Case IPR2013-00020
Patent No. 7,297,364
Petitioner's Demonstrative Slides

January 2, 2014 Hearing

1:00 pm

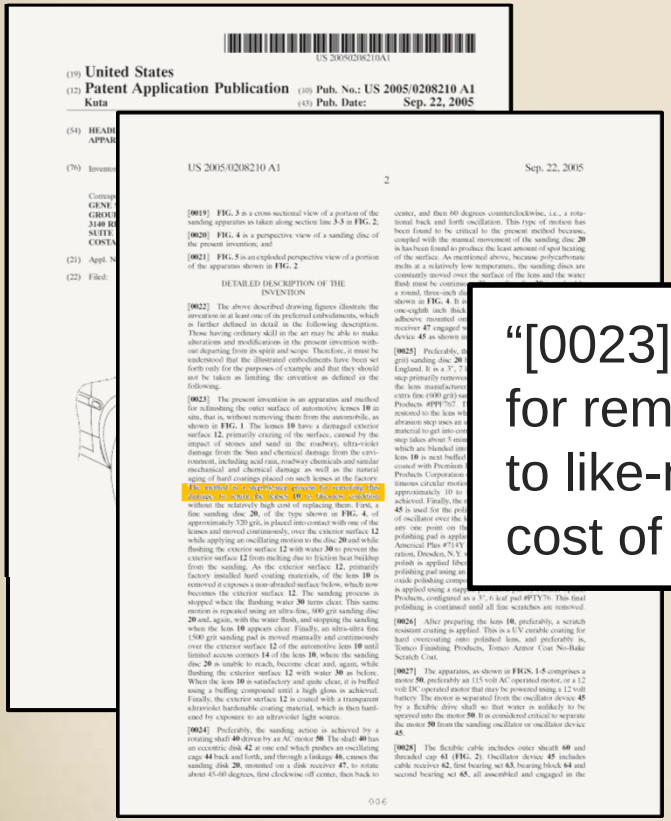
Madison Building East

600 Dulany Street

Alexandria, Virginia

Kuta Teaches A Step-By-Step Process to Return Lamps to Like-New Condition

Kuta (Ex. 1002)



US 2005/0208210 A1

(19) United States
(12) Patent Application Publication (10) Pub. No.: US 2005/0208210 A1
Kuta (43) Pub. Date: Sep. 22, 2005

US 2005/0208210 A1 Sep. 22, 2005
2

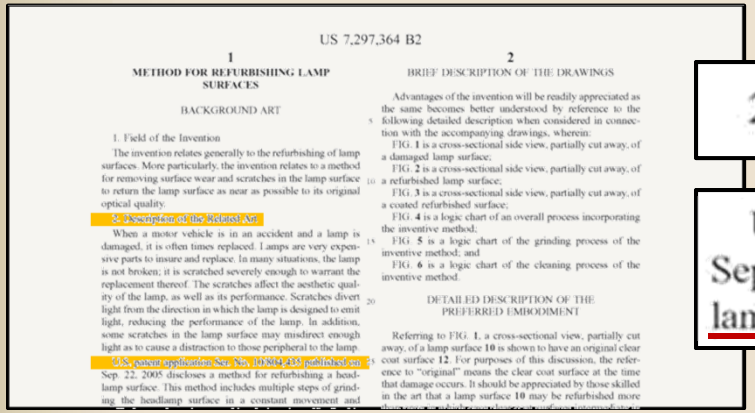
DETAILED DESCRIPTION OF THE INVENTION

"[0023] …The method is a step-by-step process for removing this damage, to return the lenses **10** to like-new condition without the relatively high cost of replacing them."

Source: Ex. 1002, p.6; Reply to Patent Owner Response, p. 9; Opposition to Motion to Amend, p. 9

Patent Owner Conceded Kuta is Related Art

‘364 Patent (Ex. 1001)



US 7,297,364 B2

1

METHOD FOR REFURBISHING LAMP SURFACES

BACKGROUND ART

1. Field of the Invention

The invention relates generally to the refurbishing of lamp surfaces. More particularly, the invention relates to a method for removing surface wear and scratches in the lamp surface to return the lamp surface as near as possible to its original optical quality.

2. Description of the Related Art

When a motor vehicle is in an accident and a lamp is damaged, it is often times replaced. Lamps are very expensive parts to insure and replace. In many situations, the lamp is not broken; it is scratched severely enough to warrant the replacement thereof. The scratches affect the aesthetic quality of the lamp, as well as its performance. Scratches divert light from the direction in which the lamp is designed to emit light, reducing the performance of the lamp. In addition, some scratches in the lamp surface may misdirect enough light as to cause a distraction to those peripheral to the lamp.

U.S. patent application Ser. No. 10/804,435 published on Sep. 22, 2005 discloses a method for refurbishing a headlamp surface. This method includes multiple steps of grinding the headlamp surface in a constant movement and

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BRIEF DESCRIPTION OF THE DRAWINGS

Advantages of the invention will be readily appreciated as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings, wherein:

FIG. **1** is a cross-sectional side view, partially cut away, of a damaged lamp surface;

FIG. **2** is a cross-sectional side view, partially cut away, of a refurbished lamp surface;

FIG. **3** is a cross-sectional side view, partially cut away, of a coated refurbished surface;

FIG. **4** is a logic chart of an overall process incorporating the inventive method;

FIG. **5** is a logic chart of the grinding process of the inventive method; and

FIG. **6** is a logic chart of the cleaning process of the inventive method.

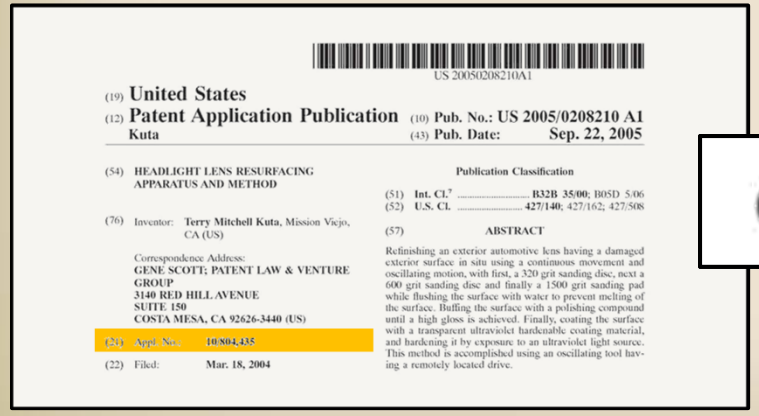
DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIG. **1**, a cross-sectional view, partially cut away, of a lamp surface **10** is shown to have an original clear coat surface **12**. For purposes of this discussion, the reference to "original" means the clear coat surface at the time that damage occurs. It should be appreciated by those skilled in the art that a lamp surface **10** may be refurbished more

2. Description of the Related Art

U.S. patent application Ser. No. 10/804,435 published on Sep. 22, 2005 discloses a method for refurbishing a headlamp surface. This method includes multiple steps of grind-

Kuta (Ex. 1002)



US 20050208210A1

(19) **United States**

(12) **Patent Application Publication**

Kuta

(10) **Pub. No.: US 2005/0208210 A1**

(43) **Pub. Date: Sep. 22, 2005**

(54) **HEADLIGHT LENS RESURFACING APPARATUS AND METHOD**

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COSTA MESA, CA 92626-3440 (US)

(21) Appl. No.: **10/804,435**

(22) Filed: **Mar. 18, 2004**

Publication Classification

(51) **Int. Cl.**[7] **B32B 35/00**; B05D 5/06

(52) **U.S. Cl.** **427/140**; 427/162; 427/508

(57) **ABSTRACT**

Refinishing an exterior automotive lens having a damaged exterior surface in situ using a continuous movement and oscillating motion, with first, a 320 grit sanding disc, next a 600 grit sanding disc and finally a 1500 grit sanding pad while flushing the surface with water to prevent melting of the surface. Buffing the surface with a polishing compound until a high gloss is achieved. Finally, coating the surface with a transparent ultraviolet hardenable coating material, and hardening it by exposure to an ultraviolet light source. This method is accomplished using an oscillating tool having a remotely located drive.

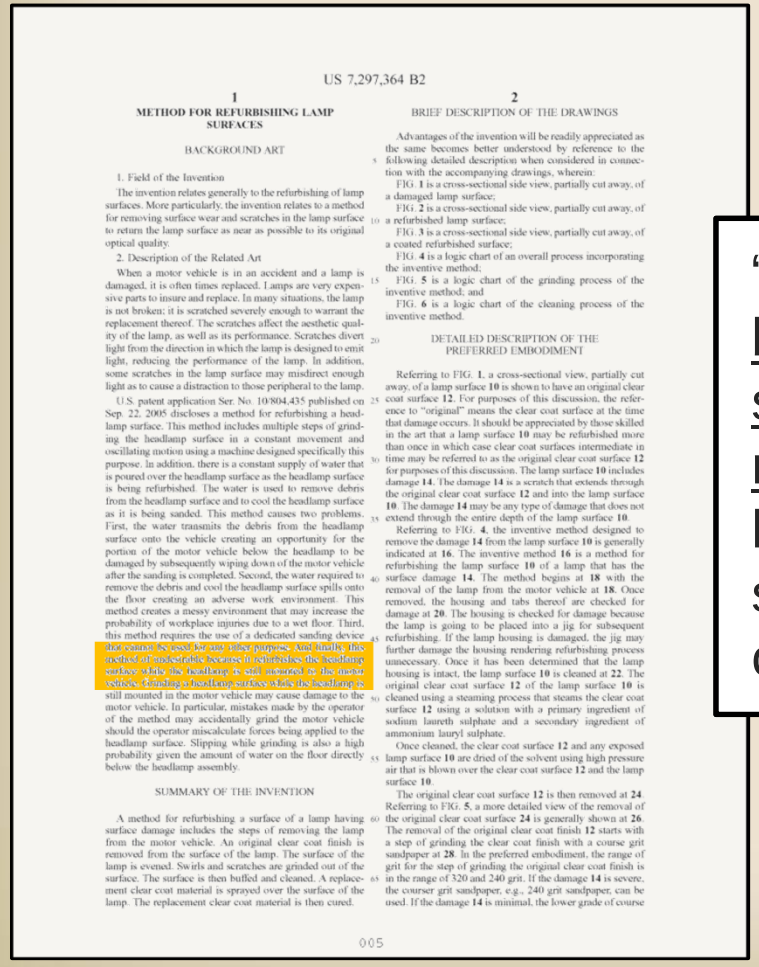
(21) Appl. No.: **10/804,435**

*All emphasis added unless otherwise indicated

Source: Ex. 1001, p. 5, 1:25-27; Ex. 1002, p.1, (21); Petition for IPR, pp.4-6

The ‘364 Patent Asserts that Kuta Does Not Teach Removing the Lamp

‘364 Patent (Ex. 1001)



US 7,297,364 B2

1

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BACKGROUND ART

1. Field of the Invention

The invention relates generally to the refurbishing of lamp surfaces. More particularly, the invention relates to a method for removing surface wear and scratches in the lamp surface to return the lamp surface as near as possible to its original optical quality.

2. Description of the Related Art

When a motor vehicle is in an accident and a lamp is damaged, it is often times replaced. Lamps are very expensive parts to insure and replace. In many situations, the lamp is not broken; it is scratched severely enough to warrant the replacement thereof. The scratches affect the aesthetic quality of the lamp, as well as its performance. Scratches divert light from the direction in which the lamp is designed to emit light, reducing the performance of the lamp. In addition, some scratches in the lamp surface may misdirect enough light as to cause a distraction to those peripheral to the lamp.

U.S. patent application Ser. No. 10/804,435 published on Sep. 22, 2005 discloses a method for refurbishing a headlamp surface. This method includes multiple steps of grinding the headlamp surface in a constant movement and oscillating motion using a machine designed specifically this purpose. In addition, there is a constant supply of water that is poured over the headlamp surface as the headlamp surface is being refurbished. The water is used to remove debris from the headlamp surface and to cool the headlamp surface as it is being sanded. This method causes two problems. First, the water transmits the debris from the headlamp surface onto the vehicle creating an opportunity for the portion of the motor vehicle below the headlamp to be damaged by subsequently wiping down of the motor vehicle after the sanding is completed. Second, the water required to remove the debris and cool the headlamp surface spills onto the floor creating an adverse work environment. This method creates a messy environment that may increase the probability of workplace injuries due to a wet floor. Third, this method requires the use of a dedicated sanding device that cannot be used for any other purpose. And finally, this method [is] undesirable because it refurbishes the headlamp surface while the headlamp is still mounted to the motor vehicle. Grinding a headlamp surface while the headlamp is still mounted in the motor vehicle may cause damage to the motor vehicle. In particular, mistakes made by the operator of the method may accidentally grind the motor vehicle should the operator miscalculate forces being applied to the headlamp surface. Slipping while grinding is also a high probability given the amount of water on the floor directly below the headlamp assembly.

SUMMARY OF THE INVENTION

A method for refurbishing a surface of a lamp having surface damage includes the steps of removing the lamp from the motor vehicle. An original clear coat finish is removed from the surface of the lamp. The surface of the lamp is evened. Swirls and scratches are grinded out of the surface. The surface is then buffed and cleaned. A replacement clear coat material is sprayed over the surface of the lamp. The replacement clear coat material is then cured.

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BRIEF DESCRIPTION OF THE DRAWINGS

Advantages of the invention will be readily appreciated as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings, wherein:

FIG. **1** is a cross-sectional side view, partially cut away, of a damaged lamp surface;

FIG. **2** is a cross-sectional side view, partially cut away, of a refurbished lamp surface;

FIG. **3** is a cross-sectional side view, partially cut away, of a coated refurbished surface;

FIG. **4** is a logic chart of an overall process incorporating the inventive method;

FIG. **5** is a logic chart of the grinding process of the inventive method; and

FIG. **6** is a logic chart of the cleaning process of the inventive method.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIG. **1**, a cross-sectional view, partially cut away, of a lamp surface **10** is shown to have an original clear coat surface **12**. For purposes of this discussion, the reference to "original" means the clear coat surface at the time that damage occurs. It should be appreciated by those skilled in the art that a lamp surface **10** may be refurbished more than once in which case clear coat surfaces intermediate in time may be referred to as the original clear coat surface **12** for purposes of this discussion. The lamp surface **10** includes damage **14**. The damage **14** is a scratch that extends through the original clear coat surface **12** and into the lamp surface **10**. The damage **14** may be any type of damage that does not extend through the entire depth of the lamp surface **10**.

Referring to FIG. **4**, the inventive method designed to remove the damage **14** from the lamp surface **10** is generally indicated at **16**. The inventive method **16** is a method for refurbishing the lamp surface **10** of a lamp that has the surface damage **14**. The method begins at **18** with the removal of the lamp from the motor vehicle at **18**. Once removed, the housing and tabs thereof are checked for damage at **20**. The housing is checked for damage because the lamp is going to be placed into a jig for subsequent refurbishing. If the lamp housing is damaged, the jig may further damage the housing rendering refurbishing process unnecessary. Once it has been determined that the lamp housing is intact, the lamp surface **10** is cleaned at **22**. The original clear coat surface **12** of the lamp surface **10** is cleaned using a steaming process that steams the clear coat surface **12** using a solution with a primary ingredient of sodium laureth sulphate and a secondary ingredient of ammonium lauryl sulphate.

Once cleaned, the clear coat surface **12** and any exposed lamp surface **10** are dried of the solvent using high pressure air that is blown over the clear coat surface **12** and the lamp surface **10**.

The original clear coat surface **12** is then removed at **24**. Referring to FIG. **5**, a more detailed view of the removal of the original clear coat surface **24** is generally shown at **26**. The removal of the original clear coat finish **12** starts with a step of grinding the clear coat finish with a course grit sandpaper at **28**. In the preferred embodiment, the range of grit for the step of grinding the original clear coat finish is in the range of 320 and 240 grit. If the damage **14** is severe, the courser grit sandpaper, e.g., 240 grit sandpaper, can be used. If the damage **14** is minimal, the lower grade of course

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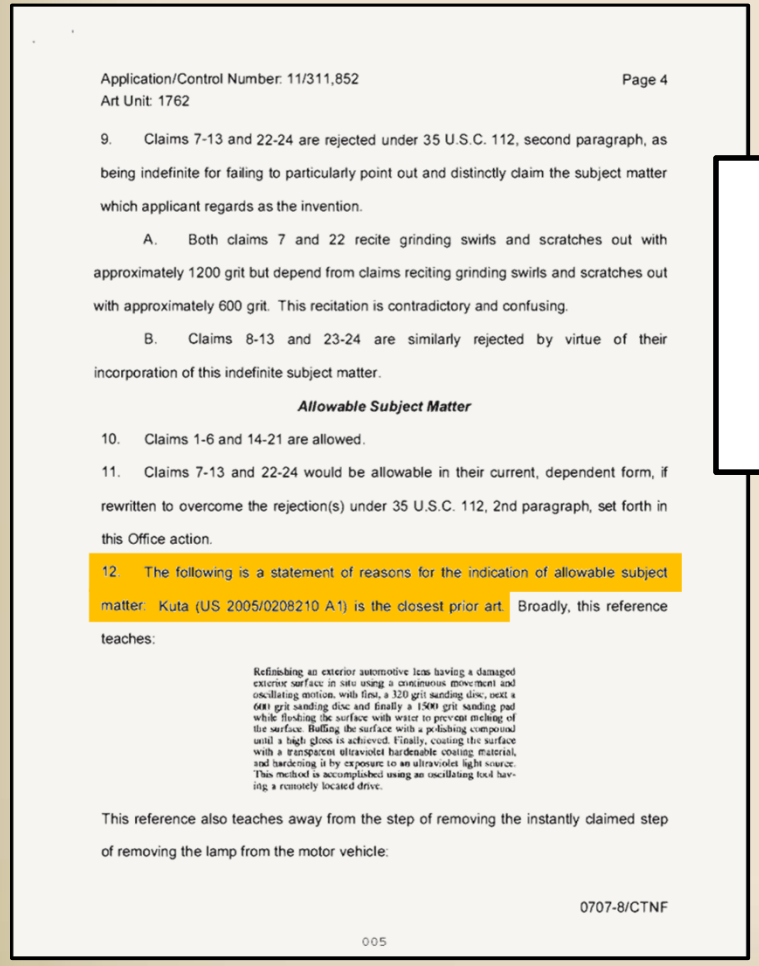
> “And finally, <u>this method [is] undesirable because it refurbishes the headlamp surface while the headlamp is still mounted to the motor vehicle</u>. Grinding a headlamp surface while the headlamp is still mounted in the motor vehicle may cause damage to the motor vehicle.”

Source: Ex. 1001, p.5, 1:46-51; Petition for IPR, pp.4-6

The Examiner Found that Kuta was the Closest Art During Prosecution

6/28/07 Office Action (Ex. 1011)



Application/Control Number: 11/311,852 Page 4
Art Unit: 1762

9. Claims 7-13 and 22-24 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

A. Both claims 7 and 22 recite grinding swirls and scratches out with approximately 1200 grit but depend from claims reciting grinding swirls and scratches out with approximately 600 grit. This recitation is contradictory and confusing.

B. Claims 8-13 and 23-24 are similarly rejected by virtue of their incorporation of this indefinite subject matter.

Allowable Subject Matter

10. Claims 1-6 and 14-21 are allowed.

11. Claims 7-13 and 22-24 would be allowable in their current, dependent form, if rewritten to overcome the rejection(s) under 35 U.S.C. 112, 2nd paragraph, set forth in this Office action.

12. The following is a statement of reasons for the indication of allowable subject matter: Kuta (US 2005/0208210 A1) is the closest prior art. Broadly, this reference teaches:

> Refinishing an exterior automotive lens having a damaged exterior surface in situ using a continuous movement and oscillating motion, with first, a 320 grit sanding disc, next a 600 grit sanding disc and finally a 1500 grit sanding pad while flushing the surface with water to prevent melting of the surface. Buffing the surface with a polishing compound until a high gloss is achieved. Finally, coating the surface with a transparent ultraviolet hardenable coating material, and hardening it by exposure to an ultraviolet light source. This method is accomplished using an oscillating tool having a remotely located drive.

This reference also teaches away from the step of removing the instantly claimed step of removing the lamp from the motor vehicle:

0707-8/CTNF

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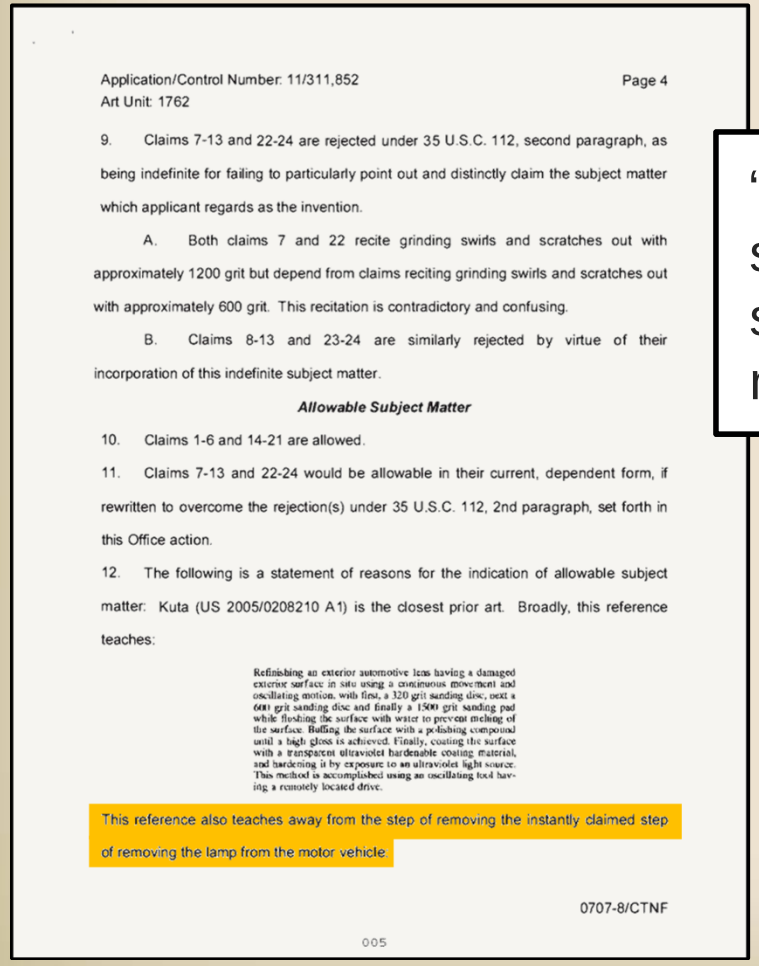
"12. The following is a statement of reasons for the indication of allowable subject matter. Kuta (US 2005/0208210 A1) is the closest prior art."

Source: Ex. 1011, p.5; Petition for IPR, pp.7-8

The Examiner Allowed the Claims Only Because They Require "Removing"

6/28/07 Office Action (Ex. 1011)



Application/Control Number: 11/311,852 Page 4
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> Refinishing an exterior automotive lens having a damaged exterior surface in situ using a continuous movement and oscillating motion, with first, a 320 grit sanding disc, next a 600 grit sanding disc and finally a 1500 grit sanding pad while flushing the surface with water to prevent melting of the surface. Buffing the surface with a polishing compound until a high gloss is achieved. Finally, coating the surface with a transparent ultraviolet hardenable coating material, and hardening it by exposure to an ultraviolet light source. This method is accomplished using an oscillating tool having a remotely located drive.

This reference also teaches away from the step of removing the instantly claimed step of removing the lamp from the motor vehicle.

0707-8/CTNF

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"This reference [] teaches away from the step of removing the instantly claimed step of [sic] removing the lamp from the motor vehicle."

Source: Ex. 1011, p.5; Petition for IPR, pp.7-8, 12

The Examiner Allowed the Claims Only Because They Require "Removing"

6/28/07 Office Action (Ex. 1011)

[0010] The present invention teaches an alternative to replacement that is more cost effective, in that it does not require removal of worn lenses nor mounting of new ones. Thus, this approach saves both the cost of new lenses as well as the cost of labor for replacement.

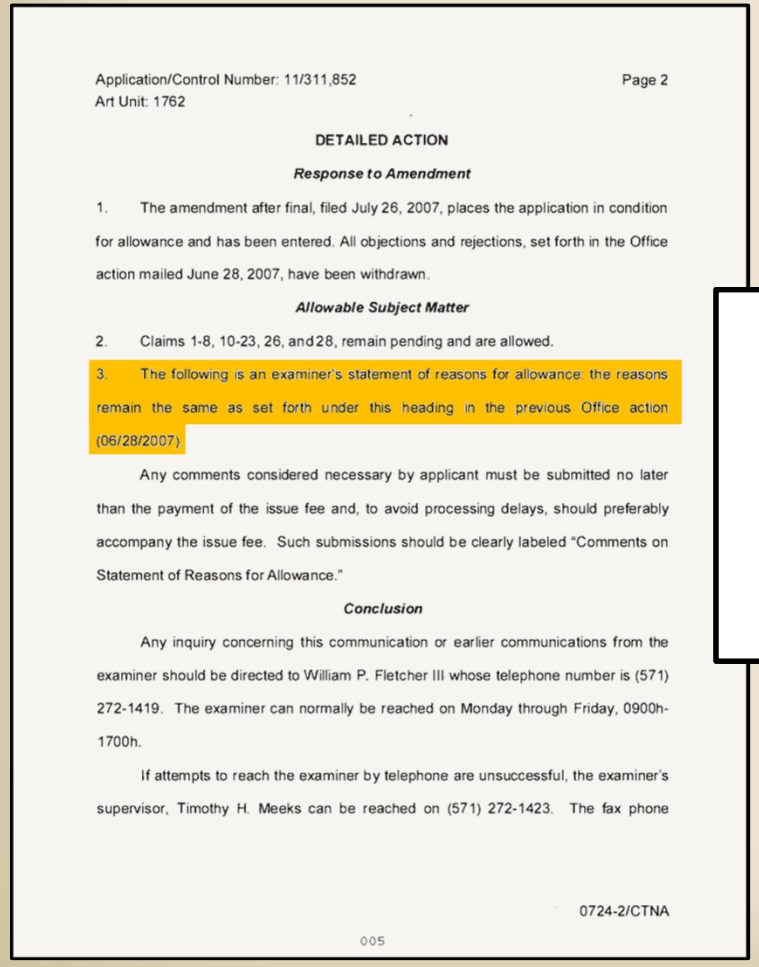
As such, the instantly claimed invention is patentable over the prior art.

Conclusion

Source: Ex. 1011, p.6; Petition for IPR, pp.7-8, 12

The Examiner Allowed the Claims Only Because They Require "Removing"

Notice of Allowability (Ex. 1013)



Application/Control Number: 11/311,852 Page 2
Art Unit: 1762

DETAILED ACTION

Response to Amendment

1. The amendment after final, filed July 26, 2007, places the application in condition for allowance and has been entered. All objections and rejections, set forth in the Office action mailed June 28, 2007, have been withdrawn.

Allowable Subject Matter

2. Claims 1-8, 10-23, 26, and 28, remain pending and are allowed.

3. The following is an examiner's statement of reasons for allowance: the reasons remain the same as set forth under this heading in the previous Office action (06/28/2007).

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to William P. Fletcher III whose telephone number is (571) 272-1419. The examiner can normally be reached on Monday through Friday, 0900h-1700h.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Timothy H. Meeks can be reached on (571) 272-1423. The fax phone

0724-2/CTNA

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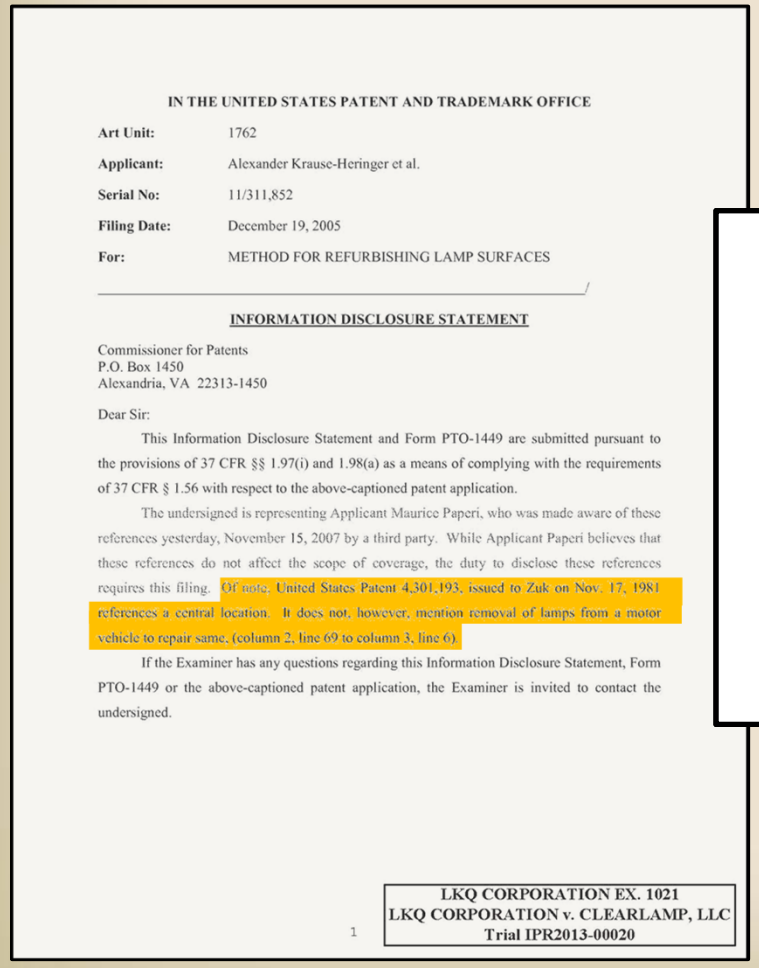
"3. The following is an examiner's statement of reasons for allowance: the reasons remain the same as set forth under this heading in the previous Office action (06/28/2007)."

Source: Ex. 1013, p.5; Petition for IPR, p.8, 12

Patent Owner Distinguished Zuk Based on Failure to Mention Removal

11/16/07 IDS After Issue Fee (Ex. 1021)



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Art Unit: 1762

Applicant: Alexander Krause-Heringer et al.

Serial No: 11/311,852

Filing Date: December 19, 2005

For: METHOD FOR REFURBISHING LAMP SURFACES

INFORMATION DISCLOSURE STATEMENT

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

This Information Disclosure Statement and Form PTO-1449 are submitted pursuant to the provisions of 37 CFR §§ 1.97(i) and 1.98(a) as a means of complying with the requirements of 37 CFR § 1.56 with respect to the above-captioned patent application.

The undersigned is representing Applicant Maurice Paperi, who was made aware of these references yesterday, November 15, 2007 by a third party. While Applicant Paperi believes that these references do not affect the scope of coverage, the duty to disclose these references requires this filing. Of note, United States Patent 4,301,193, issued to Zuk on Nov. 17, 1981 references a central location. It does not, however, mention removal of lamps from a motor vehicle to repair same, (column 2, line 69 to column 3, line 6).

If the Examiner has any questions regarding this Information Disclosure Statement, Form PTO-1449 or the above-captioned patent application, the Examiner is invited to contact the undersigned.

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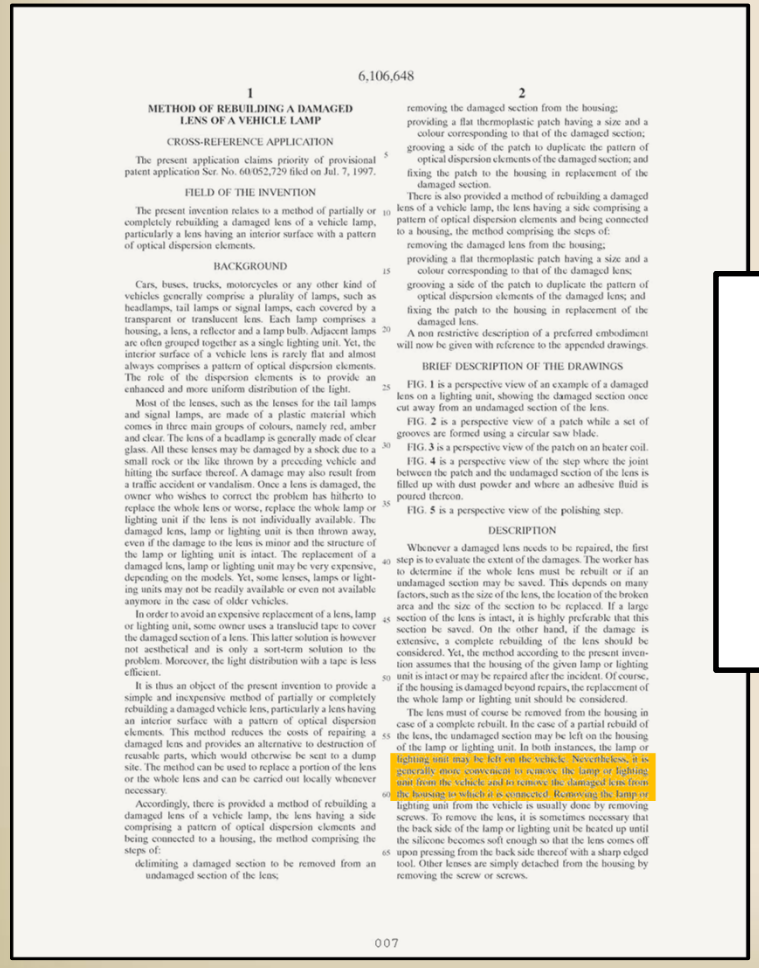
LKQ CORPORATION EX. 1021
LKQ CORPORATION v. CLEARLAMP, LLC
Trial IPR2013-00020

"Of note, United States Patent 4,301,193, issued to Zuk on Nov. 17, 1981 references a central location. It does not, however, mention removal of lamps from a motor vehicle to repair same, (column 2, line 69 to column 3, line 6)."

Source: Ex. 1021, p.1; Reply to Patent Owner Response, p.8

Butt Teaches Removing a Lamp Before Refurbishing

Butt (Ex. 1003)



6,106,648

1

METHOD OF REBUILDING A DAMAGED LENS OF A VEHICLE LAMP

CROSS-REFERENCE APPLICATION

The present application claims priority of provisional patent application Ser. No. 60/052,729 filed on Jul. 7, 1997.

FIELD OF THE INVENTION

The present invention relates to a method of partially or completely rebuilding a damaged lens of a vehicle lamp, particularly a lens having an interior surface with a pattern of optical dispersion elements.

BACKGROUND

Cars, buses, trucks, motorcycles or any other kind of vehicles generally comprise a plurality of lamps, such as headlamps, tail lamps or signal lamps, each covered by a transparent or translucent lens. Each lamp comprises a housing, a lens, a reflector and a lamp bulb. Adjacent lamps are often grouped together as a single lighting unit. Yet, the interior surface of a vehicle lens is rarely flat and almost always comprises a pattern of optical dispersion elements. The role of the dispersion elements is to provide an enhanced and more uniform distribution of the light.

Most of the lenses, such as the lenses for the tail lamps and signal lamps, are made of a plastic material which comes in three main groups of colours, namely red, amber and clear. The lens of a headlamp is generally made of clear glass. All these lenses may be damaged by a shock due to a small rock or the like thrown by a preceding vehicle and hitting the surface thereof. A damage may also result from a traffic accident or vandalism. Once a lens is damaged, the owner who wishes to correct the problem has hitherto to replace the whole lens or worse, replace the whole lamp or lighting unit if the lens is not individually available. The damaged lens, lamp or lighting unit is then thrown away, even if the damage to the lens is minor and the structure of the lamp or lighting unit is intact. The replacement of a damaged lens, lamp or lighting unit may be very expensive, depending on the models. Yet, some lenses, lamps or lighting units may not be readily available or even not available anymore in the case of older vehicles.

In order to avoid an expensive replacement of a lens, lamp or lighting unit, some owner uses a translucid tape to cover the damaged section of a lens. This latter solution is however not aesthetical and is only a sort-term solution to the problem. Moreover, the light distribution with a tape is less efficient.

It is thus an object of the present invention to provide a simple and inexpensive method of partially or completely rebuilding a damaged vehicle lens, particularly a lens having an interior surface with a pattern of optical dispersion elements. This method reduces the costs of repairing a damaged lens and provides an alternative to destruction of reusable parts, which would otherwise be sent to a dump site. The method can be used to replace a portion of the lens or the whole lens and can be carried out locally whenever necessary.

Accordingly, there is provided a method of rebuilding a damaged lens of a vehicle lamp, the lens having a side comprising a pattern of optical dispersion elements and being connected to a housing, the method comprising the steps of:

delimiting a damaged section to be removed from an undamaged section of the lens;

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removing the damaged section from the housing;

providing a flat thermoplastic patch having a size and a colour corresponding to that of the damaged section;

grooving a side of the patch to duplicate the pattern of optical dispersion elements of the damaged section; and

fixing the patch to the housing in replacement of the damaged section.

There is also provided a method of rebuilding a damaged lens of a vehicle lamp, the lens having a side comprising a pattern of optical dispersion elements and being connected to a housing, the method comprising the steps of:

removing the damaged lens from the housing;

providing a flat thermoplastic patch having a size and a colour corresponding to that of the damaged lens;

grooving a side of the patch to duplicate the pattern of optical dispersion elements of the damaged lens; and

fixing the patch to the housing in replacement of the damaged lens.

A non restrictive description of a preferred embodiment will now be given with reference to the appended drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective view of an example of a damaged lens on a lighting unit, showing the damaged section once cut away from an undamaged section of the lens.

FIG. **2** is a perspective view of a patch while a set of grooves are formed using a circular saw blade.

FIG. **3** is a perspective view of the patch on an heater coil.

FIG. **4** is a perspective view of the step where the joint between the patch and the undamaged section of the lens is filled up with dust powder and where an adhesive fluid is poured thereon.

FIG. **5** is a perspective view of the polishing step.

DESCRIPTION

Whenever a damaged lens needs to be repaired, the first step is to evaluate the extent of the damages. The worker has to determine if the whole lens must be rebuilt or if an undamaged section may be saved. This depends on many factors, such as the size of the lens, the location of the broken area and the size of the section to be replaced. If a large section of the lens is intact, it is highly preferable that this section be saved. On the other hand, if the damage is extensive, a complete rebuilding of the lens should be considered. Yet, the method according to the present invention assumes that the housing of the given lamp or lighting unit is intact or may be repaired after the incident. Of course, if the housing is damaged beyond repairs, the replacement of the whole lamp or lighting unit should be considered.

The lens must of course be removed from the housing in case of a complete rebuilt. In the case of a partial rebuild of the lens, the undamaged section may be left on the housing of the lamp or lighting unit. In both instances, the lamp or lighting unit may be left on the vehicle. Nevertheless, it is generally more convenient to remove the lamp or lighting unit from the vehicle and to remove the damaged lens from the housing to which it is connected. Removing the lamp or lighting unit from the vehicle is usually done by removing screws. To remove the lens, it is sometimes necessary that the back side of the lamp or lighting unit be heated up until the silicone becomes soft enough so that the lens comes off upon pressing from the back side thereof with a sharp edged tool. Other lenses are simply detached from the housing by removing the screw or screws.

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"Nevertheless, it is generally more convenient to remove the lamp or lighting unit from the vehicle and to remove the damaged lens from the housing to which it is connected."

Source: Ex. 1003, p.7, 2:57-60; Petition for IPR, p.10

Eastwood Teaches Removing a Lamp Before Refurbishing

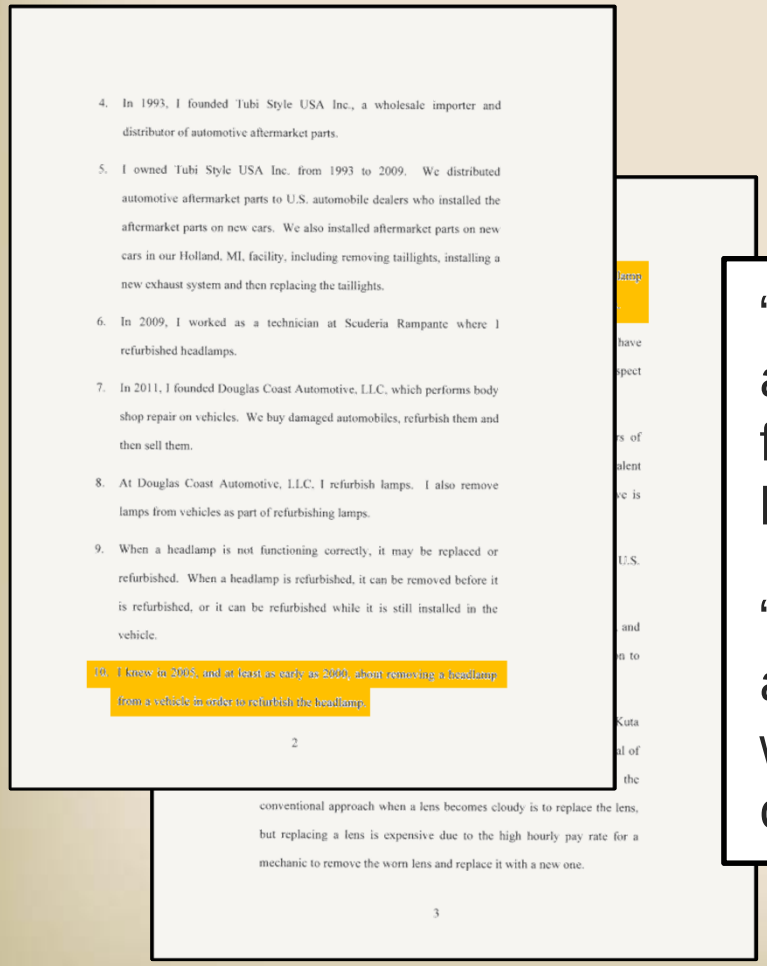
Eastwood (Ex. 1004)

"I took the headlights out of my Mustang to do them, because I didn't want to risk any damage to the car."

Source: Ex. 1004, p.6; Petition for IPR, pp.10-11

Mr. Yarde Confirmed That a POSITA Knew a Lamp Could Be Removed Before Refurbishing

Yarde Declaration (Ex. 1009)



4. In 1993, I founded Tubi Style USA Inc., a wholesale importer and distributor of automotive aftermarket parts.

5. I owned Tubi Style USA Inc. from 1993 to 2009. We distributed automotive aftermarket parts to U.S. automobile dealers who installed the aftermarket parts on new cars. We also installed aftermarket parts on new cars in our Holland, MI, facility, including removing taillights, installing a new exhaust system and then replacing the taillights.

6. In 2009, I worked as a technician at Scuderia Rampante where I refurbished headlamps.

7. In 2011, I founded Douglas Coast Automotive, LLC, which performs body shop repair on vehicles. We buy damaged automobiles, refurbish them and then sell them.

8. At Douglas Coast Automotive, LLC, I refurbish lamps. I also remove lamps from vehicles as part of refurbishing lamps.

9. When a headlamp is not functioning correctly, it may be replaced or refurbished. When a headlamp is refurbished, it can be removed before it is refurbished, or it can be refurbished while it is still installed in the vehicle.

10. I knew in 2005, and at least as early as 2000, about removing a headlamp from a vehicle in order to refurbish the headlamp.

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conventional approach when a lens becomes cloudy is to replace the lens, but replacing a lens is expensive due to the high hourly pay rate for a mechanic to remove the worn lens and replace it with a new one.

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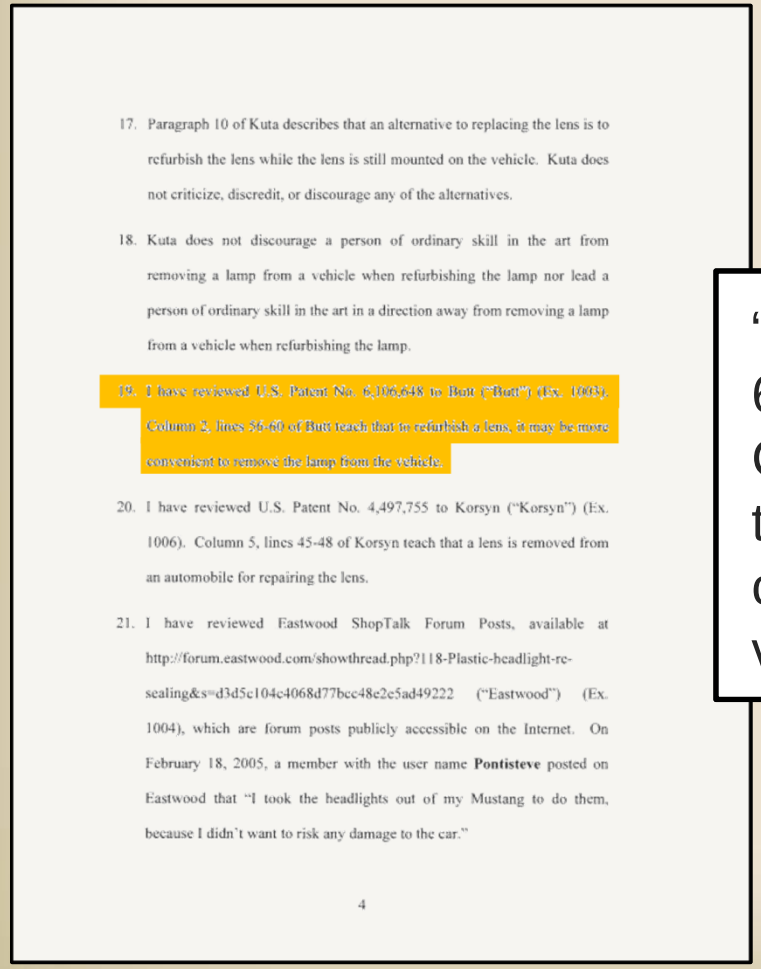
"10. I knew in 2005, and at least as early as 2000, about removing a headlamp from a vehicle in order to refurbish the headlamp."

"11. I knew in 2005, and at least as early as 2000, that refurbishing a headlamp while the headlamp is in the vehicle could cause damage to the vehicle."

Source: Ex. 1009, pp.2-3; Petition for IPR, p.13-14

Mr. Yarde Confirmed That a POSITA Knew a Lamp Could Be Removed Before Refurbishing

Yarde Declaration (Ex. 1009)



17. Paragraph 10 of Kuta describes that an alternative to replacing the lens is to refurbish the lens while the lens is still mounted on the vehicle. Kuta does not criticize, discredit, or discourage any of the alternatives.

18. Kuta does not discourage a person of ordinary skill in the art from removing a lamp from a vehicle when refurbishing the lamp nor lead a person of ordinary skill in the art in a direction away from removing a lamp from a vehicle when refurbishing the lamp.

19. I have reviewed U.S. Patent No. 6,106,648 to Butt ("Butt") (Ex. 1003). Column 2, lines 56-60 of Butt teach that to refurbish a lens, it may be more convenient to remove the lamp from the vehicle.

20. I have reviewed U.S. Patent No. 4,497,755 to Korsyn ("Korsyn") (Ex. 1006). Column 5, lines 45-48 of Korsyn teach that a lens is removed from an automobile for repairing the lens.

21. I have reviewed Eastwood ShopTalk Forum Posts, available at http://forum.eastwood.com/showthread.php?118-Plastic-headlight-re-sealing&s=d3d5c104c4068d77bcc48e2e5ad49222 ("Eastwood") (Ex. 1004), which are forum posts publicly accessible on the Internet. On February 18, 2005, a member with the user name **Pontisteve** posted on Eastwood that "I took the headlights out of my Mustang to do them, because I didn't want to risk any damage to the car."

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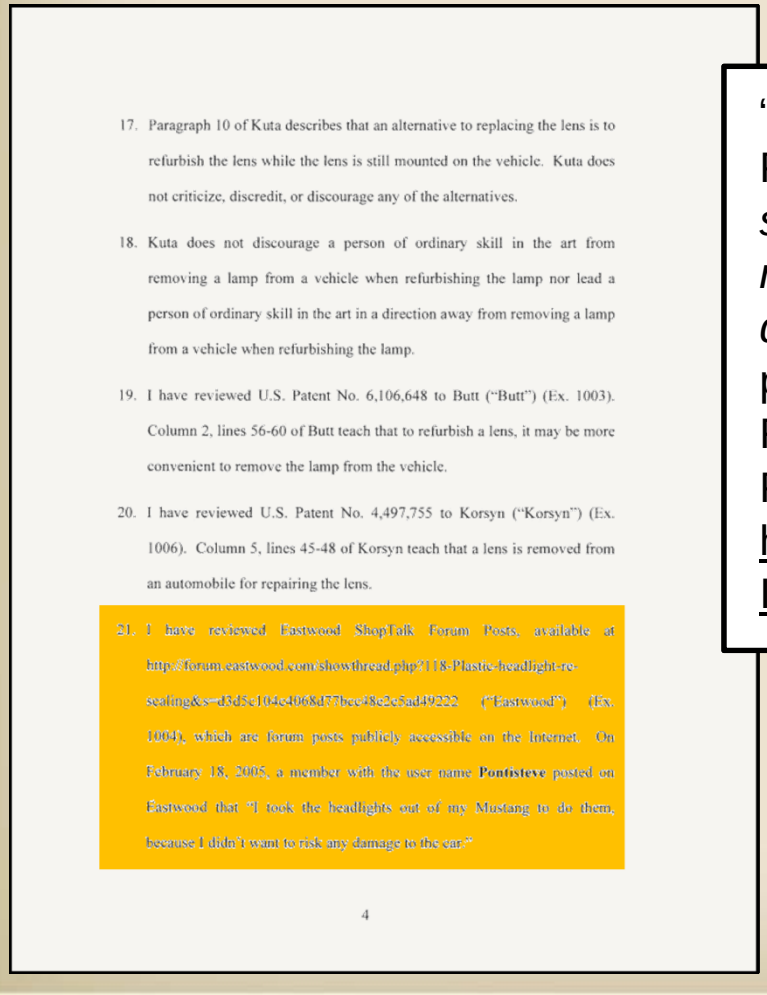
"19. I have reviewed U.S. Patent No. 6,106,648 to Butt ('Butt') (Ex. 1003). Column 2, lines 56-60 of Butt teach that to refurbish a lens, it may be more convenient to remove the lamp from the vehicle."

Source: Ex. 1009, p.4; Petition for IPR, p. 10

Mr. Yarde Confirmed That a POSITA Knew a Lamp Could Be Removed Before Refurbishing

Yarde Declaration (Ex. 1009)



17. Paragraph 10 of Kuta describes that an alternative to replacing the lens is to refurbish the lens while the lens is still mounted on the vehicle. Kuta does not criticize, discredit, or discourage any of the alternatives.

18. Kuta does not discourage a person of ordinary skill in the art from removing a lamp from a vehicle when refurbishing the lamp nor lead a person of ordinary skill in the art in a direction away from removing a lamp from a vehicle when refurbishing the lamp.

19. I have reviewed U.S. Patent No. 6,106,648 to Butt ("Butt") (Ex. 1003). Column 2, lines 56-60 of Butt teach that to refurbish a lens, it may be more convenient to remove the lamp from the vehicle.

20. I have reviewed U.S. Patent No. 4,497,755 to Korsyn ("Korsyn") (Ex. 1006). Column 5, lines 45-48 of Korsyn teach that a lens is removed from an automobile for repairing the lens.

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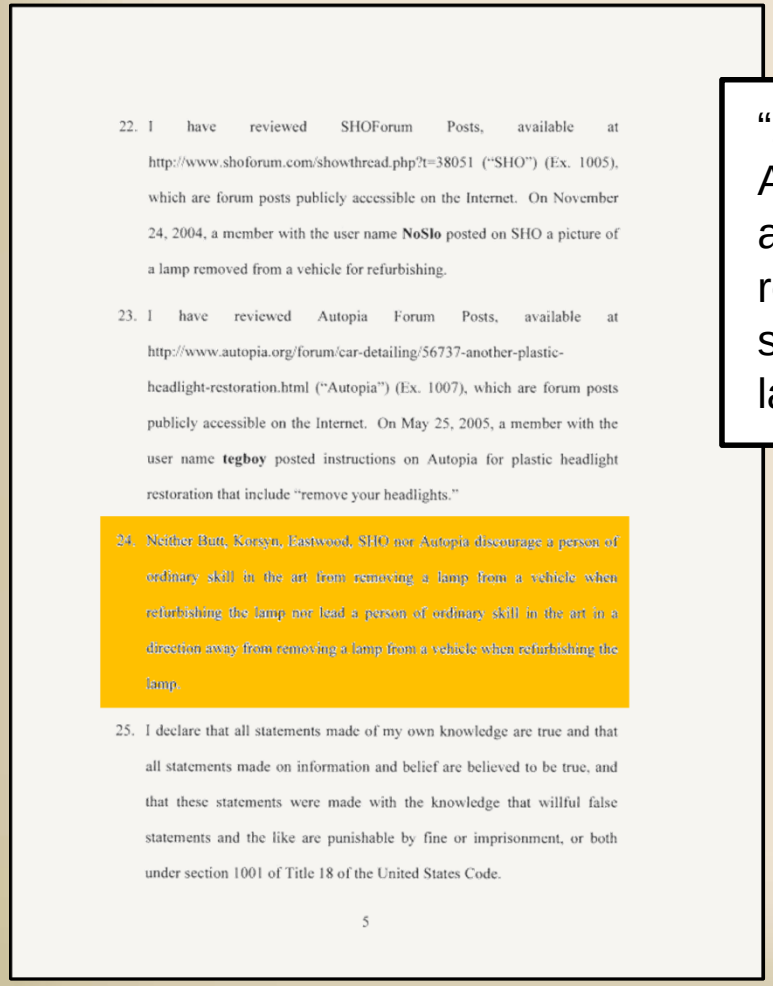
4

"21. I have reviewed Eastwood ShopTalk Forum Posts, available at *http://forum.eastwood.com/showthread.php?118-Plastic-headligbt-resealing&s=d3d5c 104c4068d77bcc48e2e5a d49222* ('Eastwood') (Ex. 1004), which are forum posts publicly accessible on the Internet. On February 18, 2005, a member with the user name Pontisteve posted on Eastwood that 'I took the headlights out of my Mustang to do them, because I didn't want to risk any damage to the car.'"

Source: Ex. 1009, p. 4; Petition for IPR, pp.10-11

Mr. Yarde Confirmed That a POSITA Knew a Lamp Could Be Removed Before Refurbishing

Yarde Declaration (Ex. 1009)



22. I have reviewed SHOForum Posts, available at http://www.shoforum.com/showthread.php?t=38051 ("SHO") (Ex. 1005), which are forum posts publicly accessible on the Internet. On November 24, 2004, a member with the user name **NoSlo** posted on SHO a picture of a lamp removed from a vehicle for refurbishing.

23. I have reviewed Autopia Forum Posts, available at http://www.autopia.org/forum/car-detailing/56737-another-plastic-headlight-restoration.html ("Autopia") (Ex. 1007), which are forum posts publicly accessible on the Internet. On May 25, 2005, a member with the user name **tegboy** posted instructions on Autopia for plastic headlight restoration that include "remove your headlights."

24. Neither Butt, Korsyn, Eastwood, SHO nor Autopia discourage a person of ordinary skill in the art from removing a lamp from a vehicle when refurbishing the lamp nor lead a person of ordinary skill in the art in a direction away from removing a lamp from a vehicle when refurbishing the lamp.

25. I declare that all statements made of my own knowledge are true and that all statements made on information and belief are believed to be true, and that these statements were made with the knowledge that willful false statements and the like are punishable by fine or imprisonment, or both under section 1001 of Title 18 of the United States Code.

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"24. Neither Butt, Korsyn, Eastwood, SHO nor Autopia discourage a person of ordinary skill in the art from removing a lamp from a vehicle when refurbishing the lamp nor lead a person of ordinary skill in the art in a direction away from removing a lamp from a vehicle when refurbishing the lamp."

Source: Ex. 1009, p. 5; Petition for IPR, pp.10-11

Claim Construction

Decision Instituting Trial

IPR2013-00020 (SCM)
Patent 7,297,364

Here, the inventors of the '364 Patent have not acted as their own lexicographers. Neither has the presumption that the ordinary and accustomed meaning of claim terms been overcome. The involved claim terms are not ambiguous or obscure and would have been commonly understood to a person of ordinary skill in the art. There is also no dispute between LKQ and Clearlamp in connection with the meaning of any claim term. Accordingly, for purposes of this decision, we construe all terms of claims 1-24 as having their ordinary and customary meaning as would be understood by one with ordinary skill in the art.

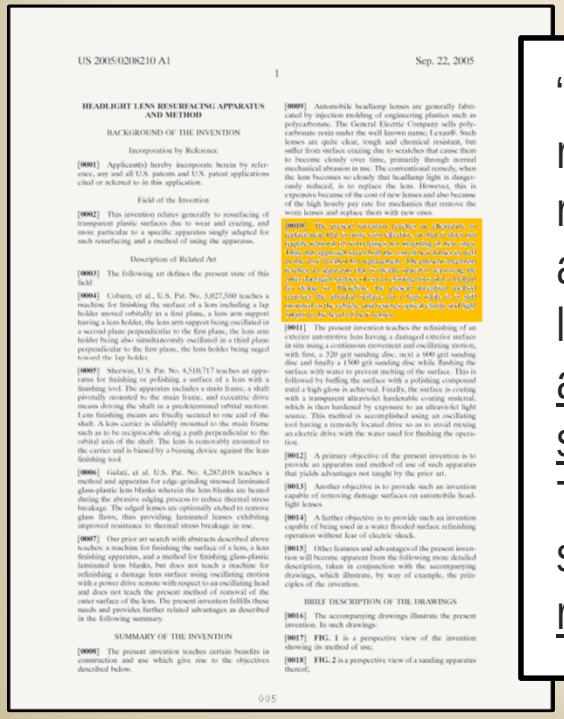
Source: Decision Instituting Trial, p.6

Kuta Teaches the Remaining Limitations of Claim 1

Claim 1:

1. A method for refurbishing a lamp surface of a lamp having surface damage, the method comprising the steps of:

Kuta (Ex. 1002)



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HEADLIGHT LENS RESURFACING APPARATUS AND METHOD

BACKGROUND OF THE INVENTION

Incorporation by Reference

[0001] Applicant(s) hereby incorporate herein by reference, any and all U.S. patents and U.S. patent applications cited or referred to in this application.

Field of the Invention

[0002] This invention relates generally to resurfacing of transparent plastic surfaces due to wear and crazing, and more particular to a specific apparatus singly adapted for such resurfacing and a method of using the apparatus.

Description of Related Art

[0003] The following art defines the present state of this field:

[0004] Cubara, et al., U.S. Pat. No. 3,027,560 teaches a machine for finishing the surface of a lens including a lap holder moved orbitally in a first plane, a lens arm support having a lens holder, the lens arm support being oscillated in a second plane perpendicular to the first plane, the lens arm holder being also simultaneously oscillated in a third plane perpendicular to the first plane, the lens holder being urged toward the lap holder.

[0005] Sherwin, U.S. Pat. No. 4,510,717 teaches an apparatus for finishing or polishing a surface of a lens with a finishing tool. The apparatus includes a main frame, a shaft pivotally mounted to the main frame, and eccentric drive means driving the shaft in a predetermined orbital motion. Lens finishing means are fixedly secured to one end of the shaft. A lens carrier is slidably mounted to the main frame such as to be reciprocable along a path perpendicular to the orbital axis of the shaft. The lens is removably mounted to the carrier and is biased by a biasing device against the lens finishing tool.

[0006] Giulati, et al., U.S. Pat. No. 4,287,018 teaches a method and apparatus for edge-grinding stressed laminated glass-plastic lens blanks wherein the lens blanks are heated during the abrasive edging process to reduce thermal stress breakage. The edged lenses are optionally etched to remove glass flows, thus providing laminated lenses exhibiting improved resistance to thermal stress breakage in use.

[0007] Our prior art search with abstracts described above teaches: a machine for finishing the surface of a lens, a lens finishing apparatus, and a method for finishing glass-plastic laminated lens blanks, but does not teach a machine for refinishing a damage lens surface using oscillating motion with a power drive remote with respect to an oscillating head and does not teach the present method of removal of the outer surface of the lens. The present invention fulfills these needs and provides further related advantages as described in the following summary.

SUMMARY OF THE INVENTION

[0008] The present invention teaches certain benefits in construction and use which give rise to the objectives described below.

[0009] Automobile headlamp lenses are generally fabricated by injection molding of engineering plastics such as polycarbonate. The General Electric Company sells polycarbonate resin under the well known name, Lexan®. Such lenses are quite clear, tough and chemical resistant, but suffer from surface crazing due to scratches that cause them to become cloudy over time, primarily through normal mechanical abrasion in use. The conventional remedy, when the lens becomes so cloudy that headlamp light is dangerously reduced, is to replace the lens. However, this is expensive because of the cost of new lenses and also because of the high hourly pay rate for mechanics that remove the worn lenses and replace them with new ones.

[0010] The present invention teaches an alternative to replacement that is more cost effective, in that it does not require removal of worn lenses nor mounting of new ones. Thus, this approach saves both the cost of new lenses as well as the cost of labor for replacement. The present invention teaches an apparatus that is ideally suited to removing the outer damaged surface of on an existing lens and a method for doing so. Therefore, the present invention method removes the abraded surface on a lens while it is still mounted on the vehicle, and restores optical clarity and light output to the level of new lenses.

[0011] The present invention teaches the refinishing of an exterior automotive lens having a damaged exterior surface in situ using a continuous movement and oscillating motion, with first, a 320 grit sanding disc, next a 600 grit sanding disc and finally a 1500 grit sanding disc while flushing the surface with water to prevent melting of the surface. This is followed by buffing the surface with a polishing compound until a high glow is achieved. Finally, the surface is coating with a transparent ultraviolet hardenable coating material, which is then hardened by exposure to an ultraviolet light source. This method is accomplished using an oscillating tool having a remotely located drive so as to avoid mixing an electric drive with the water used for flushing the operation.

[0012] A primary objective of the present invention is to provide an apparatus and method of use of such apparatus that yields advantages not taught by the prior art.

[0013] Another objective is to provide such an invention capable of removing damage surfaces on automobile headlight lenses.

[0014] A further objective is to provide such an invention capable of being used in a water flooded surface refinishing operation without fear of electric shock.

[0015] Other features and advantages of the present invention will become apparent from the following more detailed description, taken in conjunction with the accompanying drawings, which illustrate, by way of example, the principles of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0016] The accompanying drawings illustrate the present invention. In such drawings:

[0017] FIG. 1 is a perspective view of the invention showing its method of use;

[0018] FIG. 2 is a perspective view of a sanding apparatus thereof;

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"[0010] The present invention teaches an alternative to replacement that is more cost effective, in that it does not require removal of worn lenses nor mounting of new ones. Thus, this approach saves both the cost of new lenses as well as the cost of labor for replacement. The present invention teaches an apparatus that is ideally suited to removing the outer damaged surface of on an existing lens and a method for doing so. Therefore, the present invention method removes the abraded surface on a lens while it is still mounted on the vehicle, and restores optical clarity and light output to the level of new lenses."

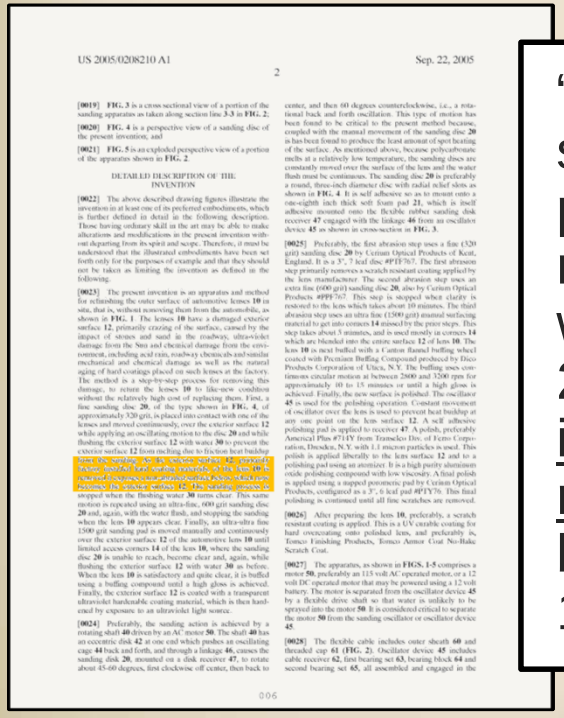
Source: Ex. 1001, Claim 1; Ex. 1002, p.5; Petition for IPR, p.16

Kuta Teaches the Remaining Limitations of Claim 1

Claim 1:

removing an original clear coat finish from the lamp surface of the lamp;

Kuta (Ex. 1002)



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[0019] FIG. 3 is a cross sectional view of a portion of the sanding apparatus as taken along section line 3-3 in FIG. 2;

[0020] FIG. 4 is a perspective view of a sanding disc of the present invention; and

[0021] FIG. 5 is an exploded perspective view of a portion of the apparatus shown in FIG. 2.

DETAILED DESCRIPTION OF THE INVENTION

[0022] The above described drawing figures illustrate the invention in at least one of its preferred embodiments, which is further defined in detail in the following description. Those having ordinary skill in the art may be able to make alterations and modifications in the present invention without departing from its spirit and scope. Therefore, it must be understood that the illustrated embodiments have been set forth only for the purposes of example and that they should not be taken as limiting the invention as defined in the following.

[0023] The present invention is an apparatus and method for refinishing the outer surface of automotive lenses 10 in situ, that is, without removing them from the automobile, as shown in FIG. 1. The lenses 10 have a damaged exterior surface 12, primarily crazing of the surface, caused by the impact of stones and sand in the roadway, ultraviolet damage from the Sun and chemical damage from the environment, including acid rain, roadway chemicals and similar mechanical and chemical damage as well as the natural aging of hard coatings placed on such lenses at the factory. The method is a step-by-step process for removing this damage, to return the lenses 10 to like-new condition without the relatively high cost of replacing them. First, a fine sanding disc 20, of the type shown in FIG. 4, of approximately 320 grit, is placed into contact with one of the lenses and moved continuously, over the exterior surface 12 while applying an oscillating motion to the disc 20 and while flushing the exterior surface 12 with water 30 to prevent the exterior surface 12 from melting due to friction heat buildup [redacted] stopped when the flushing water 30 turns clear. This same motion is repeated using an ultra-fine, 600 grit sanding disc 20 and, again, with the water flush, and stopping the sanding when the lens 10 appears clear. Finally, an ultra-ultra fine 1500 grit sanding pad is moved maunually and continuously over the exterior surface 12 of the automotive lens 10 until limited access corners 14 of the lens 10, where the sanding disc 20 is unable to reach, become clear and, again, while flushing the exterior surface 12 with water 30 as before. When the lens 10 is satisfactory and quite clear, it is buffed using a buffing compound until a high gloss is achieved. Finally, the exterior surface 12 is coated with a transparent ultraviolet hardenable coating material, which is then hardened by exposure to an ultraviolet light source.

[0024] Preferably, the sanding action is achieved by a rotating shaft 40 driven by an AC motor 50. The shaft 40 has an eccentric disk 42 at one end which pushes an oscillating cage 44 back and forth, and through a linkage 46, causes the sanding disk 20, mounted on a disk receiver 47, to rotate about 45-60 degrees, first clockwise off center, then back to center, and then 60 degrees counterclockwise, i.e., a rotational back and forth oscillation. This type of motion has been found to be critical to the present method because, coupled with the manual movement of the sanding disc 20 is has been found to produce the least amount of spot heating of the surface. As mentioned above, because polycarbonate melts at a relatively low temperature, the sanding discs are constantly moved over the surface of the lens and the water flush must be continuous. The sanding disc 20 is preferably a round, three-inch diameter disc with radial relief slots as shown in FIG. 4. It is self adhesive so as to mount onto a one-eighth inch thick soft foam pad 21, which is itself adhesive mounted onto the flexible rubber sanding disk receiver 47 engaged with the linkage 46 from an oscillator device 45 as shown in cross-section in FIG. 3.

[0025] Preferably, the first abrasion step uses a fine (320 grit) sanding disc 20 by Ceriun Optical Products of Kent, England. It is a 3", 7 leaf disc #PTF767. The first abrasion step primarily removes a scratch resistant coating applied by the lens manufacturer. The second abrasion step uses an extra fine (600 grit) sanding disc 20, also by Ceriun Optical Products #PPF767. This step is stopped when clarity is restored to the lens which takes about 10 minutes. The third abrasion step uses an ultra fine (1500 grit) enamel surfacing material to get into corners 14 missed by the prior steps. This step takes about 5 minutes, and is used mostly in corners 14 which are blended into the entire surface 12 of lens 10. The lens 10 is next buffed with a Carlton flannel buffing wheel coated with Precision Buffing Compound produced by Dico Products Corporation of Utica, N.Y. The buffing uses continuous circular motion at between 2600 and 3200 rpm for approximately 10 to 15 minutes or until a high gloss is achieved. Finally, the new surface is polished. The oscillator 45 is used for the polishing operation. Constant movement of oscillator over the lens is used to prevent heat buildup at any one point on the lens surface 12. A self adhesive polishing pad is applied to receiver 47. A polish, preferably Americal Plus #7149 from Transclco Div. of Ferro Corporation, Dresden, N.Y. with 1.1 micron particles is used. This polish is applied liberally to the lens surface 12 and to a polishing pad using an atomizer. It is a high purity aluminum oxide polishing compound with low viscosity. A final polish is applied using a napped polymeric pad by Ceriun Optical Products, configured as a 3", 6 leaf pad #PTY76. This final polishing is continued until all fine scratches are removed.

[0026] After preparing the lens 10, preferably, a scratch resistant coating is applied. This is a UV curable coating for hard overcoating onto polished lens, and preferably is, Tomco Finishing Products, Tomco Armor Coat No-Bake Scratch Coat.

[0027] The apparatus, as shown in FIGS. 1-5 comprises a motor 50, preferably an 115 volt AC operated motor, or a 12 volt DC operated motor that may be powered using a 12 volt battery. The motor is separated from the oscillator device 45 by a flexible drive shaft so that water is unlikely to be sprayed into the motor 50. It is considered critical to separate the motor 50 from the sanding oscillator or oscillator device 45.

[0028] The flexible cable includes outer sheath 60 and threaded cap 61 (FIG. 2). Oscillator device 45 includes cable receiver 62, first bearing set 63, bearing block 64 and second bearing set 65, all assembled and engaged in the

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"[0023] …First, a fine sanding disc 20, of the type shown in FIG. 4, of approximately 320 grit, is placed into contact with one of the lenses and moved continuously, over the exterior surface 12 while applying an oscillating motion to the disc 20…As the exterior surface 12, primarily factory installed hard coating materials, of the lens 10 is removed it exposes a non-abraded surface below, which now becomes the exterior surface 12."

Source: Ex. 1001, Claim 1; Ex. 1002, p.6; Petition for IPR, p.21

Kuta Teaches the Remaining Limitations of Claim 1

Claim 1:

evening the lamp surface;

Kuta (Ex. 1002)

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[0019] **FIG. 3** is a cross sectional view of a portion of the sanding apparatus as taken along section line **3-3** in **FIG. 2**;

[0020] **FIG. 4** is a perspective view of a sanding disc of the present invention; and

[0021] **FIG. 5** is an exploded perspective view of a portion of the apparatus shown in **FIG. 2**.

DETAILED DESCRIPTION OF THE INVENTION

[0022] The above described drawing figures illustrate the invention in at least one of its preferred embodiments, which is further defined in detail in the following description. Those having ordinary skill in the art may be able to make alterations and modifications in the present invention without departing from its spirit and scope. Therefore, it must be understood that the illustrated embodiments have been set forth only for the purposes of example and that they should not be taken as limiting the invention as defined in the following.

[0023] The present invention is an apparatus and method for refinishing the outer surface of automotive lenses **10** in situ, that is, without removing them from the automobile, as shown in **FIG. 1**. The lenses **10** have a damaged exterior surface **12**, primarily crazing of the surface, caused by the impact of stones and sand in the roadway, ultraviolet damage from the Sun and chemical damage from the environment, including acid rain, roadway chemicals and similar mechanical and chemical damage as well as the natural aging of hard coatings placed on such lenses at the factory. The method is a step-by-step process for removing this damage, to return the lenses **10** to like-new condition without the relatively high cost of replacing them. First, a fine sanding disc **20**, of the type shown in **FIG. 4**, of approximately 320 grit, is placed into contact with one of the lenses and moved continuously, over the exterior surface **12** while applying an oscillating motion to the disc **20** and while flushing the exterior surface **12** with water **30** to prevent the exterior surface **12** from melting due to friction heat buildup from the sanding. As the exterior surface **12**, primarily factory installed hard coating materials, of the lens **10** is removed it exposes a non-abraded surface below, which now becomes the exterior surface **12**. The sanding process is stopped [illegible] 1500 grit sanding pad is moved manually and continuously over the exterior surface **12** of the automotive lens **10** until limited access corners **14** of the lens **10**, where the sanding disc **20** is unable to reach, become clear and, again, while flushing the exterior surface **12** with water **30** as before. When the lens **10** is satisfactory and quite clear, it is buffed using a buffing compound until a high gloss is achieved. Finally, the exterior surface **12** is coated with a transparent ultraviolet hardenable coating material, which is then hardened by exposure to an ultraviolet light source.

[0024] Preferably, the sanding action is achieved by a rotating shaft **40** driven by an AC motor **50**. The shaft **40** has an eccentric disk **42** at one end which pushes an oscillating cage **44** back and forth, and through a linkage **46**, causes the sanding disk **20**, mounted on a disk receiver **47**, to rotate about 45-60 degrees, first clockwise off center, then back to center, and then 60 degrees counterclockwise, i.e., a rotational back and forth oscillation. This type of motion has been found to be critical to the present method because, coupled with the manual movement of the sanding disc **20** is has been found to produce the least amount of spot heating of the surface. As mentioned above, because polycarbonate melts at a relatively low temperature, the sanding discs are constantly moved over the surface of the lens and the water flush must be continuous. The sanding disc **20** is preferably a round, three-inch diameter disc with radial relief slots as shown in **FIG. 4**. It is self adhesive so as to mount onto a one-eighth inch thick soft foam pad **21**, which is itself adhesive mounted onto the flexible rubber sanding disk receiver **47** engaged with the linkage **46** from an oscillator device **45** as shown in cross-section in **FIG. 3**.

[0025] Preferably, the first abrasion step uses a fine (320 grit) sanding disc **20** by Cerium Optical Products of Kent, England. It is a 3", 7 leaf disc #PTF767. The first abrasion step primarily removes a scratch resistant coating applied by the lens manufacturer. The second abrasion step uses an extra fine (600 grit) sanding disc **20**, also by Ceriun Optical Products #PPF767. This step is stopped when clarity is restored to the lens which takes about 10 minutes. The third abrasion step uses an ultra fine (1500 grit) manual surfacing material to get into corners **14** missed by the prior steps. This step takes about 5 minutes, and is used mostly in corners **14** which are blended into the entire surface **12** of lens **10**. The lens **10** is next buffed with a Carlton flannel buffing wheel coated with Precision Buffing Compound produced by Dico Products Corporation of Utica, N.Y. The buffing uses continuous circular motion at between 2600 and 3200 rpm for approximately 10 to 15 minutes or until a high gloss is achieved. Finally, the new surface is polished. The oscillator **45** is used for the polishing operation. Constant movement of oscillator over the lens is used to prevent heat buildup at any one point on the lens surface **12**. A self adhesive polishing pad is applied to receiver **47**. A polish, preferably Americal Plus #7149 from Transclco Div. of Ferro Corporation, Dresden, N.Y. with 1.1 micron particles is used. This polish is applied liberally to the lens surface **12** and to a polishing pad using an atomizer. It is a high purity aluminum oxide polishing compound with low viscosity. A final polish is applied using a napped poromeric pad by Ceriun Optical Products, configured as a 3", 6 leaf pad #PTY76. This final polishing is continued until all fine scratches are removed.

[0026] After preparing the lens **10**, preferably, a scratch resistant coating is applied. This is a UV curable coating for hard overcoating onto polished lens, and preferably is, Tomco Finishing Products, Tomco Armor Coat No-Bake Scratch Coat.

[0027] The apparatus, as shown in **FIGS. 1-5** comprises a motor **50**, preferably an 115 volt AC operated motor, or a 12 volt DC operated motor that may be powered using a 12 volt battery. The motor is separated from the oscillator device **45** by a flexible drive shaft so that water is unlikely to be sprayed into the motor **50**. It is considered critical to separate the motor **50** from the sanding oscillator or oscillator device **45**.

[0028] The flexible cable includes outer sheath **60** and threaded cap **61** (**FIG. 2**). Oscillator device **45** includes cable receiver **62**, first bearing set **63**, bearing block **64** and second bearing set **65**, all assembled and engaged in the

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"[0023] …This same motion is repeated using an ultra-fine, 600 grit sanding disc **20** and, again, with the water flush, and stopping the sanding when the lens **10** appears clear."

Source: Ex. 1001, Claim 1; Ex. 1002, p.6; Petition for IPR, p.21

Kuta Teaches the Remaining Limitations of Claim 1

Claim 1:

grinding swirls and scratches out of the lamp surface;

Kuta (Ex. 1002)

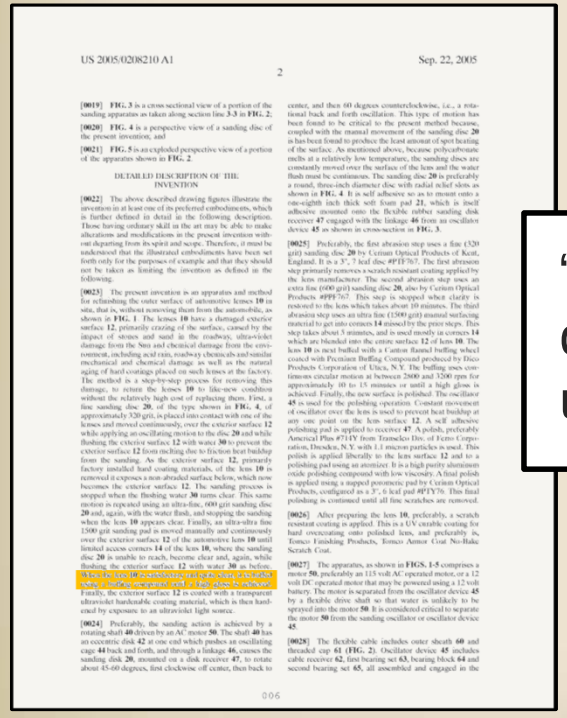
"[0025] …The second abrasion step uses an extra fine (600 grit) sanding disc **20**, also by Cerium Optical Products #PPF767. This step is stopped when clarity is restored to the lens which takes about 10 minutes."

Kuta Teaches the Remaining Limitations of Claim 1

Claim 1:

buffing the lamp surface;

Kuta (Ex. 1002)



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[0019] FIG. 3 is a cross sectional view of a portion of the sanding apparatus as taken along section line 3-3 in FIG. 2;

[0020] FIG. 4 is a perspective view of a sanding disc of the present invention; and

[0021] FIG. 5 is an exploded perspective view of a portion of the apparatus shown in FIG. 2.

DETAILED DESCRIPTION OF THE INVENTION

[0022] The above described drawing figures illustrate the invention in at least one of its preferred embodiments, which is further defined in detail in the following description. Those having ordinary skill in the art may be able to make alterations and modifications in the present invention without departing from its spirit and scope. Therefore, it must be understood that the illustrated embodiments have been set forth only for the purposes of example and that they should not be taken as limiting the invention as defined in the following.

[0023] The present invention is an apparatus and method for refinishing the outer surface of automotive lenses 10 in situ, that is, without removing them from the automobile, as shown in FIG. 1. The lenses 10 have a damaged exterior surface 12, primarily crazing of the surface, caused by the impact of stones and sand in the roadway, ultraviolet damage from the Sun and chemical damage from the environment, including acid rain, roadway chemicals and similar mechanical and chemical damage as well as the natural aging of hard coatings placed on such lenses at the factory. The method is a step-by-step process for removing this damage, to return the lenses 10 to like-new condition without the relatively high cost of replacing them. First, a fine sanding disc 20, of the type shown in FIG. 4, of approximately 320 grit, is placed into contact with one of the lenses and moved continuously, over the exterior surface 12 while applying an oscillating motion to the disc 20 and while flushing the exterior surface 12 with water 30 to prevent the exterior surface 12 from melting due to friction heat buildup from the sanding. As the exterior surface 12, primarily factory installed hard coating materials, of the lens 10 is removed it exposes a non-abraded surface below, which now becomes the exterior surface 12. The sanding process is stopped when the flushing water 30 turns clear. This same motion is repeated using an ultra-fine, 600 grit sanding disc 20 and, again, with the water flush, and stopping the sanding when the lens 10 appears clear. Finally, an ultra-ultra fine 1500 grit sanding pad is moved manually and continuously over the exterior surface 12 of the automotive lens 10 until limited access corners 14 of the lens 10, where the sanding disc 20 is unable to reach, become clear and, again, while flushing the exterior surface 12 with water 30 as before. Finally, the exterior surface 12 is coated with a transparent ultraviolet hardenable coating material, which is then hardened by exposure to an ultraviolet light source.

[0024] Preferably, the sanding action is achieved by a rotating shaft 40 driven by an AC motor 50. The shaft 40 has an eccentric disk 42 at one end which pushes an oscillating cage 44 back and forth, and through a linkage 46, causes the sanding disk 20, mounted on a disk receiver 47, to rotate about 45-60 degrees, first clockwise off center, then back to center, and then 60 degrees counterclockwise, i.e., a rotational back and forth oscillation. This type of motion has been found to be critical to the present method because, coupled with the manual movement of the sanding disc 20 is has been found to produce the least amount of spot heating of the surface. As mentioned above, because polycarbonate melts at a relatively low temperature, the sanding discs are constantly moved over the surface of the lens and the water flush must be continuous. The sanding disc 20 is preferably a round, three-inch diameter disc with radial relief slots as shown in FIG. 4. It is self adhesive so as to mount onto a one-eighth inch thick soft foam pad 21, which is itself adhesive mounted onto the flexible rubber sanding disk receiver 47 engaged with the linkage 46 from an oscillator device 45 as shown in cross-section in FIG. 3.

[0025] Preferably, the first abrasion step uses a fine (320 grit) sanding disc 20 by Ceiram Optical Products of Kent, England. It is a 3", 7 leaf disc #PTF767. The first abrasion step primarily removes a scratch resistant coating applied by the lens manufacturer. The second abrasion step uses an extra fine (600 grit) sanding disc 20, also by Ceiram Optical Products #PPF767. This step is stopped when clarity is restored to the lens which takes about 10 minutes. The third abrasion step uses an ultra fine (1500 grit) manual surfacing material to get into corners 14 missed by the prior steps. This step takes about 5 minutes, and is used mostly in corners 14 which are blended into the entire surface 12 of lens 10. The lens 10 is next buffed with a Canton flannel buffing wheel coated with Precision Buffing Compound produced by Dico Products Corporation of Utica, N.Y. The buffing uses continuous circular motion at between 2800 and 3200 rpm for approximately 10 to 15 minutes or until a high gloss is achieved. Finally, the new surface is polished. The oscillator 45 is used for the polishing operation. Constant movement of oscillator over the lens is used to prevent heat buildup at any one point on the lens surface 12. A self adhesive polishing pad is applied to receiver 47. A polish, preferably Americal Plus #7149 from Transdeo Div. of Ferro Corporation, Dresden, N.Y. with 1.1 micron particles is used. This polish is applied liberally to the lens surface 12 and to a polishing pad using an atomizer. It is a high purity aluminum oxide polishing compound with low viscosity. A final polish is applied using a stapled poromeric pad by Ceiram Optical Products, configured as a 3", 6 leaf pad #PTY76. This final polishing is continued until all fine scratches are removed.

[0026] After preparing the lens 10, preferably, a scratch resistant coating is applied. This is a UV curable coating for hard overcoating onto polished lens, and preferably is, Tomco Finishing Products, Tomco Armor Coat No-Bake Scratch Coat.

[0027] The apparatus, as shown in FIGS. 1-5 comprises a motor 50, preferably an 115 volt AC operated motor, or a 12 volt DC operated motor that may be powered using a 12 volt battery. The motor is separated from the oscillator device 45 by a flexible drive shaft so that water is unlikely to be sprayed into the motor 50. It is considered critical to separate the motor 50 from the sanding oscillator or oscillator device 45.

[0028] The flexible cable includes outer sheath 60 and threaded cap 61 (FIG. 2). Oscillator device 45 includes cable receiver 62, first bearing set 63, bearing block 64 and second bearing set 65, all assembled and engaged in the

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"[0023] …When the lens **10** is satisfactory and quite clear, it is buffed using a buffing compound until a high gloss is achieved."

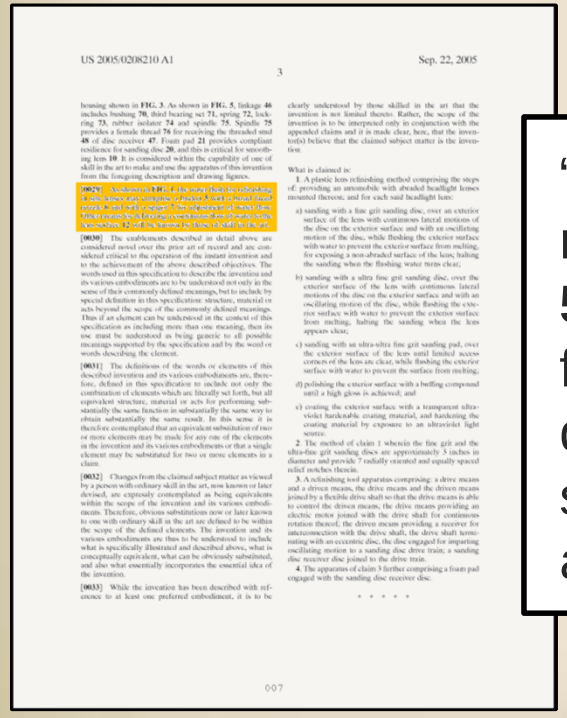
Source: Ex. 1001, Claim 1; Ex. 1002, p.6; Petition for IPR, p.21

Kuta Teaches the Remaining Limitations of Claim 1

Claim 1:

cleaning the lamp surface;

Kuta (Ex. 1002)



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housing shown in **FIG. 3**. As shown in **FIG. 5**, linkage **46** includes bushing **70**, third bearing set **71**, spring **72**, lock-ring **73**, rubber isolator **74** and spindle **75**. Spindle **75** provides a female thread **76** for receiving the threaded stud **48** of disc receiver **47**. Foam pad **21** provides compliant resilience for sanding disc **20**, and this is critical for smooth-ing lens **10**. It is considered within the capability of one of skill in the art to make and use the apparatus of this invention from the foregoing description and drawing figures.

[0029] As shown in **FIG. 1**, the water flush for refinishing in situ lenses may comprise a bucket **5** with a broad faced nozzle **6** and with a spigot **7** for adjustment of water flow. Other means for delivery a continuous flow of water to the lens surface **12** will be known by those of skill in the art.

[0030] The enablements described in detail above are considered novel over the prior art of record and are con-sidered critical to the operation of the instant invention and to the achievement of the above described objectives. The words used in this specification to describe the invention and its various embodiments are to be understood not only in the sense of their commonly defined meanings, but to include by special definition in this specification: structure, material or acts beyond the scope of the commonly defined meanings. Thus if an element can be understood in the context of this specification as including more than one meaning, then its use must be understood as being generic to all possible meanings supported by the specification and by the word or words describing the element.

[0031] The definitions of the words or elements of this described invention and its various embodiments are, there-fore, defined in this specification to include not only the combination of elements which are literally set forth, but all equivalent structure, material or acts for performing sub-stantially the same function in substantially the same way to obtain substantially the same result. In this sense it is therefore contemplated that an equivalent substitution of two or more elements may be made for any one of the elements in the invention and its various embodiments or that a single element may be substituted for two or more elements in a claim.

[0032] Changes from the claimed subject matter as viewed by a person with ordinary skill in the art, now known or later devised, are expressly contemplated as being equivalents within the scope of the invention and its various embodi-ments. Therefore, obvious substitutions now or later known to one with ordinary skill in the art are defined to be within the scope of the defined elements. The invention and its various embodiments are thus to be understood to include what is specifically illustrated and described above, what is conceptually equivalent, what can be obviously substituted, and also what essentially incorporates the essential idea of the invention.

[0033] While the invention has been described with ref-erence to at least one preferred embodiment, it is to be clearly understood by those skilled in the art that the invention is not limited thereto. Rather, the scope of the invention is to be interpreted only in conjunction with the appended claims and it is made clear, here, that the inven-tor(s) believe that the claimed subject matter is the inven-tion.

What is claimed is:

1. A plastic lens refinishing method comprising the steps of: providing an automobile with abraded headlight lenses mounted thereon; and for each said headlight lens:

a) sanding with a fine grit sanding disc, over an exterior surface of the lens with continuous lateral motions of the disc on the exterior surface and with an oscillating motion of the disc, while flushing the exterior surface with water to prevent the exterior surface from melting, for exposing a non-abraded surface of the lens, halting the sanding when the flushing water runs clear;

b) sanding with a ultra fine grit sanding disc, over the exterior surface of the lens with continuous lateral motions of the disc on the exterior surface and with an oscillating motion of the disc, while flushing the exte-rior surface with water to prevent the exterior surface from melting, halting the sanding when the lens appears clear;

c) sanding with an ultra-ultra fine grit sanding pad, over the exterior surface of the lens until limited access corners of the lens are clear, while flushing the exterior surface with water to prevent the surface from melting;

d) polishing the exterior surface with a buffing compound until a high gloss is achieved; and

e) coating the exterior surface with a transparent ultra-violet hardenable coating material, and hardening the coating material by exposure to an ultraviolet light source.

2. The method of claim 1 wherein the fine grit and the ultra-fine grit sanding discs are approximately 5 inches in diameter and provide 7 radially oriented and equally spaced relief notches therein.

3. A refinishing tool apparatus comprising: a drive means and a driven means, the drive means and the driven means joined by a flexible drive shaft so that the drive means is able to control the driven means, the drive means providing an electric motor joined with the drive shaft for continuous rotation thereof, the driven means providing a receiver for interconnection with the drive shaft, the drive shaft termi-nating with an eccentric disc, the disc engaged for imparting oscillating motion to a sanding disc drive train; a sanding disc receiver disc joined to the drive train.

4. The apparatus of claim 3 further comprising a foam pad engaged with the sanding disc receiver disc.

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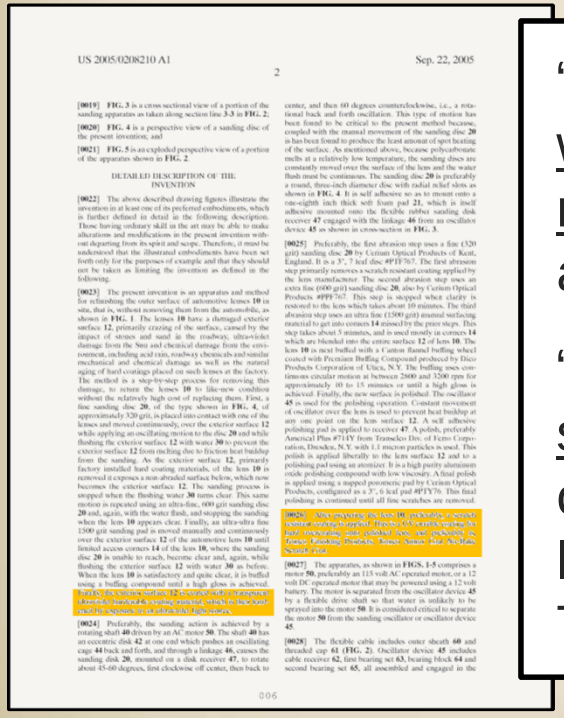
Source: Ex. 1001, Claim 1; Ex. 1002, p.7; Petition for IPR, p.21

Kuta Teaches the Remaining Limitations of Claim 1

Claim 1:

spraying a replacement clear coating material over the lamp surface; and

Kuta (Ex. 1002)



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[0019] FIG. 3 is a cross sectional view of a portion of the sanding apparatus as taken along section line 3-3 in FIG. 2;

[0020] FIG. 4 is a perspective view of a sanding disc of the present invention; and

[0021] FIG. 5 is an exploded perspective view of a portion of the apparatus shown in FIG. 2.

DETAILED DESCRIPTION OF THE INVENTION

[0022] The above described drawing figures illustrate the invention in at least one of its preferred embodiments, which is further defined in detail in the following description. Those having ordinary skill in the art may be able to make alterations and modifications in the present invention without departing from its spirit and scope. Therefore, it must be understood that the illustrated embodiments have been set forth only for the purposes of example and that they should not be taken as limiting the invention as defined in the following.

[0023] The present invention is an apparatus and method for refinishing the outer surface of automotive lenses 10 in situ, that is, without removing them from the automobile, as shown in FIG. 1. The lenses 10 have a damaged exterior surface 12, primarily crazing of the surface, caused by the impact of stones and sand in the roadway, ultraviolet damage from the Sun and chemical damage from the environment, including acid rain, roadway chemicals and similar mechanical and chemical damage as well as the natural aging of hard coatings placed on such lenses at the factory. The method is a step-by-step process for removing this damage, to return the lenses 10 to like-new condition without the relatively high cost of replacing them. First, a fine sanding disc 20, of the type shown in FIG. 4, of approximately 320 grit, is placed into contact with one of the lenses and moved continuously, over the exterior surface 12 while applying an oscillating motion to the disc 20 and while flushing the exterior surface 12 with water 30 to prevent the exterior surface 12 from melting due to friction heat buildup from the sanding. As the exterior surface 12, primarily factory installed hard coating materials, of the lens 10 is removed it exposes a non-abraded surface below, which now becomes the exterior surface 12. The sanding process is stopped when the flushing water 30 turns clear. This same motion is repeated using an ultra-fine, 600 grit sanding disc 20 and, again, with the water flush, and stopping the sanding when the lens 10 appears clear. Finally, an ultra-ultra fine 1500 grit sanding pad is moved maintually and continuously over the exterior surface 12 of the automotive lens 10 until limited access corners 14 of the lens 10, where the sanding disc 20 is unable to reach, become clear and, again, while flushing the exterior surface 12 with water 30 as before. When the lens 10 is satisfactory and quite clear, it is buffed using a buffing compound until a high gloss is achieved.

[0024] Preferably, the sanding action is achieved by a rotating shaft 40 driven by an AC motor 50. The shaft 40 has an eccentric disk 42 at one end which pushes an oscillating cage 44 back and forth, and through a linkage 46, causes the sanding disk 20, mounted on a disk receiver 47, to rotate about 45-60 degrees, first clockwise off center, then back to center, and then 60 degrees counterclockwise, i.e., a rotational back and forth oscillation. This type of motion has been found to be critical to the present method because, coupled with the manual movement of the sanding disc 20 is has been found to produce the least amount of spot heating of the surface. As mentioned above, because polycarbonate melts at a relatively low temperature, the sanding discs are constantly moved over the surface of the lens and the water flush must be continuous. The sanding disc 20 is preferably a round, three-inch diameter disc with radial relief slots as shown in FIG. 4. It is self adhesive so as to mount onto a one-eighth inch thick soft foam pad 21, which is itself adhesive mounted onto the flexible rubber sanding disk receiver 47 engaged with the linkage 46 from an oscillator device 45 as shown in cross-section in FIG. 3.

[0025] Preferably, the first abrasion step uses a fine (320 grit) sanding disc 20 by Cerium Optical Products of Kent, England. It is a 3", 7 leaf disc #PTF767. The first abrasion step primarily removes a scratch resistant coating applied by the lens manufacturer. The second abrasion step uses an extra fine (600 grit) sanding disc 20, also by Cerium Optical Products. #PPF767. This step is stopped when clarity is restored to the lens which takes about 10 minutes. The third abrasion step uses an ultra fine (1500 grit) enamel surfacing material to get into corners 14 missed by the prior steps. This step takes about 5 minutes, and is used mostly in corners 14 which are blended into the entire surface 12 of lens 10. The lens 10 is next buffed with a Cotton flannel buffing wheel coated with Precision Buffing Compound produced by Dico Products Corporation of Utica, N.Y. The buffing uses continuous circular motion at between 2800 and 3200 rpm for approximately 10 to 15 minutes or until a high gloss is achieved. Finally, the new surface is polished. The oscillator 45 is used for the polishing operation. Constant movement of oscillator over the lens is used to prevent heat buildup at any one point on the lens surface 12. A self adhesive polishing pad is applied to receiver 47. A polish, preferably Americal Plus #7149 from Transdeo Div. of Ferro Corporation, Dresden, N.Y. with 1.1 micron particles is used. This polish is applied liberally to the lens surface 12 and to a polishing pad using an atomizer. It is a high purity aluminum oxide polishing compound with low viscosity. A final polish is applied using a napped polymeric pad by Cerium Optical Products, configured as a 3", 6 leaf pad #PTY76. This final polishing is continued until all fine scratches are removed.

[0026] After preparing the lens 10, preferably, a scratch resistant coating is applied. This is a UV curable coating for hard overcoating onto polished lens, and preferably is, Tomco Finishing Products, Tomco Armor Coat No-Bake Scratch Coat.

[0027] The apparatus, as shown in FIGS. 1-5 comprises a motor 50, preferably an 115 volt AC operated motor, or a 12 volt DC operated motor that may be powered using a 12 volt battery. The motor is separated from the oscillator device 45 by a flexible drive shaft so that water is unlikely to be sprayed into the motor 50. It is considered critical to separate the motor 50 from the sanding oscillator or oscillator device 45.

[0028] The flexible cable includes outer sheath 60 and threaded cap 61 (FIG. 2). Oscillator device 45 includes cable receiver 62, first bearing set 63, bearing block 64 and second bearing set 65, all assembled and engaged in the

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"[0023] …Finally, the exterior surface **12** is coated with a transparent ultraviolet hardenable coating material, which is then hardened by exposure to an ultraviolet light source."

"[0026] After preparing the lens **10**, preferably, a scratch resistant coating is applied. This is a UV curable coating for hard overcoating onto polished lens, and preferably is, Tomco Finishing Products, Tomco Armor Coat No-Bake Scratch Coat."

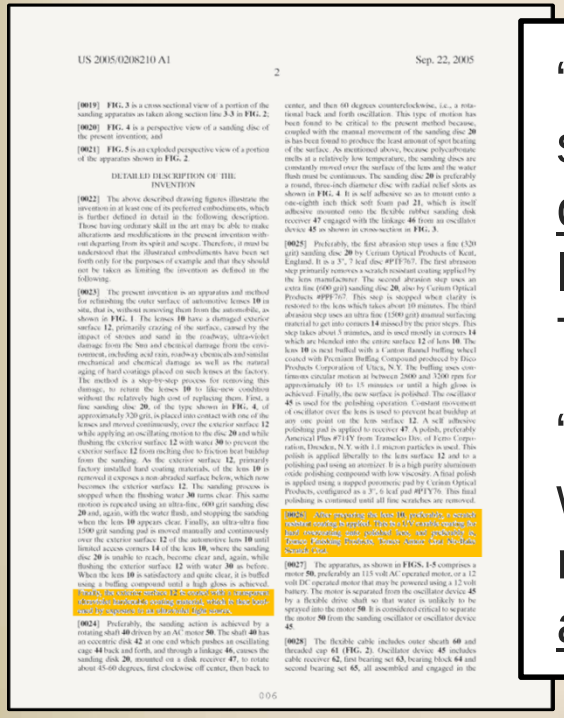
Source: Ex. 1001, Claim 1; Ex. 1002, p.6; Petition for IPR, p.21

Kuta Teaches the Remaining Limitations of Claim 1

Claim 1:

curing the replacement clear coat material.

Kuta (Ex. 1002)



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[0019] **FIG. 3** is a cross sectional view of a portion of the sanding apparatus as taken along section line **3-3** in **FIG. 2**;

[0020] **FIG. 4** is a perspective view of a sanding disc of the present invention; and

[0021] **FIG. 5** is an exploded perspective view of a portion of the apparatus shown in **FIG. 2**.

DETAILED DESCRIPTION OF THE INVENTION

[0022] The above described drawing figures illustrate the invention in at least one of its preferred embodiments, which is further defined in detail in the following description. Those having ordinary skill in the art may be able to make alterations and modifications in the present invention without departing from its spirit and scope. Therefore, it must be understood that the illustrated embodiments have been set forth only for the purposes of example and that they should not be taken as limiting the invention as defined in the following.

[0023] The present invention is an apparatus and method for refinishing the outer surface of automotive lenses **10** in situ, that is, without removing them from the automobile, as shown in **FIG. 1**. The lenses **10** have a damaged exterior surface **12**, primarily crazing of the surface, caused by the impact of stones and sand in the roadway, ultraviolet damage from the Sun and chemical damage from the environment, including acid rain, roadway chemicals and similar mechanical and chemical damage as well as the natural aging of hard coatings placed on such lenses at the factory. The method is a step-by-step process for removing this damage, to return the lenses **10** to like-new condition without the relatively high cost of replacing them. First, a fine sanding disc **20**, of the type shown in **FIG. 4**, of approximately 320 grit, is placed into contact with one of the lenses and moved continuously, over the exterior surface **12** while applying an oscillating motion to the disc **20** and while flushing the exterior surface **12** with water **30** to prevent the exterior surface **12** from melting due to friction heat buildup from the sanding. As the exterior surface **12**, primarily factory installed hard coating materials, of the lens **10** is removed it exposes a non-abraded surface below, which now becomes the exterior surface **12**. The sanding process is stopped when the flushing water **30** turns clear. This same motion is repeated using an ultra-fine, 600 grit sanding disc **20** and, again, with the water flush, and stopping the sanding when the lens **10** appears clear. Finally, an ultra-ultra fine 1500 grit sanding pad is moved maunually and continuously over the exterior surface **12** of the automotive lens **10** until limited access corners **14** of the lens **10**, where the sanding disc **20** is unable to reach, become clear and, again, while flushing the exterior surface **12** with water **30** as before. When the lens **10** is satisfactory and quite clear, it is buffed using a buffing compound until a high gloss is achieved.

[0024] Preferably, the sanding action is achieved by a rotating shaft **40** driven by an AC motor **50**. The shaft **40** has an eccentric disk **42** at one end which pushes an oscillating cage **44** back and forth, and through a linkage **46**, causes the sanding disk **20**, mounted on a disk receiver **47**, to rotate about 45-60 degrees, first clockwise off center, then back to center, and then 60 degrees counterclockwise, i.e., a rotational back and forth oscillation. This type of motion has been found to be critical to the present method because, coupled with the manual movement of the sanding disc **20** is has been found to produce the least amount of spot heating of the surface. As mentioned above, because polycarbonate melts at a relatively low temperature, the sanding discs are constantly moved over the surface of the lens and the water flush must be continuous. The sanding disc **20** is preferably a round, three-inch diameter disc with radial relief slots as shown in **FIG. 4**. It is self adhesive so as to mount onto a one-eighth inch thick soft foam pad **21**, which is itself adhesive mounted onto the flexible rubber sanding disk receiver **47** engaged with the linkage **46** from an oscillator device **45** as shown in cross-section in **FIG. 3**.

[0025] Preferably, the first abrasion step uses a fine (320 grit) sanding disc **20** by Ceiram Optical Products of Kent, England. It is a 3", 7 leaf disc #PTF767. The first abrasion step primarily removes a scratch resistant coating applied by the lens manufacturer. The second abrasion step uses an extra fine (600 grit) sanding disc **20**, also by Ceiram Optical Products #PPF767. This step is stopped when clarity is restored to the lens which takes about 10 minutes. The third abrasion step uses an ultra fine (1500 grit) enamel surfacing material to get into corners **14** missed by the prior steps. This step takes about 5 minutes, and is used mostly in corners **14** which are blended into the entire surface **12** of lens **10**. The lens **10** is next buffed with a Carlton flannel buffing wheel coated with Precision Buffing Compound produced by Dico Products Corporation of Utica, N.Y. The buffing uses continuous circular motion at between 2800 and 3200 rpm for approximately 10 to 15 minutes or until a high gloss is achieved. Finally, the new surface is polished. The oscillator **45** is used for the polishing operation. Constant movement of oscillator over the lens is used to prevent heat buildup at any one point on the lens surface **12**. A soft adhesive polishing pad is applied to receiver **47**. A polish, preferably Americal Plus #7149 from Transdeo Div. of Ferro Corporation, Dresden, N.Y. with 1.1 micron particles is used. This polish is applied liberally to the lens surface **12** and to a polishing pad using an atomizer. It is a high purity aluminum oxide polishing compound with low viscosity. A final polish is applied using a napped polymeric pad by Ceiram Optical Products, configured as a 3", 6 leaf pad #PTY76. This final polishing is continued until all fine scratches are removed.

[0026] After preparing the lens **10**, preferably, a scratch resistant coating is applied. This is a UV curable coating for hard overcoating onto polished lens, and preferably is, Tomco Finishing Products, Tomco Armor Coat No-Bake Scratch Coat.

[0027] The apparatus, as shown in **FIGS. 1-5** comprises a motor **50**, preferably an 115 volt AC operated motor, or a 12 volt DC operated motor that may be powered using a 12 volt battery. The motor is separated from the oscillator device **45** by a flexible drive shaft so that water is unlikely to be sprayed into the motor **50**. It is considered critical to separate the motor **50** from the sanding oscillator or oscillator device **45**.

[0028] The flexible cable includes outer sheath **60** and threaded cap **61** (**FIG. 2**). Oscillator device **45** includes cable receiver **62**, first bearing set **63**, bearing block **64** and second bearing set **65**, all assembled and engaged in the

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"[0026] After preparing the lens **10**, preferably, a scratch resistant coating is applied. This is a UV curable coating for hard overcoating onto polished lens, and preferably is, Tomco Finishing Products, Tomco Armor Coat No-Bake Scratch Coat."

"[0023] …Finally, the exterior surface **12** is coated with a transparent ultraviolet hardenable coating material, which is then hardened by exposure to an ultraviolet light source."

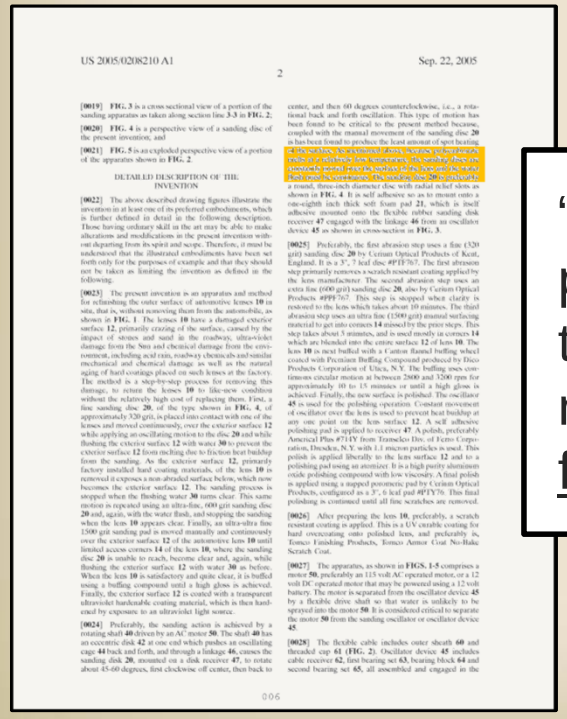
Source: Ex. 1001, Claim 1; Ex. 1002, p.6; Petition for IPR, p.21-22

Kuta Teaches the Only Additional Limitation of Independent Claim 13

Claim 13:

statically neutralizing debris on the lamp surface to facilitate the removal of all of the debris on the lamp surface;

Kuta (Ex. 1002)



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[0019] FIG. 3 is a cross sectional view of a portion of the sanding apparatus as taken along section line 3-3 in FIG. 2.

[0020] FIG. 4 is a perspective view of a sanding disc of the present invention, and

[0021] FIG. 5 is an exploded perspective view of a portion of the apparatus shown in FIG. 2.

DETAILED DESCRIPTION OF THE INVENTION

[0022] The above described drawing figures illustrate the invention in at least one of its preferred embodiments, which is further defined in detail in the following description. Those having ordinary skill in the art may be able to make alterations and modifications in the present invention without departing from its spirit and scope. Therefore, it must be understood that the illustrated embodiments have been set forth only for the purposes of example and that they should not be taken as limiting the invention as defined in the following.

[0023] The present invention is an apparatus and method for refinishing the outer surface of automotive lenses 10 in situ, that is, without removing them from the automobile, as shown in FIG. 1. The lenses 10 have a clearcoated exterior surface 12, primarily crazing of the surface, caused by the impact of stones and sand in the roadway, ultra-violet damage from the Sun and chemical damage from the environment, including acid rain, roadway chemicals and similar mechanical and chemical damage as well as the natural aging of hard coatings placed on such lenses at the factory. The method is a step-by-step process for removing this damage, to return the lenses 10 to like-new condition without the relatively high cost of replacing them. First, a fine sanding disc 20, of the type shown in FIG. 4, of approximately 320 grit, is placed into contact with one of the lenses and moved continuously, over the exterior surface 12 while applying an oscillating motion to the disc 20 and while flushing the exterior surface 12 with water 30 to prevent the exterior surface 12 from melting due to friction heat buildup from the sanding. As the exterior surface 12, primarily factory installed hard coating materials, of the lens 10 is removed it exposes a non abraded surface below, which now becomes the exterior surface 12. The sanding process is stopped when the flushing water 30 turns clear. This same motion is repeated using an ultra-fine, 600 grit sanding disc 20 and, again, with the water flush, and stopping the sanding when the lens 10 appears clear. Finally, an ultra-ultra fine 1500 grit sanding pad is moved manually and continuously over the exterior surface 12 of the automotive lens 10 until limited access corners 14 of the lens 10, where the sanding disc 20 is unable to reach, become clear and, again, while flushing the exterior surface 12 with water 30 as before. When the lens 10 is satisfactory and quite clear, it is buffed using a buffing compound until a high gloss is achieved. Finally, the exterior surface 12 is coated with a transparent ultraviolet hardenable coating material, which is then hardened by exposure to an ultraviolet light source.

[0024] Preferably, the sanding action is achieved by a rotating shaft 40 driven by an AC motor 50. The shaft 40 has an eccentric disk 42 at one end which pushes an oscillating cage 44 back and forth, and through a linkage 46, causes the sanding disk 20, mounted on a disk receiver 47, to rotate about 45-60 degrees, first clockwise off center, then back to center, and then 60 degrees counterclockwise, i.e., a rotational back and forth oscillation. This type of motion has been found to be critical to the present method because, coupled with the manual movement of the sanding disc 20 as has been found to produce the least amount of spot heating [redacted] a round, three-inch diameter disc with radial relief slots as shown in FIG. 4. It is self adhesive so as to mount onto a one-eighth inch thick soft foam pad 21, which is itself adhesive mounted onto the flexible rubber sanding disk receiver 47 engaged with the linkage 46 from an oscillator device 45 as shown in cross-section in FIG. 3.

[0025] Preferably, the first abrasion step uses a fine (320 grit) sanding disc 20 by Certum Optical Products of Kent, England. It is a 3", 7 leaf disc #PFF767. The first abrasion step primarily removes a scratch resistant coating applied by the lens manufacturer. The second abrasion step uses an extra fine (600 grit) sanding disc 20, also by Certum Optical Products #PFF767. This step is stopped when clarity is restored to the lens which takes about 10 minutes. The third abrasion step uses an ultra fine (1500 grit) manual surfacing material to get into corners 14 missed by the prior steps. This step takes about 5 minutes, and is used mostly in corners 14 which are blended into the entire surface 12 of lens 10. The lens 10 is next buffed with a Canton flannel buffing wheel coated with Precision Buffing Compound produced by Dico Products Corporation of Utica, N.Y. The buffing uses continuous circular motion at between 2600 and 3500 rpm for approximately 10 to 15 minutes or until a high gloss is achieved. Finally, the new surface is polished. The oscillator 45 is used for the polishing operation. Constant movement of oscillator over the lens is used to prevent heat buildup at any one point on the lens surface 12. A self adhesive polishing pad is applied to receiver 47. A polish, preferably America Plus #714Y from Transclco Div. of Ferro Corporation, Dresden, N.Y. with 1.1 micron particles is used. This polish is applied liberally to the lens surface 12 and to a polishing pad using an atomizer. It is a high purity aluminum oxide polishing compound with low viscosity. A final polish is applied using a stapled porotmeric pad by Certum Optical Products, configured as a 3", 6 leaf pad #PTY76. This final polishing is continued until all fine scratches are removed.

[0026] After preparing the lens 10, preferably, a scratch resistant coating is applied. This is a UV curable coating for hard overcoating onto polished lens, and preferably is, Tomco Finishing Products, Tomco Armor Coat No-Bake Scratch Coat.

[0027] The apparatus, as shown in FIGS. 1-5 comprises a motor 50, preferably an 115 volt AC operated motor, or a 12 volt DC operated motor that may be powered using a 12 volt battery. The motor is separated from the oscillator device 45 by a flexible drive shaft so that water is unlikely to be sprayed into the motor 50. It is considered critical to separate the motor 50 from the sanding oscillator or oscillator device 45.

[0028] The flexible cable includes outer sheath 60 and threaded cap 61 (FIG. 2). Oscillator device 45 includes cable receiver 62, first bearing set 63, bearing block 64 and second bearing set 65, all assembled and engaged in the

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"[0024] …As mentioned above, because polycarbonate melts at a relatively low temperature, the sanding discs are constantly moved over the surface of the lens and the water flush must be continuous."

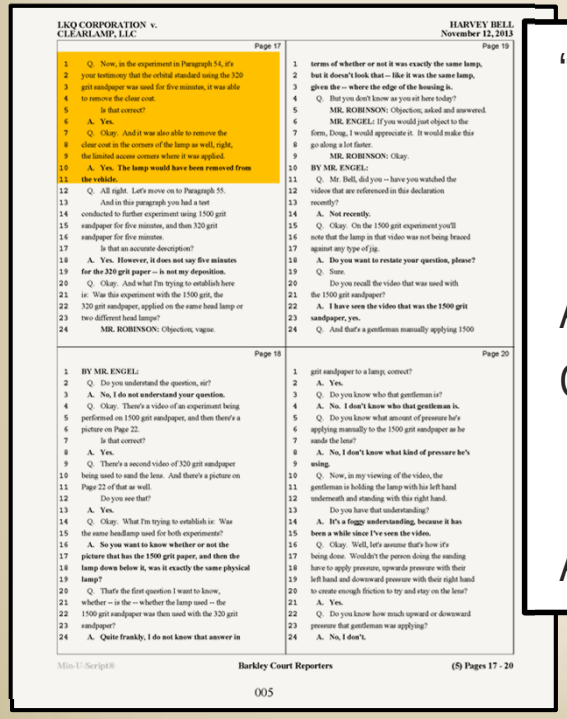
Source: Ex. 1001, Claim 13; Ex. 1002, p.6; Petition for IPR, p.28

Patent Owner's "Fully Removing" Amendment

Proposed Claim 25, 25', 25'', 37, 37', and 37'':

…**fully** removing an original clear coat finish from the lamp surface of the lamp;

Bell 11/12/13 (Ex. 1034)



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Page 17

Q. Now, in the experiment in Paragraph 54, it's your testimony that the orbital standard using the 320 grit sandpaper was used for five minutes, it was able to remove the clear coat.
Is that correct?
A. Yes.
Q. Okay. And it was also able to remove the clear coat in the corners of the lamp as well, right, the limited access corners where it was applied.
A. Yes. The lamp would have been removed from the vehicle.
Q. All right. Let's move on to Paragraph 55.
And in this paragraph you had a test conducted to further experiment using 1500 grit sandpaper for five minutes, and then 320 grit sandpaper for five minutes.
Is that an accurate description?
A. Yes. However, it does not say five minutes for the 320 grit paper -- is not my deposition.
Q. Okay. And what I'm trying to establish here is: Was this experiment with the 1500 grit, the 320 grit sandpaper, applied on the same head lamp or two different head lamps?
MR. ROBINSON: Objection; vague.

Page 18

BY MR. ENGEL:
Q. Do you understand the question, sir?
A. No, I do not understand your question.
Q. Okay. There's a video of an experiment being performed on 1500 grit sandpaper, and then there's a picture on Page 22.
Is that correct?
A. Yes.
Q. There's a second video of 320 grit sandpaper being used to sand the lens. And there's a picture on Page 22 of that as well.
Do you see that?
A. Yes.
Q. Okay. What I'm trying to establish is: Was the same headlamp used for both experiments?
A. So you want to know whether or not the picture that has the 1500 grit paper, and then the lamp down below it, was it exactly the same physical lamp?
Q. That's the first question I want to know, whether -- is the -- whether the lamp used -- the 1500 grit sandpaper was then used with the 320 grit sandpaper?
A. Quite frankly, I do not know that answer in terms of whether or not it was exactly the same lamp, but it doesn't look that -- like it was the same lamp, given the -- where the edge of the housing is.
Q. But you don't know as you sit here today?
MR. ROBINSON: Objection; asked and answered.
MR. ENGEL: If you would just object to the form, Doug, I would appreciate it. It would make this go along a lot faster.
MR. ROBINSON: Okay.
BY MR. ENGEL:
Q. Mr. Bell, did you -- have you watched the videos that are referenced in this declaration recently?
A. Not recently.
Q. Okay. On the 1500 grit experiment you'll note that the lamp in that video was not being braced against any type of jig.
A. Do you want to restate your question, please?
Q. Sure.
Do you recall the video that was used with the 1500 grit sandpaper?
A. I have seen the video that was the 1500 grit sandpaper, yes.
Q. And that's a gentleman manually applying 1500 grit sandpaper to a lamp, correct?
A. Yes.
Q. Do you know who that gentleman is?
A. No, I don't know who that gentleman is.
Q. Do you know what amount of pressure he's applying manually to the 1500 grit sandpaper as he sands the lens?
A. No, I don't know what kind of pressure he's using.
Q. Now, in my viewing of the video, the gentleman is holding the lamp with his left hand underneath and standing with this right hand.
Do you have that understanding?
A. It's a foggy understanding, because it has been a while since I've seen the video.
Q. Okay. Well, let's assume that's how it's being done. Wouldn't the person doing the sanding have to apply pressure, upwards pressure with their left hand and downward pressure with their right hand to create enough friction to try and stay on the lens?
A. Yes.
Q. Do you know how much upward or downward pressure that gentleman was applying?
A. No, I don't.

Min-U-Script® — Barkley Court Reporters — (5) Pages 17 - 20

005

"Q. Now, in the experiment in Paragraph 54, it's your testimony that the orbital standard using the 320 grit sandpaper was used for five minutes, it was able to remove the clear coat. Is that correct?

A. Yes.

Q. Okay. And it was also able to remove the clear coat in the corners of the lamp as well, right, the limited access corners where it was applied.

A. Yes. The lamp would have been removed from the vehicle."

Source: Ex. 1034, p. 5, 17:1-11; Motion to Amend, pp. 7-9, 11-13; Observations on Testimony of Bell, p. 7

Patent Owner's "Fully Removing" Amendment

Proposed Claim 25, 25', 25'', 37, 37', and 37'':

…**fully** removing an original clear coat finish from the lamp surface of the lamp;

Katsamberis 8/16/13 (Ex. 1017)


LKQ CORPORATION v. CLEARLAMP, LLC

DIMITRIS KATSAMBERIS August 16, 2013

Barkley Court Reporters (26) Pages 101 - 104

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"Q. Let's assume for a second that the system of Kuta was used to refinish a lamp that had been removed from a car, okay? Can you assume that?

A. Yes.

Q. Would the limited access corners which are labeled as Number 14 in Kuta still exist if that was the case?

A. Probably not.

Q. Why not?

A. Because the car body will not be there to limit your access to those corners."

Patent Owner's "Minimize Any Troughs" Amendment

Proposed Claim 25, 25', 25'', 37, 37', and 37'':

…evening the lamp surface **by smoothing out the lamp surface to minimize any troughs created through the removal of the damage**;

Kuta (Ex. 1002)


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007

"[0028] …Foam pad 21 provides compliant resilience for sanding disc 20, and this is critical for smoothing lens 10."

Patent Owner's "Minimize Any Troughs" Amendment

Proposed Claim 25, 25', 25'', 37, 37', and 37'':

…evening the lamp surface **by smoothing out the lamp surface to minimize any troughs created through the removal of the damage**;

VehiCROSS Forums (Ex. 1025)

"For larger more significant scratches, I'd start off with the WET sandpaper process using a lower grit as you mentioned and work yourself into a higher grit. Then follow up with the polishing. Scratches and dents that don't come off with the polishing will need to be sanded first in order to smooth out to a level surface."

Source: Ex. 1025, p.2; Motion to Amend, pp.7-9, 11-13; Opposition to Motion to Amend, pp. 6-7

Patent Owner's "Minimize Any Troughs" Amendment

Proposed Claim 25, 25', 25'', 37, 37', and 37'':

…evening the lamp surface **by smoothing out the lamp surface to minimize any troughs created through the removal of the damage**;

Cole (Ex. 1008)

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3 4

lens can tolerate without surface melting. Non-rotary tools such as orbital sanding devices (e.g., quarter sheet devices) may be equivalently used and function well, provided they are not so aggressive as to melt the lens in use. Use of random orbital sanding devices has been tried, and could possibly be effectively used, but the device tried was been found to be difficult to control. Some headlight lenses also are more readily abraded by use of hand sanding. The selection of tool versus hand sanding is made depending upon the shape and contour of the headlight lens. Often, some level of hand abrading is necessary to reach hard to sand areas.

Once the discoloration has been removed, or mostly removed by the coarse grade sanding, the lens can be cleaned by wiping or rinsing if necessary at **24** to remove the larger grit particles that may remain and hinder removing the scratches. Successively finer grade sandpapers at **28** and repeat-

[redacted]

succession of grades might involve use of all common grades, or skipping every other available grade, or skipping two grades as the process proceeds. Commonly the following progression of paper grades can be used: start: 220→400→600→800→2000. Other progressions with more or fewer grades may be in order depending upon the condition of the headlight. With experience, decisions as to which grade is appropriate to the current condition of the lens will be easily made. When the finest grade is reached at **32** (normally about 2000 grade), a final wet abrasion is carried out and the lens is wiped clean and/or rinsed at **24**.

At this point, the lens may still appear somewhat cloudy or foggy due to the microscopic scratches left behind from the fine grit abrasive operation, but the yellow discoloration should be eliminated. At this point, the lens is polished at **36** using a water based aluminum oxide paste polish which is diluted with water and applied either manually or with a polishing tool using a soft cloth or other material such as wool. In this operation, a water based polishing paste such as Aqua-Buff 2000 (available from The Matchless Metal Polish Company, 840 West 49th Place, Chicago, Ill. 60609 USA) has been found suitable. This material was developed for polishing the surface of boats and the like. This material comes as a dense paste (roughly the density of bread dough) and contains very fine abrasive particles of aluminum oxide. For the operation of **36**, the paste is diluted with water to achieve a consistency approximately that of toothpaste. This is normally achieved by dilution with approximately equal parts of water, but this dilution is not critical.

Operation **36** continues until the lens appears visually clear to the naked eye. Additional water can be added to the lens surface during the polishing if the paste appears to be drying out. The paste residue is then washed off with water and dried with a lint free cloth at **40**. A lint free cloth is used to help assure that no particles of lint are attracted to the lens during the drying process, since such particles would appear on the finished surface of the lens.

At **44** a film forming aqueous polymer dispersion containing an ultraviolet protectant is applied to the outer surface of the lens. The preferred product for this use is a sealer and ultraviolet light (UV) protectant based upon an aqueous acrylic urethane with additives that inhibit and/or absorb UV light; however, aqueous polyurethane products may possibly be substituted without departing from embodiments consistent with the present invention.

One product that has been found to be suitable for use as the sealer and UV protectant is commercially available from Clearstar Coatings Corporation (P.O. Box 590, Isle of Palms, SC 29451 USA) and is commercially marketed as ClearShield® Original formulation gloss liquid laminate. When used in this application, the product is diluted by adding approximately 50% (e.g., about 40% to 60%) of its volume of water and mixing well (i.e., 100 ml. of sealer is added to 50 ml. of water to produce a total of 150 ml.). This product was developed as a liquid laminate product for use in sealing the surface of signs, banners, digital inkjet output, printed or airbrushed products, art, and other graphic arts products. It is noted that the above-mentioned level of dilution is significantly greater than that recommended by the manufacturer, but has been found to work well.

The portion of ClearShield® Original formulation gloss liquid laminate which represents solids is not available from the manufacturer, but an experiment was conducted to attempt to determine this attribute. A protective coating was applied to at 2.0" by 2.0" (2.54 cm by 2.54 cm) sample of Lexan™ plastic in the same manner used for coating headlight lenses. The starting weight of the plastic was 7.77 grams. Immediately after application (while wet) the weight increased to 8.38 grams, indicating that approximately 0.61 grams of liquid was applied. After the sample was completely dry, it was weighed again and weighed 7.94 grams indicating that the dry weight of the coating was 0.17 grams which represents approximately 28% by weight of the diluted dispersion.

ClearShield® Original formulation gloss liquid laminate is a product which is based upon acrylic urethane copolymers. The product further contains Hindered Amine Light Stabilizers and benzotriazole UV light absorbers. Additionally, 1-methyl-2-pyrrolidone is used to improve adhesion and dipropylene glycol monomethyl ether is used as a co-solvent to help the resin coalesce and form a film. This product appears milky, but dries clear. This product has been found especially suitable because it is safe to use with minimal protective equipment, does not damage painted surfaces, rubber or other common automobile materials, and can be readily cleaned up.

While the invention should not be constrained by the theoretical explanation of operation of the various components of the preferred protective coating, it is nonetheless believed to be useful to speculate on the various properties of the components of the protective coating as follows.

In ClearShield® Original formulation gloss liquid laminate, it is likely that the vast majority of the dried film is the acrylic urethane copolymer. It is likely that the acrylic urethane copolymer represents greater than 90% of the weight of the dried film, but this has not been verified experimentally. The acrylic urethane copolymer matrix holds the UV protection in the film. The immediate appearance change caused by application of the acrylic urethane copolymer is a loss of fogginess. The dried acrylic urethane copolymer has a refractive index near to that of the plastic that is being refinished (at least much closer than the refractive index of air is). If the bulk of the plastic of the headlight lens is fairly clear, much of the fogginess is likely based on the surface of the headlight not being smooth on a microscopic scale. The many microscopic grooves, scratches and pits act as a collection of lenses, each aiming the light in a different direction.

Since light traveling between two clear materials with the same refractive index is not diffracted, a coating with a

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"The objective of the succession of finer grade papers is to remove the large scratch marks from the surface of the lens until the lens appears to have a relatively smooth surface that is virtually free of visible individual scratches. This normally occurs at a sandpaper grade of approximately 2000, plus or minus a grade."

Source: Ex. 1008, p. 6, 3:19-24; Motion to Amend, pp.7-9, 11-13; Opposition to Motion to Amend, p. 7

Patent Owner's "Original Equipment Condition" Amendments

Proposed Claim 25', 37', and 37'':

…**wherein, the steps (b) through [(h)/(i)/(j)] are performed to restore the lamp to its original equipment condition.**

Proposed Claim 25'':

…**wherein, the steps (b) through (i) are performed to restore the lamp to its original equipment condition, with the lamp surface having an optical quality similar to the optical quality of an original equipment lamp surface.**

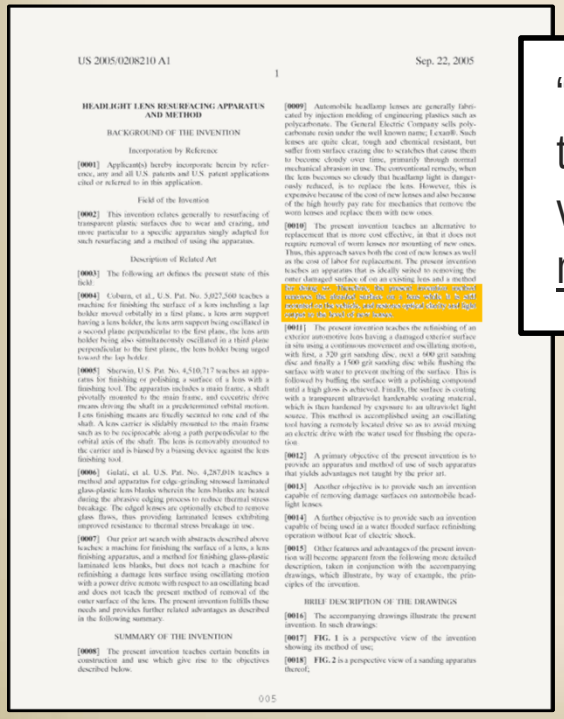
Source: Motion to Amend, pp. 8-9, 12-13

Patent Owner's "Original Equipment Condition" Amendments

Proposed Claim 25', 25", 37', and 37":

…**restore the lamp to its original equipment condition**…

Kuta (Ex. 1002)



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HEADLIGHT LENS RESURFACING APPARATUS AND METHOD

BACKGROUND OF THE INVENTION

Incorporation by Reference

[0001] Applicant(s) hereby incorporate herein by reference, any and all U.S. patents and U.S. patent applications cited or referred to in this application.

Field of the Invention

[0002] This invention relates generally to resurfacing of transparent plastic surfaces due to wear and crazing, and more particular to a specific apparatus singly adapted for such resurfacing and a method of using the apparatus.

Description of Related Art

[0003] The following art defines the present state of this field:

[0004] Coburn, et al., U.S. Pat. No. 3,027,560 teaches a machine for finishing the surface of a lens including a lap holder moved orbitally in a first plane, a lens arm support having a lens holder, the lens arm support being oscillated in a second plane perpendicular to the first plane, the lens arm holder being also simultaneously oscillated in a third plane perpendicular to the first plane, the lens holder being urged toward the lap holder.

[0005] Sherwin, U.S. Pat. No. 4,510,717 teaches an apparatus for finishing or polishing a surface of a lens with a finishing tool. The apparatus includes a main frame, a shaft pivotally mounted to the main frame, and eccentric drive means driving the shaft in a predetermined orbital motion. Lens finishing means are fixedly secured to one end of the shaft. A lens carrier is slidably mounted to the main frame such as to be reciprocable along a path perpendicular to the orbital axis of the shaft. The lens is removably mounted to the carrier and is biased by a biasing device against the lens finishing tool.

[0006] Gulati, et al. U.S. Pat. No. 4,287,018 teaches a method and apparatus for edge-grinding stressed laminated glass-plastic lens blanks wherein the lens blanks are heated during the abrasive edging process to reduce thermal stress breakage. The edged lenses are optionally etched to remove glass flows, thus providing laminated lenses exhibiting improved resistance to thermal stress breakage in use.

[0007] Our prior art search with abstracts described above teaches: a machine for finishing the surface of a lens, a lens finishing apparatus, and a method for finishing glass-plastic laminated lens blanks, but does not teach a machine for refinishing a damage lens surface using oscillating motion with a power drive remote with respect to an oscillating head and does not teach the present method of removal of the outer surface of the lens. The present invention fulfills these needs and provides further related advantages as described in the following summary.

SUMMARY OF THE INVENTION

[0008] The present invention teaches certain benefits in construction and use which give rise to the objectives described below.

[0009] Automobile headlamp lenses are generally fabricated by injection molding of engineering plastics such as polycarbonate. The General Electric Company sells polycarbonate resin under the well known name, Lexan®. Such lenses are quite clear, tough and chemical resistant, but suffer from surface crazing due to scratches that cause them to become cloudy over time, primarily through normal mechanical abrasion in use. The conventional remedy, when the lens becomes so cloudy that headlamp light is dangerously reduced, is to replace the lens. However, this is expensive because of the cost of new lenses and also because of the high hourly pay rate for mechanics that remove the worn lenses and replace them with new ones.

[0010] The present invention teaches an alternative to replacement that is more cost effective, in that it does not require removal of worn lenses nor mounting of new ones. Thus, this approach saves both the cost of new lenses as well as the cost of labor for replacement. The present invention teaches an apparatus that is ideally suited to removing the outer damaged surface of on an existing lens and a method [redacted]

[0011] The present invention teaches the refinishing of an exterior automotive lens having a damaged exterior surface in situ using a continuous movement and oscillating motion, with first, a 320 grit sanding disc, next a 600 grit sanding disc and finally a 1500 grit sanding disc while flushing the surface with water to prevent melting of the surface. This is followed by buffing the surface with a polishing compound until a high gloss is achieved. Finally, the surface is coating with a transparent ultraviolet hardenable coating material, which is then hardened by exposure to an ultraviolet light source. This method is accomplished using an oscillating tool having a remotely located drive so as to avoid mixing an electric drive with the water used for flushing the operation.

[0012] A primary objective of the present invention is to provide an apparatus and method of use of such apparatus that yields advantages not taught by the prior art.

[0013] Another objective is to provide such an invention capable of removing damage surfaces on automobile headlight lenses.

[0014] A further objective is to provide such an invention capable of being used in a water flooded surface refinishing operation without fear of electric shock.

[0015] Other features and advantages of the present invention will become apparent from the following more detailed description, taken in conjunction with the accompanying drawings, which illustrate, by way of example, the principles of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0016] The accompanying drawings illustrate the present invention. In such drawings:

[0017] FIG. 1 is a perspective view of the invention showing its method of use;

[0018] FIG. 2 is a perspective view of a sanding apparatus thereof;

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"[0010] …Therefore, the present invention [sic] method removes the abraded surface on a lens while it is still mounted on the vehicle, and restores optical clarity and light output to the level of new lenses."

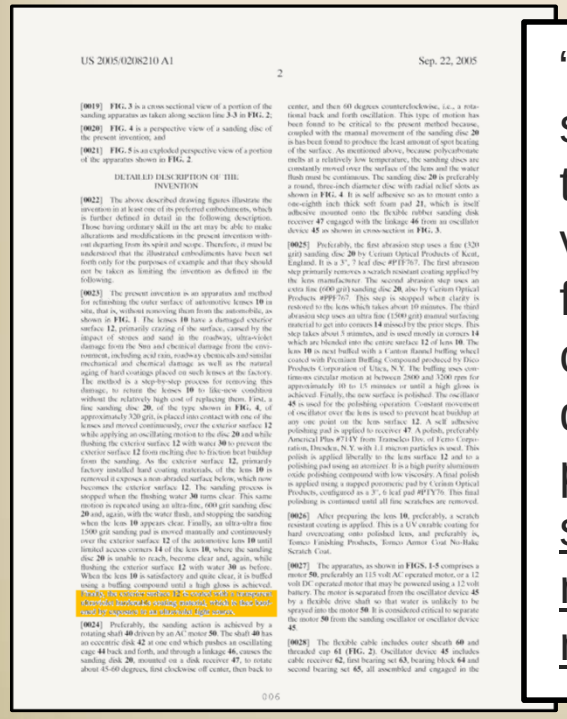
Source: Ex. 1002, p.5; Motion to Amend, pp.8-9, 12-13; Opposition to Motion to Amend, pp. 7-8, 9-10

Patent Owner's "Original Equipment Condition" Amendments

Proposed Claim 25', 25", 37', and 37":

…**restore the lamp to its original equipment condition**…

Kuta (Ex. 1002)



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[0019] FIG. 3 is a cross sectional view of a portion of the sanding apparatus as taken along section line 3-3 in FIG. 2;

[0020] FIG. 4 is a perspective view of a sanding disc of the present invention; and

[0021] FIG. 5 is an exploded perspective view of a portion of the apparatus shown in FIG. 2.

DETAILED DESCRIPTION OF THE INVENTION

[0022] The above described drawing figures illustrate the invention in at least one of its preferred embodiments, which is further defined in detail in the following description. Those having ordinary skill in the art may be able to make alterations and modifications in the present invention without departing from its spirit and scope. Therefore, it must be understood that the illustrated embodiments have been set forth only for the purposes of example and that they should not be taken as limiting the invention as defined in the following.

[0023] The present invention is an apparatus and method for refinishing the outer surface of automotive lenses 10 in situ, that is, without removing them from the automobile, as shown in FIG. 1. The lenses 10 have a damaged exterior surface 12, primarily crazing of the surface, caused by the impact of stones and sand in the roadway, ultra-violet damage from the Sun and chemical damage from the environment, including acid rain, roadway chemicals and similar mechanical and chemical damage as well as the natural aging of hard coatings placed on such lenses at the factory. The method is a step-by-step process for removing this damage, to return the lenses 10 to like-new condition without the relatively high cost of replacing them. First, a fine sanding disc 20, of the type shown in FIG. 4, of approximately 320 grit, is placed into contact with one of the lenses and moved continuously, over the exterior surface 12 while applying an oscillating motion to the disc 20 and while flushing the exterior surface 12 with water 30 to prevent the exterior surface 12 from melting due to friction heat buildup from the sanding. As the exterior surface 12, primarily factory installed hard coating materials, of the lens 10 is removed it exposes a non-abraded surface below, which now becomes the exterior surface 12. The sanding process is stopped when the flushing water 30 turns clear. This same motion is repeated using an ultra-fine, 600 grit sanding disc 20 and, again, with the water flush, and stopping the sanding when the lens 10 appears clear. Finally, an ultra-ultra fine 1500 grit sanding pad is moved manually and continuously over the exterior surface 12 of the automotive lens 10 until limited access corners 14 of the lens 10, where the sanding disc 20 is unable to reach, become clear and, again, while flushing the exterior surface 12 with water 30 as before. When the lens 10 is satisfactory and quite clear, it is buffed using a buffing compound until a high gloss is achieved. [redacted]

[0024] Preferably, the sanding action is achieved by a rotating shaft 40 driven by an AC motor 50. The shaft 40 has an eccentric disk 42 at one end which pushes an oscillating cage 44 back and forth, and through a linkage 46, causes the sanding disk 20, mounted on a disk receiver 47, to rotate about 45-60 degrees, first clockwise off center, then back to center, and then 60 degrees counterclockwise, i.e., a rotational back and forth oscillation. This type of motion has been found to be critical to the present method because, coupled with the manual movement of the sanding disc 20 as has been found to produce the least amount of spot heating of the surface. As mentioned above, because polycarbonate melts at a relatively low temperature, the sanding discs are constantly moved over the surface of the lens and the water flush must be continuous. The sanding disc 20 is preferably a round, three-inch diameter disc with radial relief slots as shown in FIG. 4. It is self adhesive so as to mount onto a one-eighth inch thick soft foam pad 21, which is itself adhesive mounted onto the flexible rubber sanding disk receiver 47 engaged with the linkage 46 from an oscillator device 45 as shown in cross-section in FIG. 3.

[0025] Preferably, the first abrasion step uses a fine (320 grit) sanding disc 20 by Cerium Optical Products of Kent, England. It is a 3", 7 leaf disc #PFF767. The first abrasion step primarily removes a scratch resistant coating applied by the lens manufacturer. The second abrasion step uses an extra fine (600 grit) sanding disc 20, also by Ceriun Optical Products #PFF767. This step is stopped when clarity is restored to the lens which takes about 10 minutes. The third abrasion step uses an ultra fine (1500 grit) manual surfacing material to get into corners 14 missed by the prior steps. This step takes about 5 minutes, and is used mostly in corners 14 which are blended into the entire surface 12 of lens 10. The lens 10 is next buffed with a Canton flannel buffing wheel coated with Precision Buffing Compound produced by Dico Products Corporation of Utica, N.Y. The buffing uses continuous circular motion at between 2600 and 3200 rpm for approximately 10 to 15 minutes or until a high gloss is achieved. Finally, the new surface is polished. The oscillator 45 is used for the polishing operation. Constant movement of oscillator over the lens is used to prevent heat buildup at any one point on the lens surface 12. A self adhesive polishing pad is applied to receiver 47. A polish, preferably Americal Plus #7141Y from Transdco Div. of Ferro Corporation, Dresden, N.Y. with 1.1 micron particles is used. This polish is applied liberally to the lens surface 12 and to a polishing pad using an atomizer. It is a high purity aluminum oxide polishing compound with low viscosity. A final polish is applied using a stapled pororneric pad by Ceriun Optical Products, configured as a 3", 6 leaf pad #PTY76. This final polishing is continued until all fine scratches are removed.

[0026] After preparing the lens 10, preferably, a scratch resistant coating is applied. This is a UV curable coating for hard overcoating onto polished lens, and preferably is, Tomco Finishing Products, Tomco Armor Coat No-Bake Scratch Coat.

[0027] The apparatus, as shown in FIGS. 1-5 comprises a motor 50, preferably an 115 volt AC operated motor, or a 12 volt DC operated motor that may be powered using a 12 volt battery. The motor is separated from the oscillator device 45 by a flexible drive shaft so that water is unlikely to be sprayed into the motor 50. It is considered critical to separate the motor 50 from the sanding oscillator or oscillator device 45.

[0028] The flexible cable includes outer sheath 60 and threaded cap 61 (FIG. 2). Oscillator device 45 includes cable receiver 62, first bearing set 63, bearing block 64 and second bearing set 65, all assembled and engaged in the

006

"[0023] …The lenses 10 have a damaged exterior surface 12, primarily crazing of the surface, caused by the impact of stones and sand in the roadway, ultra-violet damages from the Sun and chemical damage from the environment, including acid rain, roadway chemicals and similar mechanical and chemical damage as well as natural aging of hard coatings placed on such lenses at the factory. The method is a step-by-step process for removing this damage, to return the lenses 10 to like-new condition without the relatively high cost of replacing them…."

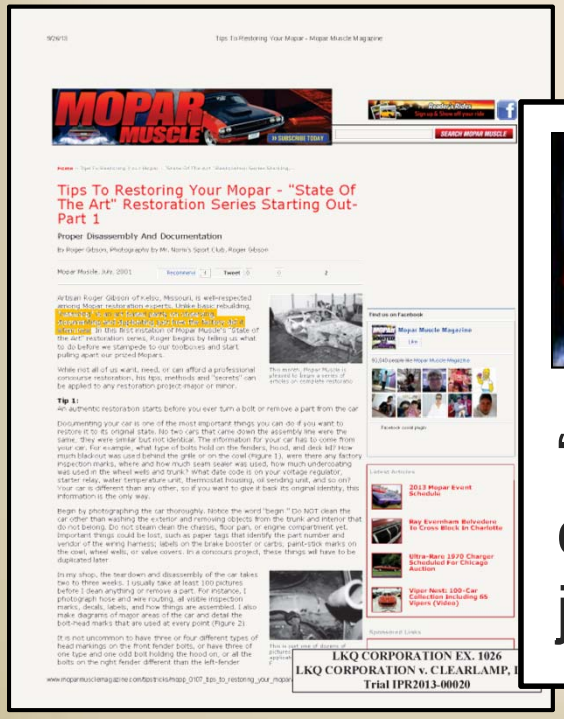
Source: Ex. 1002, p.6; Motion to Amend, pp.8-9, 12-13; Opposition to Motion to Amend, pp. 7-8, 9-10

Patent Owner's "Original Equipment Condition" Amendments

Proposed Claim 25', 25", 37', and 37":

…**restore the lamp to its original equipment condition**…

Mopar Muscle (Ex. 1026)



Tips To Restoring Your Mopar - "State Of The Art" Restoration Series Starting Out- Part 1

Proper Disassembly And Documentation

LKQ CORPORATION EX. 1026
LKQ CORPORATION v. CLEARLAMP, I
Trial IPR2013-00020

"'[R]estoring' is an art based partly on observing, documenting and duplicating just how the factory did it when new."

Source: Ex. 1026, p. 1; Motion to Amend, pp.8-9, 12-13; Opposition to Motion to Amend, p. 8

Patent Owner's "Original Equipment Condition" Amendments

Proposed Claim 25', 25", 37', and 37":

…**restore the lamp to its original equipment condition**…

Mopar Muscle (Ex. 1026)

9/26/13 Tips To Restoring Your Mopar - Mopar Muscle Magazine

as well as the type of plating used. Very seldom do all the bolts holding the fenders on have the same head markings. Sometimes you will find that different size washers or studs and nuts have been used. It's a lot to remember, and without documentation it's impossible to get it correct. Here, also, you want to photograph the amount and location of seam sealer used on the inner and outer fenders so you can duplicate it later.

Usually, cleaning the parts and areas now exposed is in order, and I document undercoat patterns with photos. How the blackout behind the grille was applied-I document this with photos and match the colors to be used later if I have to restore it. Type of headlamps-clean these and look for date-code ink stamps on back. This helps to validate their originality. For example, the old (usually GE or Westinghouse) headlamps have a different glass "fluting" pattern than the new ones.

I usually remove the doors, rear bumper, and deck lid next. Disassemble and document as needed. This will be my first load of parts to go to Redi-Strip for de-rusting and paint removal. Just a quick note: I always take steel parts that need to be re-chromed to get de-rusted. Most re-platers take no time to remove rust from the backs of the bumpers and the chrome is already peeling when you pick them up.

I always photograph the doors under the inside panels for paint patterns. This is usually a good place to tell the color of primer that was used on the car as well as the mask pattern used on the inner door color where applicable.

We photograph the empty engine bay or floor before we remove the rest of the parts. Afterwa

After carefully cleaning the front steering and suspension assemblies we see many inspecti

All muscle-car-era torsion bars have paint dots on them. The right-hand side has one and th

Tip 2:
During the disassembly, further document every area and individual part of the car

The inner door color was painted before the exterior color and masked off while the exterior paint was being applied (A- and B- Body cars). This was done because the colors could bleed. You can verify this by examining the edge of the paint where the colors meet or by sanding the paint edges to examine the layers. In the application of paint, the accent color(s) was quite often done first. For example, '67 GTX stripes were applied before the exterior paint. 'Cuda tail panels painted with Organosol were done first, as were the rockers on '71 'Cudas. Anywhere the textured black paint was used, it was applied before the exterior color, such as Road Runner and GTX hood accents, and Charger and 'Cuda tail panels. These areas were all masked off and sprayed with the lacquer-based Organosol (Figure 5). These are the things that, with close attention, can be seen. After I noticed this, I found several pages of original documents titled Process Standard Painting-Passenger Cars-Procedure and Materials (PS 3774) that laid it all out and backed up my findings.

Photograph all the wiring routes such as under-dash, underhood, and body. Wiring can end u

Now back to our disassembly. Next, I remove the engine, transmission, and front suspension (Figure 6). I photograph the compartment, minus the engine, in detail. I document how the seam sealer on the firewall was applied (Figure 7). I then steam clean the removed components, photograph and document bolts, date codes, finishes, and what's painted engine color and what's not. What suspension parts are natural metal and what is painted, plated, or dipped? The front suspension parts often have inspection marks that need documenting as well as the torsion bars (Figures 8a and 8b). I usually set the motor and trans aside and wait until later to work on them while the body is gone to Redi-Strip. I even photograph what types of cotter pins are used and how they are bent. Picky, but that's how you end up

Note the red paint on the face of this rear brake drum. A Chrysler Passenger Cars-Procedur

www.moparmusclemagazine.com/tipstricks/mopp_0107_tips_to_restoring_your_mopar.html 3/6

"To truly restore the car, every part has to be returned to its original state."

Source: Ex. 1026, p.3; Motion to Amend, pp.8-9, 12-13; Opposition to Motion to Amend, p. 8

Patent Owner's "Original Equipment Condition" Amendments

Proposed Claim 25', 25'', 37', and 37'':

…<u>**restore the lamp to its original equipment condition**</u>…

Zuk (Ex. 1022)

United States Patent [19] Zuk

[11] 4,301,193
[45] Nov. 17, 1981

[54] PROCESS FOR RESTORATION OF CLEAR PLASTIC
[76] Inventor: Paul W. Zuk, 318 Schaffer Ave., Syracuse, N.Y. 13206
[21] Appl. No.: 168,162
[22] Filed: Jul. 14, 1980
[51] Int. Cl.³ G02B 1/10; B05D 3/12; B05D 7/02
[52] U.S. Cl. 427/140; 427/163; 427/164
[58] Field of Search 427/140, 163, 164
[56] References Cited
U.S. PATENT DOCUMENTS
3,485,662 12/1969 Metevia 427/140

Primary Examiner—James R. Hoffman

[57] ABSTRACT

5 Claims, No Draw…

> "ABSTRACT A process for removing scratches and dirt from plastic sheeting, windows, face shields, windshields and other plastic articles that will improve the transparency, optical quality and appearance of the above. More specifically, the process will restore plastic glass replacements that have become so scratched as to have their transparency and optical quality impaired to a state where the transparency, optical quality, and appearance are close to if not equal to, <u>a new article</u>."

001 LKQ CORPORATION EX. 1022
LKQ CORPORATION v. CLEARLAMP, LLC
Trial IPR2013-00020

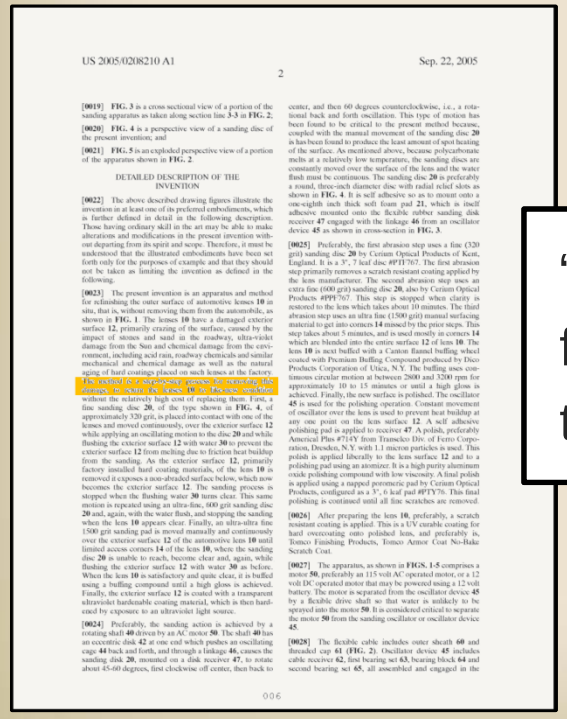
Source: Ex. 1022, p. 1, Abstract; Motion to Amend, pp.8-9, 12-13; Opposition to Motion to Amend, p. 8

Patent Owner's "Removing Damage" Amendment

Proposed Claim 25'' and 37'':

…**removing damage from the lamp surface of the lamp;**

Kuta (Ex. 1002)



US 2005/0208210 A1 Sep. 22, 2005
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[0019] FIG. 3 is a cross sectional view of a portion of the sanding apparatus as taken along section line 3-3 in FIG. 2;

[0020] FIG. 4 is a perspective view of a sanding disc of the present invention; and

[0021] FIG. 5 is an exploded perspective view of a portion of the apparatus shown in FIG. 2.

DETAILED DESCRIPTION OF THE INVENTION

[0022] The above described drawing figures illustrate the invention in at least one of its preferred embodiments, which is further defined in detail in the following description. Those having ordinary skill in the art may be able to make alterations and modifications in the present invention without departing from its spirit and scope. Therefore, it must be understood that the illustrated embodiments have been set forth only for the purposes of example and that they should not be taken as limiting the invention as defined in the following.

[0023] The present invention is an apparatus and method for refinishing the outer surface of automotive lenses **10** in situ, that is, without removing them from the automobile, as shown in FIG. 1. The lenses **10** have a damaged exterior surface **12**, primarily crazing of the surface, caused by the impact of stones and sand in the roadway, ultra-violet damage from the Sun and chemical damage from the environment, including acid rain, roadway chemicals and similar mechanical and chemical damage as well as the natural aging of hard coatings placed on such lenses at the factory. The method is a step-by-step process for removing this damage, to return the lenses **10** to like-new condition without the relatively high cost of replacing them. First, a fine sanding disc **20**, of the type shown in FIG. 4, of approximately 320 grit, is placed into contact with one of the lenses and moved continuously, over the exterior surface **12** while applying an oscillating motion to the disc **20** and while flushing the exterior surface **12** with water **30** to prevent the exterior surface **12** from melting due to friction heat buildup from the sanding. As the exterior surface **12**, primarily factory installed hard coating materials, of the lens **10** is removed it exposes a non-abraded surface below, which now becomes the exterior surface **12**. The sanding process is stopped when the flushing water **30** turns clear. This same motion is repeated using an ultra-fine, 600 grit sanding disc **20** and, again, with the water flush, and stopping the sanding when the lens **10** appears clear. Finally, an ultra-ultra fine 1500 grit sanding pad is moved manually and continuously over the exterior surface **12** of the automotive lens **10** until limited access corners **14** of the lens **10**, where the sanding disc **20** is unable to reach, become clear and, again, while flushing the exterior surface **12** with water **30** as before. When the lens **10** is satisfactory and quite clear, it is buffed using a buffing compound until a high gloss is achieved. Finally, the exterior surface **12** is coated with a transparent ultraviolet hardenable coating material, which is then hardened by exposure to an ultraviolet light source.

[0024] Preferably, the sanding action is achieved by a rotating shaft **40** driven by an AC motor **50**. The shaft **40** has an eccentric disk **42** at one end which pushes an oscillating cage **44** back and forth, and through a linkage **46**, causes the sanding disk **20**, mounted on a disk receiver **47**, to rotate about 45-60 degrees, first clockwise off center, then back to center, and then 60 degrees counterclockwise, i.e., a rotational back and forth oscillation. This type of motion has been found to be critical to the present method because, coupled with the manual movement of the sanding disc **20** as has been found to produce the least amount of spot heating of the surface. As mentioned above, because polycarbonate melts at a relatively low temperature, the sanding discs are constantly moved over the surface of the lens and the water flush must be continuous. The sanding disc **20** is preferably a round, three-inch diameter disc with radial relief slots as shown in FIG. 4. It is self adhesive so as to mount onto a one-eighth inch thick soft foam pad **21**, which is itself adhesive mounted onto the flexible rubber sanding disk receiver **47** engaged with the linkage **46** from an oscillator device **45** as shown in cross-section in FIG. 3.

[0025] Preferably, the first abrasion step uses a fine (320 grit) sanding disc **20** by Cerium Optical Products of Kent, England. It is a 3", 7 leaf disc #P1T767. The first abrasion step primarily removes a scratch resistant coating applied by the lens manufacturer. The second abrasion step uses an extra fine (600 grit) sanding disc **20**, also by Cerium Optical Products #P9T767. This step is stopped when clarity is restored to the lens which takes about 10 minutes. The third abrasion step uses an ultra fine (1500 grit) manual surfacing material to get into corners **14** missed by the prior steps. This step takes about 5 minutes, and is used mostly in corners **14** which are blended into the entire surface **12** of lens **10**. The lens **10** is next buffed with a Canton flannel buffing wheel coated with Premium Buffing Compound produced by Dico Products Corporation of Utica, N.Y. The buffing uses continuous circular motion at between 2600 and 3200 rpm for approximately 10 to 15 minutes or until a high gloss is achieved. Finally, the new surface is polished. The oscillator **45** is used for the polishing operation. Constant movement of oscillator over the lens is used to prevent heat buildup at any one point on the lens surface **12**. A self adhesive polishing pad is applied to receiver **47**. A polish, preferably Americal Plus #714Y from Transelco Div. of Ferro Corporation, Dresden, N.Y. with 1.1 micron particles is used. This polish is applied liberally to the lens surface **12** and to a polishing pad using an atomizer. It is a high purity aluminum oxide polishing compound with low viscosity. A final polish is applied using a napped porromeric pad by Cerium Optical Products, configured as a 3", 6 leaf pad #9T576. This final polishing is continued until all fine scratches are removed.

[0026] After preparing the lens **10**, preferably, a scratch resistant coating is applied. This is a UV curable coating for hard overcoating onto polished lens, and preferably is, Tomco Finishing Products, Tomco Armor Coat No-Bake Scratch Coat.

[0027] The apparatus, as shown in FIGS. 1-5 comprises a motor **50**, preferably an 115 volt AC operated motor, or a 12 volt DC operated motor that may be powered using a 12 volt battery. The motor is separated from the oscillator device **45** by a flexible drive shaft so that water is unlikely to be sprayed into the motor **50**. It is considered critical to separate the motor **50** from the sanding oscillator or oscillator device **45**.

[0028] The flexible cable includes outer sheath **60** and threaded cap **61** (FIG. 2). Oscillator device **45** includes cable receiver **62**, first bearing set **63**, bearing block **64** and second bearing set **65**, all assembled and engaged in the

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"[0023] …The method is a step-by-step process for removing this damage, to return the lenses **10** to like-new condition…"

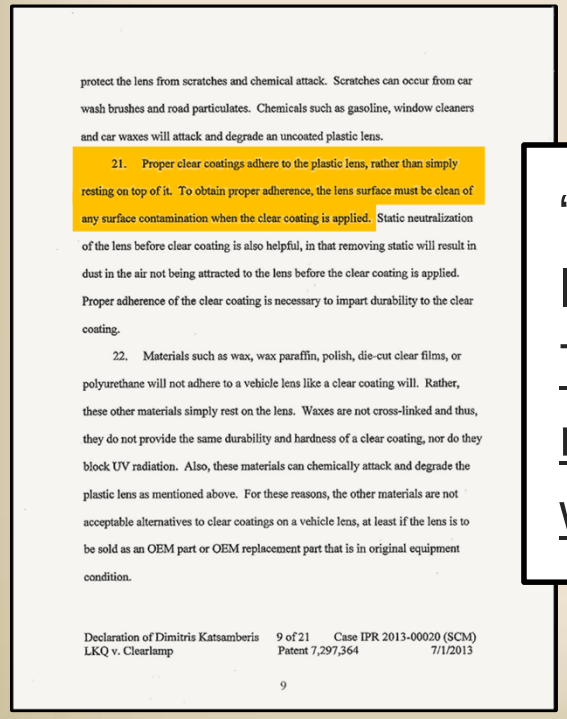
Source: Ex. 1002, p.6; Motion to Amend, pp.8-9, 12-13; Opposition to Motion to Amend, p. 9

Patent Owner's "After the Steps" Amendment

Proposed Claim 37, 37', and 37":

…(g) statically neutralizing debris on the lamp surface to facilitate the removal of all of the debris on the lamp surface **after the steps (b) through (d)**;

Katsamberis Declaration (Ex. 2007)



protect the lens from scratches and chemical attack. Scratches can occur from car wash brushes and road particulates. Chemicals such as gasoline, window cleaners and car waxes will attack and degrade an uncoated plastic lens.

21. Proper clear coatings adhere to the plastic lens, rather than simply resting on top of it. To obtain proper adherence, the lens surface must be clean of any surface contamination when the clear coating is applied. Static neutralization of the lens before clear coating is also helpful, in that removing static will result in dust in the air not being attracted to the lens before the clear coating is applied. Proper adherence of the clear coating is necessary to impart durability to the clear coating.

22. Materials such as wax, wax paraffin, polish, die-cut clear films, or polyurethane will not adhere to a vehicle lens like a clear coating will. Rather, these other materials simply rest on the lens. Waxes are not cross-linked and thus, they do not provide the same durability and hardness of a clear coating, nor do they block UV radiation. Also, these materials can chemically attack and degrade the plastic lens as mentioned above. For these reasons, the other materials are not acceptable alternatives to clear coatings on a vehicle lens, at least if the lens is to be sold as an OEM part or OEM replacement part that is in original equipment condition.

Declaration of Dimitris Katsamberis 9 of 21 Case IPR 2013-00020 (SCM)
LKQ v. Clearlamp Patent 7,297,364 7/1/2013

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"21. Proper clear coatings adhere to the plastic lens, rather than simply resting on top of it. To obtain proper adherence, the lens surface **must** be clean of any surface contamination when the clear coating is applied."

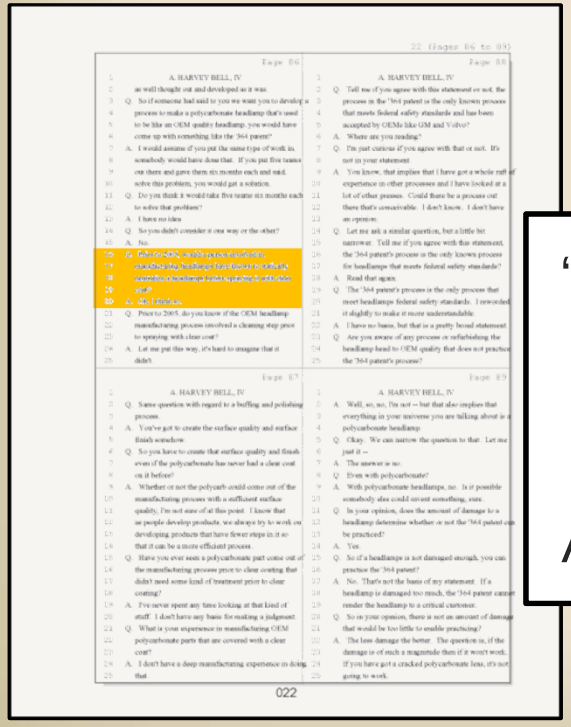
Source: Ex. 2007, p. 9; Motion to Amend, pp.11-13; Reply to PO Response, p. 9

Patent Owner's "After the Steps" Amendment

Proposed Claim 37, 37', and 37":

…(g) statically neutralizing debris on the lamp surface to facilitate the removal of all of the debris on the lamp surface **after the steps (b) through (d)**;

Bell Deposition 8/27/13 (Ex. 1018)



"Q. Prior to 2005, would a person involved in manufacturing headlamps have known to statically neutralize a headlamps before spraying it with clear coat?

A. Oh, I think so."

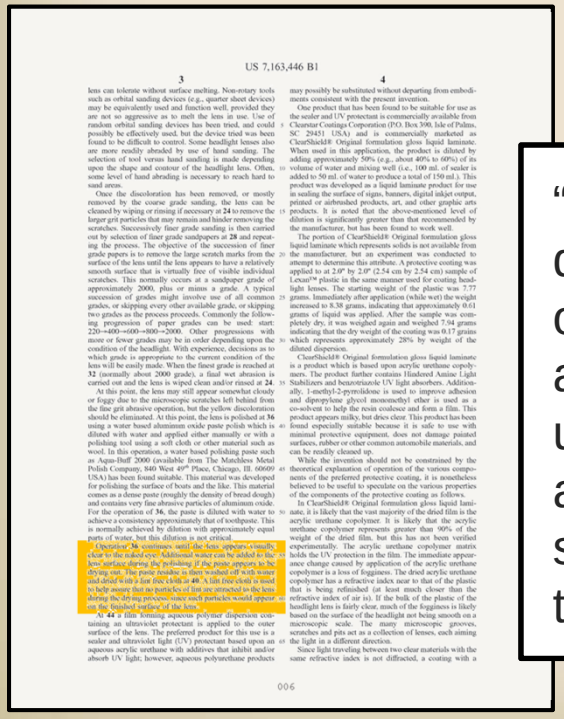
Source: Ex. 1018, p. 22, 86:16-20; Motion to Amend, pp. 11-13; Opposition to Motion to Amend, p. 12

Patent Owner's "After the Steps" Amendment

Proposed Claim 37, 37', and 37":

…(g) statically neutralizing debris on the lamp surface to facilitate the removal of all of the debris on the lamp surface **after the steps (b) through (d)**;

Cole (Ex. 1008)



US 7,163,446 B1

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lens can tolerate without surface melting. Non-rotary tools such as orbital sanding devices (e.g., quarter sheet devices) may be equivalently used and function well, provided they are not so aggressive as to melt the lens in use. Use of random orbital sanding devices has been tried, and could possibly be effectively used, but the device tried was been found to be difficult to control. Some headlight lenses also are more readily abraded by use of hand sanding. The selection of tool versus hand sanding is made depending upon the shape and contour of the headlight lens. Often, some level of hand abrading is necessary to reach hard to sand areas.

Once the discoloration has been removed, or mostly removed by the coarse grade sanding, the lens can be cleaned by wiping or rinsing if necessary at **24** to remove the larger grit particles that may remain and hinder removing the scratches. Successively finer grade sanding is then carried out by selection of finer grade sandpapers at **28** and repeating the process. The objective of the succession of finer grade papers is to remove the large scratch marks from the surface of the lens until the lens appears to have a relatively smooth surface that is virtually free of visible individual scratches. This normally occurs at a sandpaper grade of approximately 2000, plus or minus a grade. A typical succession of grades might involve use of all common grades, or skipping every other available grade, or skipping two grades as the process proceeds. Commonly the following progression of paper grades can be used: start: 220→400→600→800→2000. Other progressions with more or fewer grades may be in order depending upon the condition of the headlight. With experience, decisions as to which grade is appropriate to the current condition of the lens will be easily made. When the finest grade is reached at **32** (normally about 2000 grade), a final wet abrasion is carried out and the lens is wiped clean and/or rinsed at **24**.

At this point, the lens may still appear somewhat cloudy or foggy due to the microscopic scratches left behind from the fine grit abrasive operation, but the yellow discoloration should be eliminated. At this point, the lens is polished at **36** using a water based aluminum oxide paste polish which is diluted with water and applied either manually or with a polishing tool using a soft cloth or other material such as wool. In this operation, a water based polishing paste such as Aqua-Buff 2000 (available from The Matchless Metal Polish Company, 840 West 49th Place, Chicago, Ill. 60609 USA) has been found suitable. This material was developed for polishing the surface of boats and the like. This material comes as a dense paste (roughly the density of bread dough) and contains very fine abrasive particles of aluminum oxide. For the operation of **36**, the paste is diluted with water to achieve a consistency approximately that of toothpaste. This is normally achieved by dilution with approximately equal parts of water, but this dilution is not critical.

Operation **36** continues until the lens appears visually clear to the naked eye. Additional water can be added to the lens surface during the polishing if the paste appears to be drying out. The paste residue is then washed off with water and dried with a lint free cloth at 40. A lint free cloth is used to help assure that no particles of lint are attracted to the lens during the drying process, since such particles would appear on the finished surface of the lens."

At **44** a film forming aqueous polymer dispersion containing an ultraviolet protectant is applied to the outer surface of the lens. The preferred product for this use is a sealer and ultraviolet light (UV) protectant based upon an aqueous acrylic urethane with additives that inhibit and/or absorb UV light; however, aqueous polyurethane products

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may possibly be substituted without departing from embodiments consistent with the present invention.

One product that has been found to be suitable for use as the sealer and UV protectant is commercially available from Clearstar Coatings Corporation (P.O. Box 300, Isle of Palms, SC 29451 USA) and is commercially marketed as ClearShield® Original formulation gloss liquid laminate. When used in this application, the product is diluted by adding approximately 50% (e.g., about 40% to 60%) of its volume of water and mixing well (i.e., 100 mL of sealer is added to 50 mL of water to produce a total of 150 mL). This product was developed as a liquid laminate product for use in sealing the surface of signs, banners, digital inkjet output, printed or airbrushed products, art, and other graphic arts products. It is noted that the above-mentioned level of dilution is significantly greater than that recommended by the manufacturer, but has been found to work well.

The portion of ClearShield® Original formulation gloss liquid laminate which represents solids is not available from the manufacturer, but an experiment was conducted to attempt to determine this attribute. A protective coating was applied to at 2.0" by 2.0" (2.54 cm by 2.54 cm) sample of Lexan™ plastic in the same manner used for coating headlight lenses. The starting weight of the plastic was 7.77 grams. Immediately after application (while wet) the weight increased to 8.38 grams, indicating that approximately 0.61 grams of liquid was applied. After the sample was completely dry, it was weighed again and weighed 7.94 grams indicating that the dry weight of the coating was 0.17 grams which represents approximately 28% by weight of the diluted dispersion.

ClearShield® Original formulation gloss liquid laminate is a product which is based upon acrylic urethane copolymers. The product further contains Hindered Amine Light Stabilizers and benzotriazole UV light absorbers. Additionally, 1-methyl-2-pyrrolidone is used to improve adhesion and dipropylene glycol monomethyl ether is used as a co-solvent to help the resin coalesce and form a film. This product appears milky, but dries clear. This product has been found especially suitable because it is safe to use with minimal protective equipment, does not damage painted surfaces, rubber or other common automobile materials, and can be readily cleaned up.

While the invention should not be constrained by the theoretical explanation of operation of the various components of the preferred protective coating, it is nonetheless believed to be useful to speculate on the various properties of the components of the protective coating as follows.

In ClearShield® Original formulation gloss liquid laminate, it is likely that the vast majority of the dried film is the acrylic urethane copolymer. It is likely that the acrylic urethane copolymer represents greater than 90% of the weight of the dried film, but this has not been verified experimentally. The acrylic urethane copolymer matrix holds the UV protection in the film. The immediate appearance change caused by application of the acrylic urethane copolymer is a loss of fogginess. The dried acrylic urethane copolymer has a refractive index near to that of the plastic that is being refinished (at least much closer than the refractive index of air is). If the bulk of the plastic of the headlight lens is fairly clear, much of the fogginess is likely based on the surface of the headlight not being smooth on a microscopic scale. The many microscopic grooves, scratches and pits act as a collection of lenses, each aiming the light in a different direction.

Since light traveling between two clear materials with the same refractive index is not diffracted, a coating with a

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"Additional water can be added to the lens surface during the polishing if the paste appears to be drying out. The paste residue is then washed off with water and dried with a lint free cloth at 40. A lint free cloth is used to help assure that no particles of lint are attracted to the lens during the drying process, since such particles would appear on the finished surface of the lens."

Source: Ex. 1008, p. 6, 3:54-61; Motion to Amend, pp.11-13; Opposition to Motion to Amend, p. 12