Report of Eric H. Maslen, Ph.D.

Contents

1. Identity of the Author

My name is Eric H. Maslen. I reside at 910 Ridgewood Road, Harrisonburg, Virginia 22801. I am currently employed in the Department of Integrated Science and Technology of James Madison University where I have been a full professor and head of the department since 2010.

2. Prior Employment

From 1990 to 2010, I was a member of the faculty of the Department of Mechanical and Aerospace Engineering at the University of Virginia: an Assistant Professor from 1990 to 1995, an Associate Professor from 1995 to 2003, and a Professor from 2003 to 2010. From 1986 to 1990, I was employed as a Research Assistant in the ROMAC laboratories (Rotating Machinery and Controls) of the Department of Mechanical and Aerospace Engineering at the University of Virginia. From 1984 to 1985, I was employed as Acting Director of Research and Development by the Container Machinery Division of the Koppers Company. From 1983 to 1984, I served as a secondary school educator in Kenya for the United States Peace Corps. From 1980 to 1983, I was employed as a Research and Development engineer by the Container Machinery Division of the Koppers Company.

3. Education

I received my Ph. D. degree in Mechanical and Aerospace Engineering from the University of Virginia in January 1991 having completed and defended my doctoral dissertation prior to my employment by the same university in September 1990. I received my Bachelor of Science degree in Mechanical Engineering from Cornell University in January 1980.

4. Publication, Teaching, and Research

I have authored 54 refereed journal articles, 108 peer reviewed conference articles, and five book chapters. I have also edited one book on magnetic bearings and been awarded six patents. During my tenure as a professor, I have taught a range of courses including mechanical design and control. I have received numerous professional awards, been invited as a visiting professor to several universities, and have been a frequent speaker at technical seminars including several invited keynote presentations. My curriculum vitae is attached hereto, and includes a list of all publications I have authored or co-authored in the past ten years.

5. Compensation

Costco Wholesale Corporation is compensating me for the time spent in preparing and providing my opinion in this litigation at the hourly rate of $250.00.

6. Materials Considered in Forming My Opinions

In forming the opinions expressed in this Report, I have considered the patents and other published references cited in my Tutorial History of Windshield Wiper Development dated April 15, 2015, and the materials and experiments described below.

7. Objectives of This Report

I have been asked to consider the following questions:

(1) Whether the Goodyear Hybrid windshield wiper assembly lacks one or more of the structural elements that are described by claims 1 and 2 of U.S. Patent No. 6,836,926 (the " '926 patent");

(2) Whether the Goodyear Hybrid windshield wiper assembly lacks one or more of the structural elements that are described by claim 11 of U.S. Patent No. 6,611,988 (the " '988 patent");

(3) Whether the Goodyear Hybrid windshield wiper assembly lacks one or more of the structural elements that are described by claim 1 of U.S. Patent No. 6,553,607 (the " '607 patent");

(4) Whether the Goodyear Hybrid windshield wiper assembly lacks one or more of the structural elements that are described by claims 1, 18, or 21 of U.S. Patent No. 8,272,096 (the " '096 patent"); and

(5) What subject matter disclosed in the asserted patents' specifications and drawings is denoted by certain words or phrases appearing in certain claims, including

(a) "means for maintaining the clearance" (U.S. Patent No. 6,669,419 [the " '419 patent"]);

(b) "spherically curved window" (U.S. Patent No. 6,973,698 [the " '698 patent"]);

(c) "support means (58, 144)" (U.S. Patent No. 7,228,588 [the " '588 patent"]).

8. Claim 1 of U.S. Patent No. 6,826,926

Claim 1 of U.S. Patent No. 6,826,926 recites (emphasis added)

> A wiper blade for windows, comprising: at least one support element (12), a wiper strip (14), and a connecting device (16) for a wiper arm (18), wherein the support element (12) is *an elongated, flat bar to which the wiper strip (14) and the connecting device (16) are attached*, wherein the support element (12) has a cross sectional profile in which

$$\frac{F_{wf} \times L^2}{48 \times E \times I_{zz}} < 0.009,$$

where F_{wf} is an actual contact force exerted on the wiper blade by the wiper arm (18) in condition when it is pressed against a window, L is a length of the support element (12), E is an elasticity modulus of the support element (12), and I_{zz} is a moment of inertia of cross sectional profile around a z-axis perpendicular to an taxis[sic][1], which adapts along with the support element (12), and perpendicular to a y-axis, wherein the support element (12) has a substantially rectangular cross sectional profile (40), with a substantially constant width b and a substantially constant thickness d.

Both the drawings and specification of '926 clearly indicate that the claimed "support element (12)" is a pre-curved spring that is substantially rectangular in cross sectional profile and that is "attached" to both the claimed "connecting device (16)" and the claimed "wiper strip (14)." As discussed at length in the specification of '926, the claimed "support element (12)" is said to distribute the concentrated force applied by the wiper arm to a specific load distribution along the length of the wiper strip (14). The patent expressly distinguishes this pre-curved flat spring support from multi-part "support bracket" designs like the one illustrated in U.S. Patent No. 3,418,679 to Barth ("Barth").

The Goodyear Hybrid product accomplishes distribution of the wiper arm load to the wiper strip contact through a support bracket system that consists of the main bracket, two pivotally mounted secondary brackets with claws, a plastic stiffener, and a metal stiffener contained within the plastic stiffener. All of these co-acting elements are crucial to accomplishing relatively uniform distribution of the wiper arm force across the length of the wiper strip. The mechanics of the Goodyear Hybrid wiper support system are the same, in principle, as the wiper support system disclosed in Barth.

The '926 patent proposes designing and making pre-curved, flat spring support structures by reference to a mathematical formula for calculating a lateral deflection angle, which is labeled with the Greek letter gamma in Figure 7 of the patent. Claims 1 and 2 of the '926 recite a mathematical formula for calculating the bending deflection of a structure having a substantially rectangular cross-sectional profile. The formula recited in claims 1 and 2 of the '926 patent could not be used to calculate the bending deflection of the support system of the Goodyear Hybrid product, which consists of multiple non-rectangular structures acting in concert.

In common with conventional support bracket systems like the one disclosed in Barth, one component of the Goodyear Hybrid wiper support system is a metal stiffener that receives force from support brackets and distributes it along the length of a rubber wiper strip. This wiper strip stiffener is not "attached" to that product's wiper arm connector as is, for example, the claimed "support element (12)" depicted in Figures 1, 3, and 4 of the '926 patent and described in the accompanying written description. In the context of a description of mechanical structures like those depicted and described in the '926 patent, when the term "attached" is used without qualification, a person skilled in the art of mechanical engineering would take it to mean a relationship between two or more

[1] Bosch asserts that "taxis" is a typographical error and should be read as "s-axis". I have assumed this reading of the patent for the purpose of my discussion.

distinct components where they are in contact one with another and are further joined in such a fashion as to preclude relative motion, as are the wiper arm connector (16), wiper strip (14), and support element (12) depicted in the '926 patent.

The metal stiffener in the Goodyear Hybrid product, and its physical relationship to other components in that product's wiper support system, are accurately illustrated in the video file entitled "Goodyear_Orientation.mwv" which accompanies the Declaration of Daniel H. Kruger. This video was made under my supervision. As shown in that video file, the metal stiffener in the Goodyear Hybrid product slides loosely inside a plastic stiffener, which plastic stiffener is in turn slidingly engaged with claws of two outer support brackets, which outer support brackets are in turn pivotally coupled to a center support bracket, which center support bracket is in turn attached to a wiper arm connector, using "attached" in the sense stated above. This wiper support system is completely different from any disclosed in the '926 patent and is, in fact, the type of wiper support system that the '926 patent says the alleged invention "replaces." The specification and drawings of the '926 patent do not describe any embodiment in which a system made up of support brackets, claws, and stiffeners are identified as an alternative to a pre-curved flat spring support that eliminates the need for load balancing support brackets like those found in the Goodyear Hybrid product.

A critical aspect of the wiper support described in '926 is that the claimed "support element (12)" is pre-curved in order to attain the desired uniform distribution of loading of the wiper strip in contact with the windshield glass. See, for instance, column 4 lines 55 through 67: "Since the dot-and-dash line 26 shown in FIG. 2 is intended to represent the sharpest curvature of the window surface in the vicinity of the wiping zone, it is clear that the curvature of the wiper blade 10, which is as yet unstressed and rests with its two ends against the window, is sharper than the maximal curvature of the spherically curved window 15. When the contact force F_{wf} (arrow 24) is applied, the wiper blade 10 rests with its wiper lip 28, which is part of the wiper strip 14, over its entire length against the window surface 26. This produces a tension in the band-like, spring elastic support element 12, which ensures a proper contact of the wiper strip 14 or rather the wiper lip 28 over its entire length against the vehicle window 15."

At column 9, lines 16 through 25, the '926 specification makes clear that this desirable curvature of the wiper blade 10 is created by the engineered progression of curvature (K) of the support element 12: "FIG. 10 depicts a possible curvature progression K of the support element 12, which can produce a contact force distribution p of the wiper lip 28 against the window 15, which decreases toward the wiper blade end. With this spring elastic support element 12 which, when unstressed, 20 has a sharper hollow curvature toward the window than this window has in the vicinity of the wiping zone swept by the wiper blade, the curvature progression K is designed so that it is sharper in the middle section 36 of the support element 12 than in its end sections 38." A simple inspection of the metal stiffener of the Goodyear Hybrid wiper assembly immediately reveals that it is straight and no different, in principle, from stiffeners used in systems like that of Barth.

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