also includes the step of providing a source of air to the fluid after the fluid exits the second passage. Air is drawn into the fluid to aerate the fluid. The aerated fluid expels fluid from the interior of the housing to the fluid reservoir.

50 Claims, 8 Drawing Sheets

