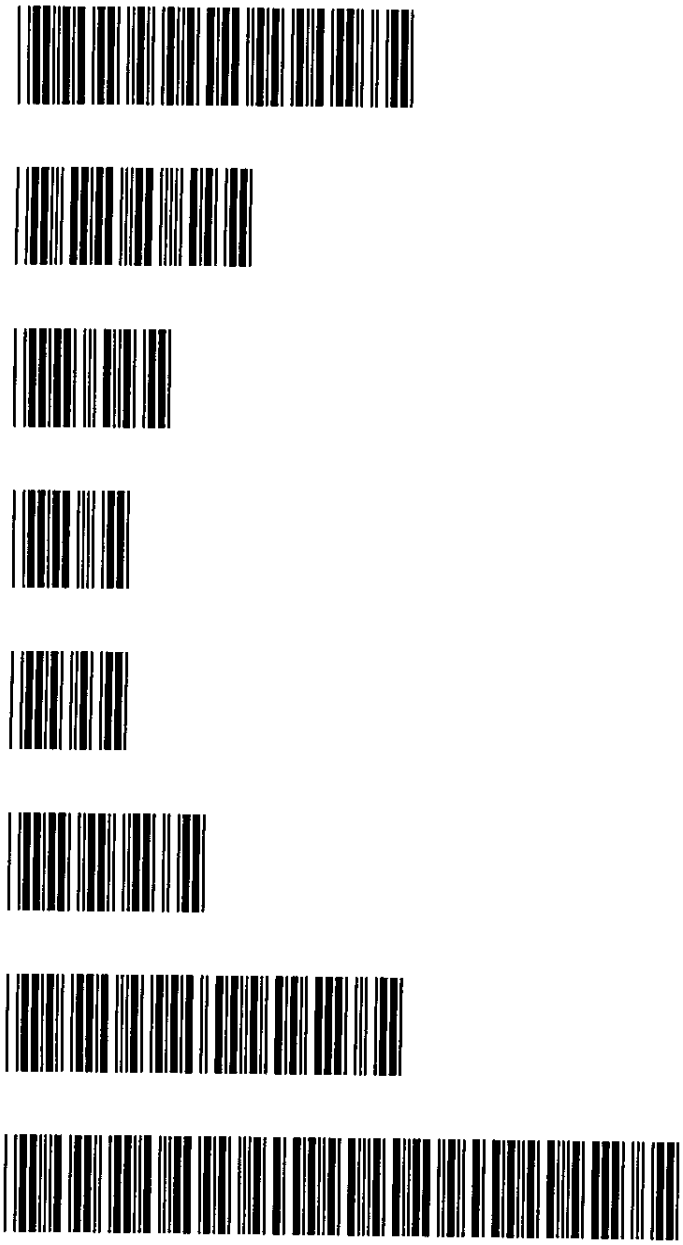

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ORIGINAL

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Attorneys for Plaintiff
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IN THE UNITED STATES DISTRICT COURT

FOR THE SOUTHERN DISTRICT OF CALIFORNIA

AEBS, LLC, a California limited liability company, Plaintiff, v. DARTON INTERNATIONAL, INC., a Nevada corporation, Defendant.	Civil Action No. 03 CV 0034 L (JAH) **COMPLAINT FOR INFRINGEMENT OF U.S. PATENT NO. 6,439,173** **DEMAND FOR JURY TRIAL**

Plaintiff AEBS, LLC (hereinafter, "AEBS" or "Plaintiff") hereby complains of Defendant DARTON INTERNATIONAL, INC. (hereinafter, "Darton" or "Defendant") and alleges as follows:

JURISDICTION AND VENUE

1. This is an action for patent infringement arising under the patent laws of the United States, Title 35, United States Code, and more particularly 35 U.S.C. §§ 271 and 281.

2. This Court has subject matter jurisdiction under 28 U.S.C. §§ 1331 and 1338(a).

3. Venue is proper in this judicial district under 28 U.S.C. §§ 1391(b) and (c), and 28 U.S.C. § 1400(b).

THE PARTIES

4. Plaintiff AEBS is a California limited liability company with a principal place of business located at 8270 Miramar Road, San Diego, California.

5. AEBS is the owner by assignment of United States Patent No. 6,439,173 ("the '173 patent"), duly and lawfully issued on August 27, 2002. A copy of the '173 patent is attached hereto as Exhibit A.

6. AEBS is informed and believes, and on that basis alleges, that Darton is a Nevada corporation with a place of business at 2380 Camino Vida Roble, Suite J & K, Carlsbad, California.

7. AEBS is informed and believes, and on that basis alleges, that Darton does business in this judicial district and has committed acts of infringement in this judicial district.

FIRST CLAIM FOR RELIEF

(Direct Infringement Of The '173 Patent)

8. AEBS hereby realleges and incorporates by reference the allegations set forth in paragraphs 1 through 7.

9. AEBS is informed and believes, and on that basis alleges, that Darton has been and still is infringing the '173 patent under 35 U.S.C. § 271(a) by making, using, selling, and/or offering for sale internal combustion engines with cylinder inserts claimed in the '173 patent. AEBS is further informed and believes, and on that basis alleges, that Darton's infringement of the '173 patent under 35 U.S.C. § 271(a) will continue unless enjoined by this Court.

10. AEBS is informed and believes, and on that basis alleges, that Darton is willfully, deliberately, and intentionally infringing the '173 patent under 35 U.S.C. § 271(a) with full knowledge thereof, and will continue to do so unless enjoined by this Court.

11. AEBS is informed and believes, and on that basis alleges, that Darton has derived, received, and will continue to derive and receive from the aforesaid acts of infringement gains, profits, and advantages, tangible and intangible, the extent of which are not presently known to AEBS. By reason of the aforesaid acts of infringement, AEBS has been, and will continue to be, greatly and irreparably damaged.

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SECOND CLAIM FOR RELIEF

(Inducing Infringement Of The '173 Patent)

12. AEBS hereby realleges and incorporates by reference the allegations set forth in paragraphs 1 through 11.

13. AEBS is informed and believes, and on that basis alleges, that Darton has been and still is knowingly and intentionally inducing others under 35 U.S.C. § 271(b) to directly infringe the '173 patent by supplying cylinder inserts and sufficient instructions to make and use the claimed internal combustion engines, thereby inducing infringement of the '173 patent under 35 U.S.C. § 271(b). AEBS is further informed and believes, and on that basis alleges, that Darton's inducement of others under 35 U.S.C. § 271(b) to directly infringe the '173 patent will continue unless enjoined by this Court.

14. AEBS is informed and believes, and on that basis alleges, that Darton is willfully, deliberately, and intentionally infringing the '173 patent under 35 U.S.C. § 271(b) with full knowledge thereof, and will continue to do so unless enjoined by this Court.

15. AEBS is informed and believes, and on that basis alleges, that Darton has derived, received, and will continue to derive and receive from the aforesaid acts of infringement gains, profits, and advantages, tangible and intangible, the extent of which are not presently known to AEBS. By reason of the aforesaid acts of infringement, AEBS has been, and will continue to be, greatly and irreparably damaged.

THIRD CLAIM FOR RELIEF

(Contributory Infringement Of The '173 Patent)

16. AEBS hereby realleges and incorporates by reference the allegations set forth in paragraphs 1 through 15.

17. AEBS is informed and believes, and on that basis alleges, that Darton has been and still is knowingly and intentionally contributorily infringing the '173 patent under 35 U.S.C. § 271(c) by selling and offering for sale cylinder inserts especially made or adapted for use in an infringement of the '173 patent, and not a staple article or commodity of commerce suitable for substantial noninfringing use. AEBS is further informed and believes, and on that basis alleges,

that Darton's contributory infringement the '173 patent under 35 U.S.C. § 271(c) will continue unless enjoined by this Court.

18. AEBS is informed and believes, and on that basis alleges, that Darton is willfully, deliberately, and intentionally contributorily infringing the '173 patent under 35 U.S.C. § 271(c) with full knowledge thereof, and will continue to do so unless enjoined by this Court.

19. AEBS is informed and believes, and on that basis alleges, that Darton has derived, received, and will continue to derive and receive from the aforesaid acts of infringement gains, profits, and advantages, tangible and intangible, the extent of which are not presently known to AEBS. By reason of the aforesaid acts of infringement, AEBS has been, and will continue to be, greatly and irreparably damaged.

PRAYER FOR RELIEF

WHEREFORE, Plaintiff AEBS prays for relief as follows:

A. That Darton be adjudged to have infringed the '173 patent under 35 U.S.C. § 271(a), (b) and (c);

B. That Darton, its affiliates, subsidiaries, officers, agents, servants, employees and attorneys, and all those persons in active concert or participation with either of them be preliminarily and permanently restrained and enjoined under 35 U.S.C. § 283 from directly or indirectly infringing the '173 patent;

C. That the Court award AEBS an accounting of all gains, profits, and advantages derived by Darton's patent infringement and recovery of damages to compensate AEBS for Darton's infringement of the '173 patent, pursuant to 35 U.S.C. § 284;

D. That Darton be adjudged to have willfully infringed the '173 patent under 35 U.S.C. §§ 271(a), (b) and (c), and that the Court treble the amount of actual damages pursuant to 35 U.S.C. § 284;

E. That this action be adjudged an exceptional case, and that the Court award AEBS its attorneys' fees incurred in connection with this action, pursuant to 35 U.S.C. § 285;

F. That the Court assess pre-judgment and post-judgment interests and costs of suit against Darton, and award such interests and costs to AEBS pursuant to 35 U.S.C. § 284; and

G. That AEBS have such other and further relief as this Court may deem just and proper.

Respectfully submitted,

KNOBBE, MARTENS, OLSON & BEAR, LLP

Dated: January 8, 2003

By: _____
Frederick S. Berretta

Attorneys for Plaintiff
AEBS, LLC

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DEMAND FOR JURY TRIAL

Plaintiff AEBS hereby demands a trial by jury as to all issues triable by jury, specifically including, but not limited to, the infringement of United States Patent No. 6,439,173.

Respectfully submitted,

KNOBBE, MARTENS, OLSON & BEAR, LLP

Dated: January 8, 2003

By: _____
Frederick S. Berretta

Attorneys for Plaintiff
AEBS, LLC

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EXHIBIT A

US006439173B1

(12) **United States Patent**
Chung

(10) **Patent No.: US 6,439,173 B1**
(45) **Date of Patent: Aug. 27, 2002**

(54) **INTERNAL COMBUSTION ENGINE WITH CYLINDER INSERT**

(75) Inventor: **Lee Wai Chung**, El Cajon, CA (US)

(73) Assignee: **Advanced Engine Breathing System**, San Diego, CA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **09/716,197**

(22) Filed: **Nov. 17, 2000**

(51) **Int. Cl.**[7] **F02F 1/10**
(52) **U.S. Cl.** **123/41.84**; 123/193.2
(58) **Field of Search** 123/41.83, 41.84, 123/193.2, 193.3

(56) **References Cited**

U.S. PATENT DOCUMENTS

2,721,542 A	*	10/1955	Sheppard	123/41.83
4,562,799 A	*	1/1986	Woods et al.	123/193.2
4,791,891 A	*	12/1988	Kubis et al.	123/41.84
5,582,144 A		12/1996	Mizutani	
5,676,096 A		10/1997	Nishi et al.	
6,079,375 A		6/2000	Duerr et al.	
6,116,198 A		9/2000	Kirtley et al.	

* cited by examiner

Primary Examiner—Noah P. Kamen

(57) **ABSTRACT**

An internal combustion engine includes an engine block having a head seat surface and a cylinder opening extending from the head seat surface into an interior of the engine block, and a cylinder insert residing within the cylinder opening and having an insert upper surface substantially flush with the head seat surface of the engine block. The cylinder insert has a smooth cylindrical inner surface with a longitudinally extending cylindrical axis, and a stepped outer surface formed of three longitudinal regions. The three longitudinal regions include a first longitudinal region adjacent to the insert upper surface and having a first wall thickness, a second longitudinal region remote from the first longitudinal region and having a second wall thickness less than the first wall thickness, and a third longitudinal region intermediate between and continuous with the first longitudinal region and the second longitudinal region. The third longitudinal region has a third wall thickness intermediate between the first wall thickness and the second wall thickness.

20 Claims, 2 Drawing Sheets

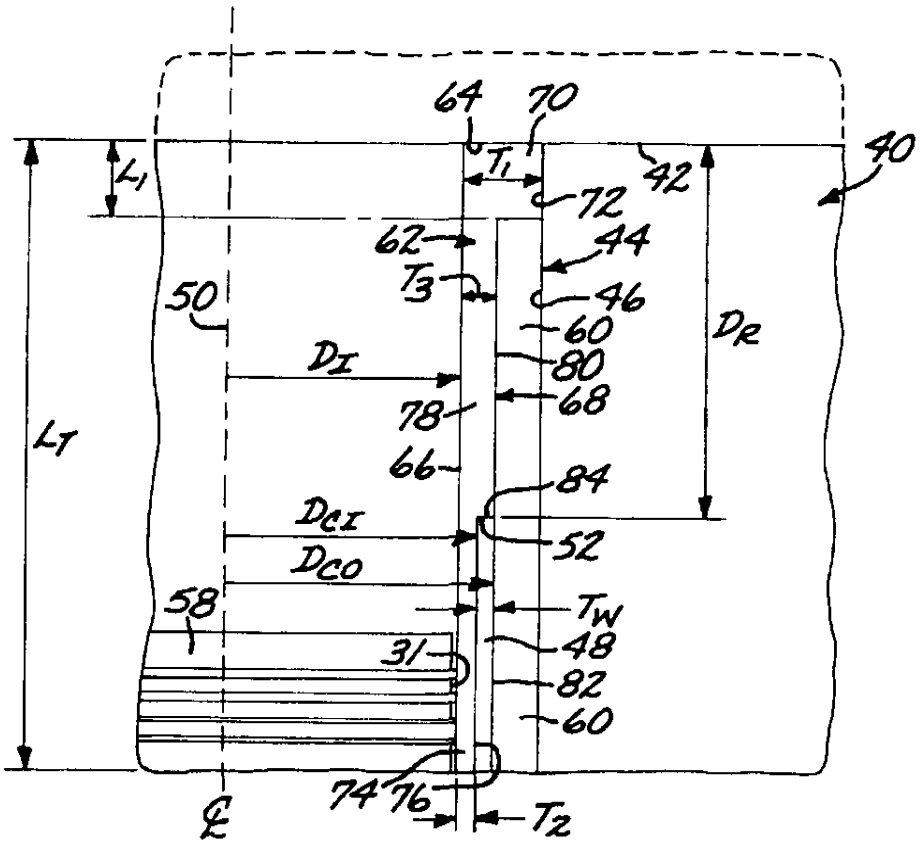


FIG. 1 PRIOR ART

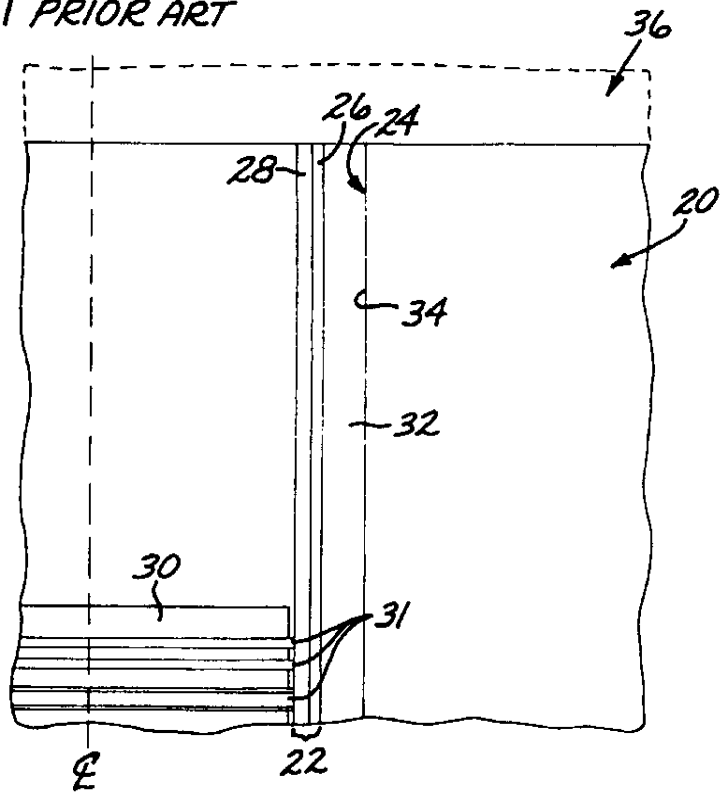
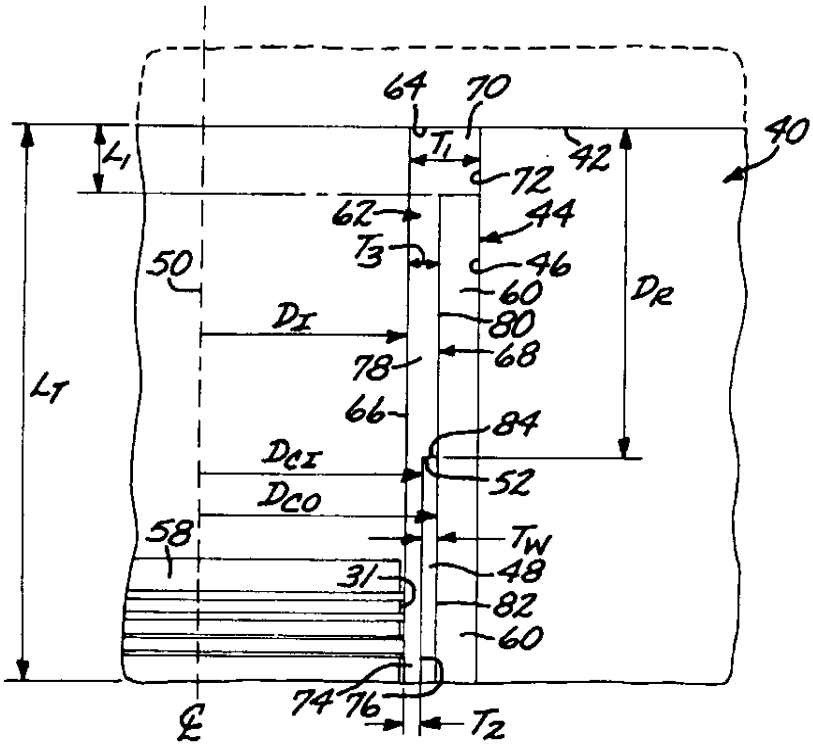


FIG. 2



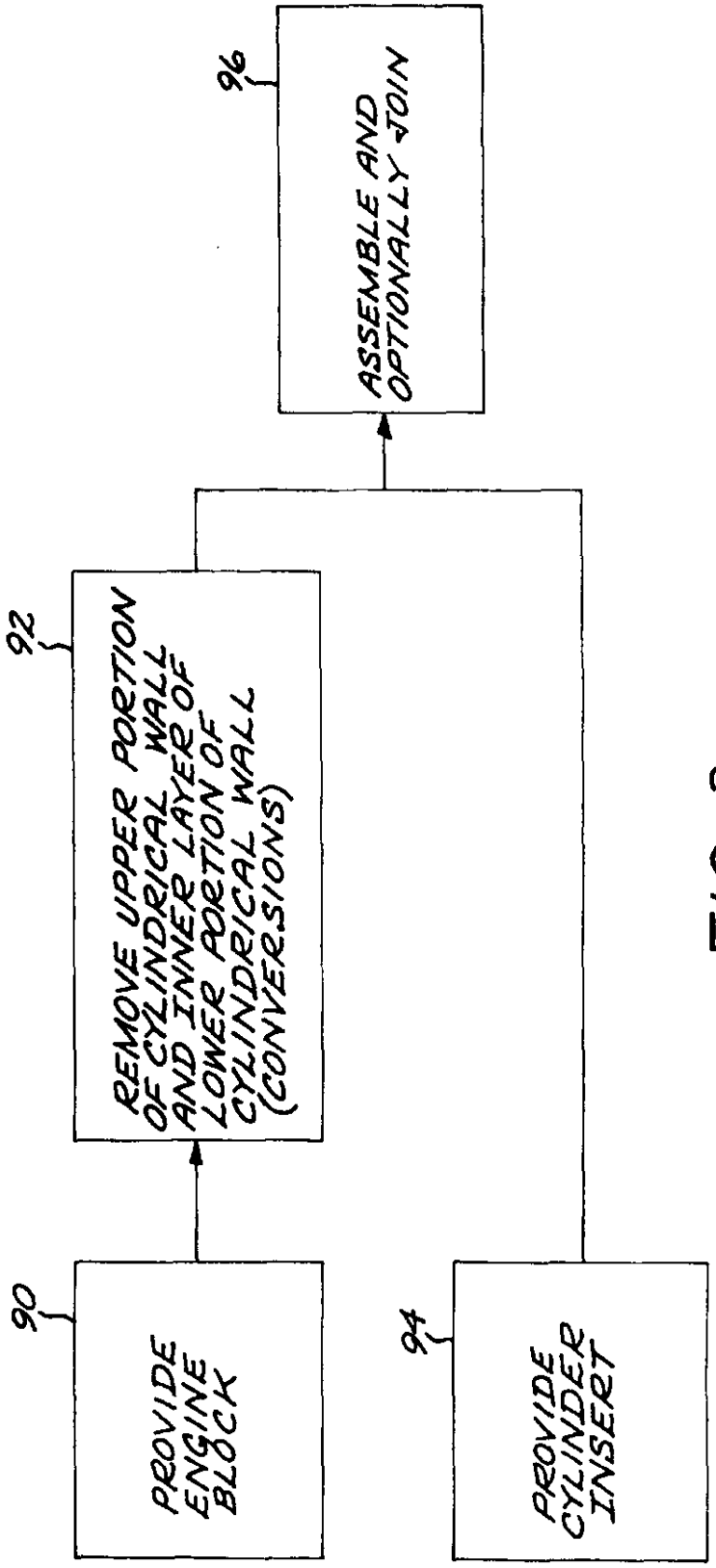

96
ASSEMBLE AND OPTIONALLY JOIN
92
REMOVE UPPER PORTION OF CYLINDRICAL WALL AND INNER LAYER OF LOWER PORTION OF CYLINDRICAL WALL (CONVERSIONS)
90
PROVIDE ENGINE BLOCK
94
PROVIDE CYLINDER INSERT

FIG. 3

INTERNAL COMBUSTION ENGINE WITH CYLINDER INSERT

This invention relates to a cylinder insert structure used in an internal combustion engine such as an automotive engine.

BACKGROUND OF THE INVENTION

An internal combustion engine has an engine block with a number of cylinder openings therein. The pistons of the engine move within the cylinder openings in a reciprocating fashion. The pistons are driven downwardly by the appropriately timed combustion of a mixture of fuel and air in a combustion space between the top of each piston and the bottom of a cylinder head.

Some types of engine blocks are cast from aluminum-base alloys. The use of aluminum-base alloys rather than iron-base alloys reduces the weight of the engine because of the lower density of the aluminum-base alloys. The reduced weight improves the gas mileage of the vehicle.

The aluminum-base alloys work well for most of the engine block. However, they do not have sufficiently good strength and wear resistance at elevated temperatures to serve as the interior liner of the cylinder against which the piston slides and against which there is the combustion of the mixture of fuel and air. Several techniques have been used to improve the properties of the portion of the engine block that defines the cylinder openings. In one, that portion of the aluminum-base alloy is strengthened and/or hardened, as by the addition of alloying elements, coatings, or composite reinforcement.

In another approach that has generally gained the greatest acceptance, a cylinder liner of an iron-base alloy (e.g., steel or cast iron) is provided. A water jacket overlies the exterior of at least a part of the iron-base cylinder liner. To manufacture a cylinder block using an iron-base cylinder liner, the aluminum-base alloy is cast around iron-base cylinder liners already prepositioned within a mold.

This approach works well for many conventional uses of such engines. However, in other applications, such as a high-performance racing engine based on a modified stock engine block, the present inventor has observed that there are engine failures associated with the cylinder liner. There is a need for an approach to overcome these failures, while retaining the other advantageous features of the standard engine. The present invention fulfills this need, and further provides related advantages.

SUMMARY OF THE INVENTION

This invention provides an internal combustion engine with a cylinder insert that is not prone to failure in demanding applications. The cylinder insert is readily manufactured and is suited for use both in new construction and in the modification of conventional stock engines. It is compatible with the structure of conventional stock engine blocks, so that only minimal modifications of the conventional stock engine blocks are required to utilize the present cylinder insert. An engine with the engine block modified to use the present cylinder insert may be pushed to performance levels well in excess of those of conventional engine blocks without failures.

In accordance with the invention, an internal combustion engine includes an engine block having a head seat surface and a cylinder opening extending from the head seat surface into an interior of the engine block, and a cylinder insert residing within the cylinder opening and having an insert upper surface substantially flush with the head seat surface of the engine block. The cylinder insert has a smooth cylindrical inner surface with a longitudinally extending cylindrical axis, and a stepped outer surface formed of three longitudinal regions. The three longitudinal regions include a first longitudinal region adjacent to the insert upper surface and having a first wall thickness, a second longitudinal region remote from the first longitudinal region and having a second wall thickness less than the first wall thickness, and a third longitudinal region intermediate between and continuous with the first longitudinal region and the second longitudinal region. The third longitudinal region has a third wall thickness intermediate between the first wall thickness and the second wall thickness. Typically, there are at least two cylinder openings, and there is a cylinder insert as described above for each of the cylinder openings.

In an embodiment of most interest because it is well suited to the modification of an existing stock engine, an internal combustion engine includes an engine block having a head seat surface and a cylinder opening extending from the head seat surface into an interior of the engine block. The cylinder opening has a cylinder opening surface, and a cylinder opening cylindrical wall that is cylindrical about a longitudinally extending cylindrical axis and has a wall upper surface located at a recess depth below the head seat surface. The cylinder opening wall has a cylinder opening inner cylindrical diameter and a cylinder opening outer dimension such that there is a gap between the cylinder opening cylindrical wall and the cylinder opening surface. A cylinder insert resides within the cylinder opening and has an insert upper surface substantially flush with the head seat surface of the engine block. The cylinder insert comprises a smooth cylindrical inner surface that is cylindrical about the longitudinally extending cylindrical axis, and a stepped outer surface formed of three longitudinal regions. The outer surface includes a first longitudinal region adjacent to the insert upper surface and having a first wall thickness such that the first longitudinal region contacts the cylinder opening surface, and a second longitudinal region remote from the first longitudinal region and having a second wall thickness less than the first wall thickness, the second longitudinal region being received within the cylinder opening inner wall. There is a third longitudinal region intermediate between and continuous with the first longitudinal region and the second longitudinal region, the third longitudinal region having a third wall thickness intermediate between the first wall thickness and the second wall thickness. A support shoulder lies between the second longitudinal region and the third longitudinal region and rests upon the wall upper surface.

Desirably, the cylinder insert contacts the engine block in the first longitudinal region and the second longitudinal region, but does not contact the engine block in the third longitudinal region so that the gap is continued into this volume. Cooling water is circulated in the gap between the cylinder insert and the engine block.

The engine block preferably comprises an aluminum-base alloy and the cylinder insert preferably comprises an iron-base alloy such as a cast iron.

The cylinder insert of the invention has its thickest wall in the first region near the top of the cylinder opening. The greatest wall stresses in the cylinder insert are produced in this first region by the combustion of the mixture of fuel and air, requiring the greatest wall thickness. The first region need not have a great longitudinal length, because the magnitude of the combustion-induced stresses falls rapidly

with increasing distance from the top of the cylinder and the insert top. The wall thickness of the cylinder insert is therefore reduced by reducing the outside diameter of the cylinder insert a short distance from the insert top. This reduction in the wall thickness of the cylinder insert provides both a shoulder for supporting the cylinder insert in the engine block and also decreases the thermal impedance to heat flow out of the insert wall and into the surrounding water jacket.

The invention is described herein as applied to one of the cylinders of an internal combustion engine. More commonly, the internal combustion engine has multiple cylinders, and a cylinder insert as described herein is provided for each of the cylinders.

Other features and advantages of the present invention will be apparent from the following more detailed description of the preferred embodiment, taken in conjunction with the accompanying drawings, which illustrate, by way of example, the principles of the invention. The scope of the invention is not, however, limited to this preferred embodiment.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a sectional view of a portion of an engine block and a conventional cylinder liner structure;

FIG. **2** is a sectional view of a portion of an engine block and a cylinder insert according to the invention; and

FIG. **3** is a block flow diagram of a preferred approach for practicing the invention by modifying a stock engine.

DETAILED DESCRIPTION OF THE INVENTION

FIG. **1** depicts a portion of a conventional engine block **20** of an internal combustion engine, and a cylinder liner **22**. The engine block **20**, which is typically made of an aluminum-base alloy, has a bore **24** therein. The cylinder liner **22** is a composite structure having an outer layer **26** of an aluminum-base alloy (usually the same alloy as the remainder of the engine block **20**) and an inner layer **28** of an iron-base alloy such as a nodular cast iron. A piston **30** moves in reciprocating movement within the interior of the cylinder liner **22** so that the piston rings **31** ride on the inner layer **28**. Cooling water circulates through a gap **32** between the outer layer **26** and an interior surface **34** of the bore **24**. A separate head structure **36**, shown in phantom lines, is bolted onto the engine block **20** and seals both the interior of the cylinder and the gap **32**.

This structure works well for many internal combustion engines. However, in some applications such as racing engines or other engines that require high performance operation, failures are observed in the relatively thin cylinder liner **22**. The present invention, as described next, eliminates these failures.

FIG. **2** depicts a portion of an internal combustion engine including an engine block **40**, preferably made of an aluminum-base alloy, having a head seat surface **42** and a cylinder opening **44** extending from the head seat surface **42** into an interior of the engine block **40**. (As used herein, the terminology "X-base alloy" means that there is more of the element X than any other element in the alloy. Thus, an aluminum-base alloy has more aluminum than any other element, and an iron-base alloy has more iron than any other element.) The cylinder opening **44** has a cylinder opening surface **46** that is typically, but not necessarily, cylindrical. A cylinder opening cylindrical wall **48** is internally cylindrical about a longitudinally extending cylindrical axis **50**, which in this case is coincident with the centerline of the cylinder opening **44**. The cylinder opening cylindrical wall **48**, sometimes termed the "cylindrical wall" herein, has a thickness of T_W. The cylindrical wall **48** has a wall upper surface **52** located at a recess depth D_R below the head seat surface **42**. The cylindrical wall **48** preferably is formed of an aluminum-base alloy (usually the same alloy as the remainder of the engine block **40**). The cylinder opening cylindrical wall **48** has a cylinder opening inner cylindrical diameter D_{CI} and a cylinder opening outer dimension D_{CO} such that there is a gap **60** between the cylinder opening cylindrical wall **48** and the cylinder opening surface **46**.

A cylinder insert **62** resides within the cylinder opening **44** and has an insert upper surface **64** substantially flush (i.e., coplanar) with the head seat surface **42** of the engine block **40**. The cylinder insert **62** has a smooth cylindrical inner surface **66** that is cylindrical about the longitudinally extending cylindrical axis **50** and has a diameter D_I. A piston **58** moves in reciprocating movement within the interior of the cylindrical inner surface **66** so that the piston rings **31** ride on the cylindrical inner surface **66**. The cylinder insert **62** is preferably made of an iron-base alloy such as steel or cast iron, and is most preferably a nodular cast iron having good wear resistance to the rubbing of the piston rings **31**.

The cylinder insert **62** has a stepped outer surface **68** formed of three longitudinal regions. These regions include a first longitudinal region **70** adjacent to the insert upper surface **64** and having a first wall thickness T_1 such that an outwardly facing surface **72** of the first longitudinal region **70** contacts the cylinder opening surface **46**. It is preferred that the outwardly facing surface **72** have a contacting interference fit to the cylinder opening surface **46**. The interference fit may be achieved by making the outer diameter of the outwardly facing surface **72** from about 0.001 inch to about 0.004 inch smaller than the inner diameter of the cylinder opening surface **46**. The outwardly facing surface **72** may be joined to the cylinder opening surface if desired, as for example by brazing, but such joining is typically not necessary with the interference fit.

A second longitudinal region **74** is remote from the first longitudinal region **70** and has a second wall thickness T_2 less than the first wall thickness T_1. The second longitudinal region **74** is received within the cylinder opening cylindrical wall **48** such that an outwardly facing surface **76** of the second longitudinal region **74** is in facing relation to the cylinder opening cylindrical wall **48**. It is preferred that the second longitudinal region **74** have a contacting interference fit to the cylinder opening cylindrical wall **48**. The interference fit may be achieved by making the outer diameter of the second longitudinal region **74** be from about 0.001 inch to about 0.004 inch smaller than the inner diameter of the cylinder opening cylindrical wall **48**. The second longitudinal region **74** may be joined to the cylinder opening cylindrical wall **48** if desired, as for example by brazing, but such joining is typically not necessary with the interference fit.

A third longitudinal region **78** is intermediate between and continuous with the first longitudinal region **70** and the second longitudinal region **74**. The third longitudinal region **78** has a third wall thickness T_3 intermediate between the first wall thickness T_1 and the second wall thickness T_2. Preferably, the third wall thickness T_3 is selected such that an outwardly facing surface **80** of the third longitudinal region **78** is of about the same outer diameter as an outwardly facing surface **82** of the cylinder opening cylindrical wall **48**. That is, the sum of T_2 plus T_W is about equal to T_3. With this construction, the gap **60** extends with a generally

uniform width over the length of the cylinder opening cylindrical wall **48** and over the length of the third longitudinal region **78**. In normal operation, a flow of cooling water is passed through this gap **60**.

A right-angle support shoulder **84** is defined in the outer surface **68** of the cylinder insert **62** between the second longitudinal region **74** and the third longitudinal region **78**. The support shoulder **84** rests upon the wall upper surface **52** to define the axial and radial positioning of the cylinder insert **62** relative to the wall upper surface **52** and the cylindrical wall **48**.

The present approach places a great thickness T_1 of material in the first longitudinal region **70** of the cylinder insert **62**. The inventor has observed that most failures of the cylinders of conventional engines occur near the very top of the cylinder liner, near the plane of the head seat surface. This localization of the failures is believed to find its origin in the fact that the combustion of the fuel and air mixture occurs at the very top of the cylinder, with resulting high pressures and thence circumferential forces in the wall. The circumferential wall forces fall very rapidly with increasing distance from the plane of the head seat surface **42**. The first longitudinal region with its greater thickness of material to resist the circumferential combustion forces extends only a short distance in the longitudinal direction parallel to the axis **50**. However, this increased thickness need not extend for a large distance parallel to the cylindrical axis **50**.

FIG. **3** is a block flow diagram of a preferred approach for practicing the invention. The engine block **40** is provided, numeral **90**. The engine block **40** may be furnished with the structure described in relation to FIG. **2**. The inventor converts stock engines to custom, high performance engines. In that case, the conventional stock engine block such as shown in FIG. **1** may be obtained and then altered, as by removing the upper portion of the cylinder liner **22** to the depth D_R and also removing the remaining portion of the inner layer **28** (the steel or cast iron layer) in the lower portion of the cylindrical liner **22** that would otherwise face the second longitudinal region **74**, numeral **92**. The wall thickness T_2 of the second longitudinal region **74** of the cylinder insert **62** is made about the same as the thickness of the layer **28** that is removed, so that D_1 of the cylinder insert **62** is the same as the inner diameter of the cylinder liner **22** of the unmodified engine. The size of the piston used in the modified engine therefore remains unchanged. (Step **92** is required only for engine conversions. In using the present approach with an engine specifically designed for use with the cylinder insert **62**, the engine block **40** is initially cast and machined with the configuration shown in FIG. **2**.) The cylinder insert **62** structured as described above is provided, numeral **94**. In a typical case, the cylinder insert **62** is cast from iron-base nodular cast iron alloy and then final machined. The cylinder insert **62** is assembled to the engine block **40**, numeral **96**.

The present invention has been reduced to practice by converting a stock engine block of a Honda and Acura 1.6–1.8 liter engine using the approach of FIG. **3**. For that specific case, the dimensions of the cylinder insert **62** are a diameter D_1 about 3.386 inches, T_1 about 0.745 inch, T_2 about 0.119 inch, T_3 about 0.357 inch, L_1 about 0.5 inch, D_R about 2½ inches, L_T about 5.5 inches, and the total length of the first longitudinal region **70** plus the second longitudinal region **74** about 2½ inches. Cylinder inserts were prepared and used for the six cylinders of this engine. The engine was tested under a wide variety of conditions, and no failures of the cylinder inserts were observed.

Although a particular embodiment of the invention has been described in detail for purposes of illustration, various modifications and enhancements may be made without departing from the spirit and scope of the invention. Accordingly, the invention is not to be limited except as by the appended claims.

What is claimed is:

1. An internal combustion engine including:

an engine block having a head seat surface and a cylinder opening extending from the head seat surface into an interior of the engine block, the cylinder opening having

a cylinder opening surface, and

a cylinder opening cylindrical wall that is cylindrical about a longitudinally extending cylindrical axis and has a wall upper surface located at a recess depth below the head seat surface, the cylinder opening wall having a cylinder opening inner cylindrical diameter and a cylinder opening outer dimension such that there is a gap between the cylinder opening cylindrical wall and the cylinder opening surface; and

a cylinder insert residing within the cylinder opening and having an insert upper surface substantially flush with the head seat surface of the engine block, the cylinder insert comprising

a smooth cylindrical inner surface with a longitudinally extending cylindrical axis, and

a stepped outer surface formed of three longitudinal regions, the three longitudinal regions including

a first longitudinal region adjacent to the insert upper surface and having a first wall thickness,

a second longitudinal region remote from the first longitudinal region and having a second wall thickness less than the first wall thickness, the second longitudinal region being received within the inner cylindrical diameter of the cylinder opening wall, and

a third longitudinal region intermediate between and continuous with the first longitudinal region and the second longitudinal region, the third longitudinal region having a third wall thickness intermediate between the first wall thickness and the second wall thickness.

2. The internal combustion engine of claim **1**, wherein the engine block comprises an aluminum-base alloy and the cylinder insert comprises an iron-base alloy.

3. The internal combustion engine of claim **1**, wherein the cylinder insert contacts the engine block in the first longitudinal region and the second longitudinal region, but does not contact the engine block in the third longitudinal region so that there is a gap between the cylinder insert and the engine block in the third longitudinal region.

4. The internal combustion engine of claim **1**, wherein the engine block comprises at least two cylinder openings, and wherein there is a cylinder insert as set forth in claim **1** for each of the cylinder openings.

5. The internal combustion engine of claim **1**, wherein each of the longitudinal regions is cylindrical about the cylindrical axis.

6. The internal combustion engine of claim **1**, wherein the cylinder opening is cylindrical.

7. An internal combustion engine including:

an engine block having a head seat surface and a cylinder opening extending from the head seat surface into an interior of the engine block, the cylinder opening having

a cylinder opening surface, and

a cylinder opening cylindrical wall that is cylindrical about a longitudinally extending cylindrical axis and

has a wall upper surface located at a recess depth below the head seat surface, the cylinder opening wall having a cylinder opening inner cylindrical diameter and a cylinder opening outer dimension such that there is a gap between the cylinder opening cylindrical wall and the cylinder opening surface; and

a cylinder insert residing within the cylinder opening and having an insert upper surface substantially flush with the head seat surface of the engine block, the cylinder insert comprising

a smooth cylindrical inner surface that is cylindrical about the longitudinally extending cylindrical axis, and

a stepped outer surface formed of three longitudinal regions, the outer surface including

a first longitudinal region adjacent to the insert upper surface and having a first wall thickness such that the first longitudinal region contacts the cylinder opening surface,

a second longitudinal region remote from the first longitudinal region and having a second wall thickness less than the first wall thickness, the second longitudinal region being received within the cylinder opening inner wall,

a third longitudinal region intermediate between and continuous with the first longitudinal region and the second longitudinal region, the third longitudinal region having a third wall thickness intermediate between the first wall thickness and the second wall thickness, and

a support shoulder between the second longitudinal region and the third longitudinal region, the support shoulder resting upon the wall upper surface.

8. The internal combustion engine of claim **7**, wherein the engine block comprises an aluminum-base alloy and the cylinder insert comprises an iron-base alloy.

9. The internal combustion engine of claim **7**, wherein the cylinder insert contacts the engine block in the first longitudinal region and the second longitudinal region, but does not contact the engine block in the third longitudinal region.

10. The internal combustion engine of claim **7**, wherein the engine block comprises at least two cylinder openings, and wherein there is a cylinder insert as set forth in claim **6** for each of the cylinder openings.

11. The internal combustion engine of claim **7**, wherein the first longitudinal region is joined to the cylinder opening surface and the second longitudinal region is joined to the cylinder opening inner wall.

12. The internal combustion engine of claim **7**, wherein each of the longitudinal regions is cylindrical about the cylindrical axis.

13. The internal combustion engine of claim **6**, wherein the cylinder opening is cylindrical.

14. An internal combustion engine including:

an engine block having a head seat surface and a cylinder opening extending from the head seat surface into an interior of the engine block, the cylinder opening having

a cylinder opening surface, and

a cylinder opening cylindrical wall that is cylindrical about a longitudinally extending cylindrical axis and has a wall upper surface located at a recess depth below the head seat surface, the cylinder opening wall having a cylinder opening inner cylindrical diameter and a cylinder opening outer dimension such that there is a gap between the cylinder opening cylindrical wall and the cylinder opening surface; and

a cylinder insert residing within the cylinder opening and having an insert upper surface substantially flush with the head seat surface of the engine block, the cylinder insert comprising

a smooth cylindrical inner surface that is cylindrical about the longitudinally extending cylindrical axis, and

a stepped outer surface formed of three longitudinal regions, the outer surface including

a first longitudinal region adjacent to the insert upper surface and having a first wall thickness such that the first longitudinal region contacts the cylinder opening surface,

a second longitudinal region remote from the first longitudinal region and having a second wall thickness less than the first wall thickness, the second longitudinal region being received within the cylinder opening inner wall,

a third longitudinal region intermediate between and continuous with the first longitudinal region and the second longitudinal region, the third longitudinal region having a third wall thickness intermediate between the first wall thickness and the second wall thickness, and

a support shoulder between the second longitudinal region and the third longitudinal region, the support shoulder resting upon the wall upper surface, wherein the gap serves as a water-cooling jacket extending over a length of the second longitudinal region and a length of the third longitudinal region.

15. The internal combustion engine of claim **14**, wherein the engine block comprises an aluminum-base alloy and the cylinder insert comprises an iron-base alloy.

16. The internal combustion engine of claim **14**, wherein the cylinder insert contacts the engine block in the first longitudinal region and the second longitudinal region, but does not contact the engine block in the third longitudinal region.

17. The internal combustion engine of claim **14**, wherein the engine block comprises at least two cylinder openings, and wherein there is a cylinder insert as set forth in claim **14** for each of the cylinder openings.

18. The internal combustion engine of claim **14**, wherein the first longitudinal region is joined to the cylinder opening surface and the second longitudinal region is joined to the cylinder opening inner wall.

19. The internal combustion engine of claim **14**, wherein each of the longitudinal regions is cylindrical about the cylindrical axis.

20. The internal combustion engine of claim **14**, wherein the cylinder opening is cylindrical.

* * * * *

TO: Commissioner of Patents and Trademarks Washington, D.C. 20231	**REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT**

In compliance with the Act of July 19, 1952 (66 Stat. 814; 35 U.S.C. 290) you are hereby advised that a court action has been filed on the following patent(s) in the U.S. District Court:

DOCKET NO. 03cv0034-L(JAH)	DATE FILED 01/08/03	U.S. DISTRICT COURT United States District Court, Southern District of California
PLAINTIFF AEBS, LLC		DEFENDANT Darton International, Inc.
PATENT NO.	**DATE OF PATENT**	**PATENTEE**
1 6,439,173	08/27/02	Lee Wai Chung
2		
3		
4		
5		

In the above-entitled case, the following patent(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT NO.	**DATE OF PATENT**	**PATENTEE**
1		
2		
3		
4		
5		

In the above-entitled case, the following decision has been rendered or judgment issued:

DECISION/JUDGMENT		
CLERK	(BY) DEPUTY CLERK	DATE

Copy 1 - Upon initiation of action, mail this copy to Commissioner Copy 3 - Upon termination of action, mail this copy to Commissioner
Copy 2 - Upon filing document adding patent(s), mail this copy to Commissioner Copy 4 - Case file copy

JS 44
(Rev. 07/89)

ORIGINAL
CIVIL COVER SHEET

The JS-44 civil cover sheet and the information contained herein neither replace nor supplement the filing and service of pleadings or other papers as required by law, except as provided by local rules of court. This form, approved by the Judicial Conference of the United States in September 1974, is required for the use of the Clerk of Court for the purpose of initiating the civil docket sheet. (SEE INSTRUCTIONS ON THE SECOND PAGE OF THIS FORM.)

I. (a) PLAINTIFFS

AEBS, LLC, a California limited liability company

DEFENDANTS

DARTON INTERNATIONAL, INC., a Nevada corporation

FILED
03 JAN -8 AM 10:32
CLERK U.S. DISTRICT COURT
SOUTHERN DISTRICT OF CALIFORNIA
BY DEPUTY

(b) COUNTY OF RESIDENCE OF FIRST LISTED PLAINTIFF San Diego
(EXCEPT IN U.S. PLAINTIFF CASES)

COUNTY OF RESIDENCE OF FIRST LISTED DEFENDANT San Diego
(IN U.S. PLAINTIFF CASES ONLY)
NOTE: IN LAND CONDEMNATION CASES, USE THE LOCATION OF THE TRACT OF LAND INVOLVED.

(c) ATTORNEYS (FIRM NAME, ADDRESS, AND TELEPHONE NUMBER)
Knobbe Martens Olson & Bear, LLP
550 West "C" Street, Suite 1200
San Diego, CA 92101
619/235-8550

ATTORNEYS (IF KNOWN)

'03 CV 0034 L (JAH)

II. BASIS OF JURISDICTION (PLACE AN 'X' IN ONE BOX ONLY)

- ☐ 1 U.S. Government Plaintiff
- ☒ 3 Federal Question (U.S. Government Not a Party)
- ☐ 2 U.S. Government Defendant
- ☐ 4 Diversity (Indicate Citizenship of Parties in Item III)

III. CITIZENSHIP OF PRINCIPAL PARTIES (PLACE AN 'X' IN ONE BOX FOR PLAINTIFF AND ONE BOX FOR DEFENDANT)
(For Diversity Cases Only)

	PT	DEF		PT	DEF
Citizen of This State	☐ 1	☐ 1	Incorporated *or* Principal Place of Business in This State	☐ 4	☐ 4
Citizen of Another State	☐ 2	☐ 2	Incorporated *and* Principal Place of Business in Another State	☐ 5	☐ 5
Citizen or Subject of a Foreign Country	☐ 3	☐ 3	Foreign Nation	☐ 6	☐ 6

IV. CAUSE OF ACTION (CITE THE U.S. CIVIL STATUTE UNDER WHICH YOU ARE FILING AND WRITE A BRIEF STATEMENT OF CAUSE. DO NOT CITE JURISDICTIONAL STATUTES UNLESS DIVERSITY.)

This is an action for patent infringement arising under the patent laws of the United States, Title 35, United States Code, and more particularly 35 U.S.C Sections 271 and 281.

V. NATURE OF SUIT (PLACE AN "X" IN ONE BOX ONLY)

CONTRACT
- ☐ 110 Insurance
- ☐ 120 Marine
- ☐ 130 Miller Act
- ☐ 140 Negotiable Instrument
- ☐ 150 Recovery of Overpayment & Enforcement of Judgment
- ☐ 151 Medicare Act
- ☐ 152 Recovery of Defaulted Student Loans (Excl. Veterans)
- ☐ 153 Recovery of Overpayment of Veteran's Benefits
- ☐ 160 Stockholders' Suits
- ☐ 190 Other Contract
- ☐ 195 Contract Product Liability

REAL PROPERTY
- ☐ 210 Land Condemnation
- ☐ 220 Foreclosure
- ☐ 230 Rent Lease & Ejectment
- ☐ 240 Torts to Land
- ☐ 245 Tort Product Liability
- ☐ 290 All Other Real Property

TORTS

PERSONAL INJURY
- ☐ 310 Airplane
- ☐ 315 Airplane Product Liability
- ☐ 320 Assault, Libel & Slander
- ☐ 330 Federal Employers' Liability
- ☐ 340 Marine
- ☐ 345 Marine Product Liability
- ☐ 350 Motor Vehicle
- ☐ 355 Motor Vehicle Product Liability
- ☐ 360 Other Personal Injury

PERSONAL INJURY
- ☐ 362 Personal Injury - Medical Malpractice
- ☐ 365 Personal Injury - Product Liability
- ☐ 368 Asbestos Personal Injury Product Liability

PERSONAL PROPERTY
- ☐ 370 Other Fraud
- ☐ 371 Truth in Lending
- ☐ 380 Other Personal Property Damage
- ☐ 385 Property Damage Product Liability

CIVIL RIGHTS
- ☐ 441 Voting
- ☐ 442 Employment
- ☐ 443 Housing/ Accommodations
- ☐ 444 Welfare
- ☐ 440 Other Civil Rights

PRISONER PETITIONS
- ☐ 510 Motion to Vacate Sentence

HABEAS CORPUS:
- ☐ 530 General
- ☐ 535 Death Penalty
- ☐ 540 Mandamus & Other
- ☐ 550 Civil Rights
- ☐ 555 Prison Conditions

FORFEITURE/PENALTY
- ☐ 610 Agriculture
- ☐ 620 Other Food & Drug
- ☐ 625 Drug Related Seizure of Property 21 USC 881
- ☐ 630 Liquor Laws
- ☐ 640 R.R. & Truck
- ☐ 650 Airline Regs.
- ☐ 660 Occupational Safety/Health
- ☐ 690 Other

LABOR
- ☐ 710 Fair Labor Standards Act
- ☐ 720 Labor/Mgmt. Relations
- ☐ 730 Labor/Mgmt. Reporting & Disclosure Act
- ☐ 740 Railway Labor Act
- ☐ 790 Other Labor Litigation
- ☐ 791 Empl. Ret. Inc. Security Act

BANKRUPTCY
- ☐ 422 Appeal 28 USC 158
- ☐ 423 Withdrawal 28 USC 157

PROPERTY RIGHTS
- ☐ 820 Copyrights
- ☒ 830 Patent
- ☐ 840 Trademark

SOCIAL SECURITY
- ☐ 861 HIA (13958)
- ☐ 862 Black Lung (923)
- ☐ 863 DIWC/DIWW (405(g))
- ☐ 864 SSID Title XVI
- ☐ 865 RSI (405(g))

FEDERAL TAX SUITS
- ☐ 870 Taxes (U.S. Plaintiff or Defendant)
- ☐ 871 IRS - Third Party 26 USC 7609

OTHER STATUTES
- ☐ 400 State Reappointment
- ☐ 410 Antitrust
- ☐ 430 Banks and Banking
- ☐ 450 Commerce/ICC Rates/etc.
- ☐ 460 Deportation
- ☐ 470 Racketeer Influenced and Corrupt Organizations
- ☐ 810 Selective Service
- ☐ 850 Securities/Commodities/ Exchange
- ☐ 875 Customer Challenge 12 USC 3410
- ☐ 891 Agricultural Acts
- ☐ 892 Economic Stabilization Act
- ☐ 893 Environmental Matters
- ☐ 894 Energy Allocation Act
- ☐ 895 Freedom of Information Act
- ☐ 900 Appeal of Fee Determination Under Equal Access to Justice
- ☐ 950 Constitutionality of State Statutes
- ☐ 890 Other Statutory Actions

VI. ORIGIN (PLACE AN "X" IN ONE BOX ONLY)

- ☒ 1 Original Proceeding
- ☐ 2 Removal from State Court
- ☐ 3 Remanded from Appellate Court
- ☐ 4 Reinstated or Reopened
- ☐ 5 Transferred from another district (specify)
- ☐ 6 Multidistrict Litigation
- ☐ 7 Appeal to District Judge from Magistrate Judgment

VII. REQUESTED IN COMPLAINT: ☐ CHECK IF THIS IS A **CLASS ACTION** UNDER F.R.C.P. 23 **DEMAND $**

CHECK YES only if demanded in complaint:
JURY DEMAND: ☒ YES ☐ NO

VIII. RELATED CASE(S) IF ANY (See instructions): JUDGE _____ Docket Number _____

DATE: January 8, 2003

SIGNATURE OF ATTORNEY OF RECORD: Frederick S. Berretta

::ODMA\PCDOCS\WORDPERFECT\22816\1 January 24, 2000 (3:10pm)

#090150 $150.00 BCH