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Sworn to before me this
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(54) PRESSURE REGULATOR IN CONSTANT-VELOCITY JOINT BOOT

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SPECIFICATION

1. TITLE OF THE INVENTION

PRESSURE REGULATOR IN CONSTANT-VELOCITY JOINT BOOT

2. SCOPE OF PATENT CLAIMS

1. For a device wherein an intermediate shaft is provided between constant-velocity joints and the space between this intermediate shaft and the outer race of the constant-velocity joint is sealed by means of a boot, a pressure regulator in a constant-velocity joint boot characterized in that an air passageway is provided on the interior of the aforesaid intermediate shaft ~~on the interior of the boot~~ leading from the interior of the boot to the exterior, and an annular protector is fitted over the intermediate shaft in such a way as to cover the connective opening leading to the exterior, with a connective opening leading to the exterior being provided on this protector at a phase difference relative to the position of the connective opening leading to the aforesaid intermediate shaft.

3. DETAILED DESCRIPTION OF THE INVENTION

This invention relates to a pressure regulator on the interior of a boot of a constant-velocity joint used in the transmission system of an automobile or the like.

Prior-art examples of this manner of device include those indicated, for example, in FIG. 1 and FIG. 2. In the drawings, 1 is the outer race of the constant velocity joint, 2 is the inner race, 3 is a ball, 4 is a cage, 5 is an intermediate shaft fastened to inner race 2, 6 is a rubber boot that covers the space between outer race 1 and intermediate shaft 5, 7 is a ring-shaped nylon air breather fitted between intermediate shaft 5 and boot 6, and 7a and 7b are air passageways running in the axial direction. Additionally, 8 is a band that fastens boot 6 to outer race 1, and 9 is a band that fastens boot 6 to air breather 7.

In these devices, during power transmission, intermediate shaft 5 freely changes its angle relative to shaft 1a, which is integral with outer race 1, causing boot 6 to expand and contract and to bend and twist. The resultant frequent change in the volume of the interior a of boot 6 causes air a in the boot and air b from the exterior to enter and exit via air passageways 7a, 7b of air breather 7, as indicated by the arrows c in FIG. 1. Furthermore, in these prior-art devices, air breather 7 is situated in a location where it is exposed to muddy water and dust, causing muddy water and dust to enter into boot 6 along with the aforesaid entry and exit of air. This can lead to a variety of problems adversely affecting

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the constant-velocity joint, including reducing the life of the joint as well as blocking the passage of air through air passageways 7a, 7b with muddy water or dust, which can impair the pressure regulation function.

This invention was devised to overcome these problems with prior-art devices, having as its objective to extend the life of the joint and eliminate the risk of losing pressure regulation function due to clogging of the air passageways with muddy water or dust, which is achieved by providing the connective opening that links the interior of the boot to the exterior in a location separated from the boot as well as covering this connective opening with a protector so as to prevent outside air from directly entering the aforesaid connective opening and thereby prevent muddy water and dust from entering into the constant-velocity joint.

Embodiments of the present invention will be described below by means of FIG. 3 through FIG. 6. In these drawings, symbols identical to those in the previous drawings signify the same component.

FIG. 3 and FIG. 4 show embodiment example 1 of the present invention. In this case, the prior-art air breather 7 is not provided; instead, the tip 6a of boot 6 is directly fastened to intermediate shaft 5 by means of band 9.

Additionally, a through-hole 10 is provided in the center of intermediate shaft 5, and an air passageway 11 is provided in intermediate shaft 5 linking through-hole 10 to the exterior b. An annular protector 12 is fitted over intermediate shaft 5 covering this connective opening 11a leading to the exterior, and a connective opening 12a leading to the exterior is provided in this protector 12 at a phase difference relative to the position of the connective opening 11a leading to the aforesaid intermediate shaft 5. Note that 12b is an annular groove provided along the inner circumference of protector 12, and 13 is a band that fastens protector 12 to intermediate shaft 5. FIG. 4 (a) is an example in which connective opening 12a is situated at a phase difference of 180 degrees relative to connective opening 11a, and FIG. 4 (b) is an example in which two connective openings 11a are provided at a phase difference of 180 degrees relative to one another, and two connective openings 12a are provided at a phase difference of 90 degrees relative to each of these, respectively.

FIG. 5 and FIG. 6 show embodiment example 2 of the present invention. In this example, intermediate shaft 5 is comprised of a pipe 5a and a connective shaft 5b splined onto either end of this pipe 5a. In this case, because pipe 5a is hollow, this eliminates the need to provide a through-hole 10, as in embodiment example 1, for which reason only air passageway 11 needs to be provided in the wall of pipe 5a. Protector 12 can be the same as that in embodiment example 1. FIG. 6 shows a cross-section along line B-B in FIG. 5. Because the spline of pipe 5a and connective shaft 5b produces numerous gaps S, the interior a of boot 6 communicates with the interior c of pipe 5a by means of these gaps S.

Next, the action of the device of the present invention in the above-described configurations will be described. When this transmission system is driven, the above-stated expansion and contraction and bending and twisting of boot 6 causes the volume of the interior a of boot 6 to change. However, because in the device of the present invention the interior a of boot 6 communicates to the exterior b by means of through-hole 10 or the interior c of pipe 5a, air passageway 11, annular groove 12b, and opening 12a, air is able to escape or enter via the aforesaid passageway in response to any change in the volume of the interior a of boot 6. This allows for automatic regulation of the pressure of the interior a of boot 6.

Hence, whereas in prior-art devices muddy water and dust were able to enter into the constant-velocity joint together with air through these air passageways 7a, 7b due to the fact that air breather 7 was situated at the tip of boot 6, in the device of the present invention, even if muddy water or dust should happen to infiltrate along with air through connective opening 12a, there is no chance whatsoever that muddy water or dust will accede to the interior of the constant-velocity joint and consequently impair the function of the joint as well as reduce its lifespan, because connective opening 12a in protector 12, which is the entryway for outside air, is situated at a location separated from the site of the constant-velocity joint, and also because connective opening 12a and connective opening 11a are provided at a phase difference relative to one another.

Furthermore, in the device of the present invention, protector 12 is fitted over intermediate shaft 5 at an interim location away from boot 6, which is a location less exposed to muddy water and dust than that of the air breather in prior-art devices, thereby reducing the risk that clogs in opening 12a will impair the pressure regulation function.

Because the device of the present invention is configured in the manner described above, it provides the excellent effect of being able to prevent

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deformation of the boot of the constant-velocity joint by successfully regulating the change in pressure within the boot, as well as being able to extend the life of the constant-velocity joint.

4. BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a longitudinal cross-section of a prior-art device,

FIG. 2 is a cross-section along line A-A therein,

FIG. 3 is a longitudinal cross-section of the device of the present invention,

FIG. 4 (a) is a cross-section of the protector portion therein, FIG. 4 (b) is a variant example thereof,

FIG. 5 is a longitudinal cross-section showing another embodiment example of the device of the present invention, and

FIG. 6 is a cross-section along line B-B therein.

1: Outer race of constant-velocity joint, 1a: shaft integral with outer race, 2: inner race, 3: ball, 4: cage, 5: intermediate shaft, 5a: pipe, 5b: connective shaft, 6: boot, 7: air breather, 8, 9: band, 10: through-hole, 11: air passageway, 11a: connective opening, 12: protector, 12a: connective opening, 12b: annular groove, 13: band.

FIG. 1

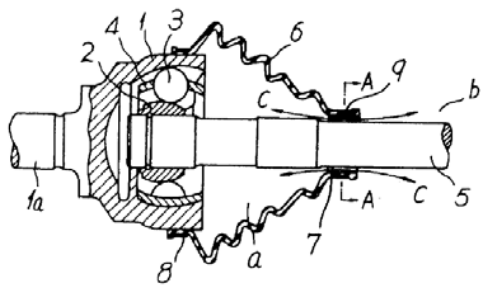

FIG. 2

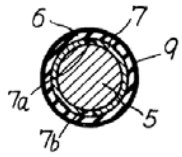

FIG. 3

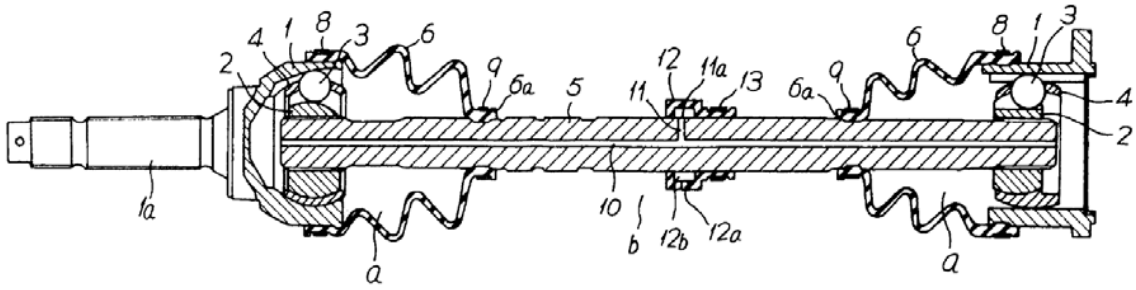

FIG. 4

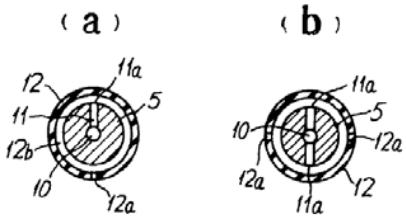

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FIG. 5

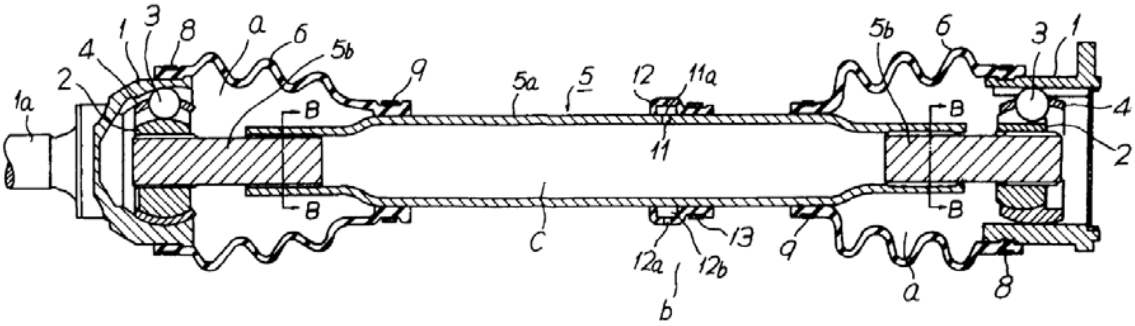
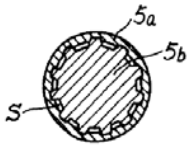


FIG. 6



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3/84　7006—3 J

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審査請求　未請求

（全 4 頁）

⑤等速ジョイントブーツ内の圧力調整装置

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㉒出　願　昭57(1982) 3月8日
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明　細　書

1. 発明の名称　等速ジョイントブーツ内の圧力調整装置

2. 特許請求の範囲

1. 等速ジョイント間に中間軸を設け、この中間軸と等速ジョイントのアウターレースとの間をブーツにより密封した装置において、前記中間軸の内部に前記ブーツ内部を外部と連通する空気通路を設けると共に、この外部との連通口を覆う環状のプロテクターを中間軸に嵌装し、このプロテクターに設けた外部との連通口の位置を前記中間軸の連通口の位置に対して位相差を設けたことを特徴とする等速ジョイントブーツ内の圧力調整装置。

3. 発明の詳細な説明

この発明は、自動車等の伝動系に使用する等速ジョイントのブーツ内部の圧力調整装置に関するものである。

従来のこの種装置としては、例えば第1図および第2図に示すようなものがある。図中1は等速ジョイントのアウターレース、2はインナーレース、3はボール、4はケージ、5はインナーレース2と固定した中間軸、6はアウターレース1と中間軸5との間をカバーするゴム製のブーツ、7は中間軸5とブーツ6との間に嵌装したリング状のナイロン製エアブリーザで、7aおよび7bは軸方向に設けた通気路である。また8はブーツ6をアウターレース1に締結するためのバンド、9はブーツ6をエアブリーザ7に締結するためのバンドである。

しかしてこの装置は、動力伝達中に中間軸5がアウターレース1と一体の軸1aに対して角度を自由に変えるため、ブーツ6が伸縮したり折れ曲がつたりする。このためブーツ6の内部a内の容積が頻繁に変化する結果、エアブリーザ7の通気路7a，7bを介して第1図の矢印cのようにブーツ内aの空気と外部bの空気が出入する。そしてこの従来装置のエアブリーザ7は泥水やほこりをかぶりやすい位置にあるため、前記空気の出入に伴つて泥水やほこりがブーツ6内に侵入して等

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速ジョイントに悪影響を与え、ジョイントの寿命を低下させたり、また泥水やほこりが通気路7a，7bにつまつて空気の流通を遮断する結果、圧力調整機能を失う等の問題点があつた。

この発明は、このような従来装置の問題点を解決するためになされたもので、ブーツ内部と外部との連通口をブーツから離れた位置に設けると共に、その連通口をプロテクターによつてカバーして、外気が直接前記連通口に入らないようにすることにより、等速ジョイントに泥水やほこりが入らないようにして、ジョイントの寿命を延ばすと共に、泥水やほこりが通気路をふさいで圧力調整機能をそこなうおそれがないようにすることを目的とするものである。

以下第3図～第6図により本発明の実施例を説明する。図中前記符号と同一の符号は同等のものを示す。

第3図および第4図は本発明の第1実施例を示すもので、この場合は従来のエアブリーザ7は設けず、ブーツ6の端部6aはバンド9によつて直接中間軸5に締結する。

そして中間軸5には中心部に貫通孔10を設けると共に、中間軸5の中間部に外部bと貫通孔10とを連通する空気通路11を設け、この外部との連通口11aを覆う環状のプロテクター12を中間軸5に嵌装し、このプロテクター12に設けた外部との連通口12aの位置を前記中間軸5の連通口11aに対して位相差を設けて配置する。なお12bはプロテクター12の内周部に設けた環状溝で、13はプロテクター12を中間軸5に締結するバンドである。なお第4図(a)は連通口12aを連通口11aに対して180度の位相差で配置した例であり、同図(b)は180度の位相差で2個設けた連通口11aに対して、それぞれ90度の位相差で2個の連通口12aを配置した例である。

第5図および第6図は本発明の第2実施例を示すもので、これは中間軸5を、パイプ5aと、そのパイプ5aの両端部にそれぞれスプライン嵌合した連結軸5bとにより形成したものである。この場合パイプ5aは中空であるため、第1実施例のような貫通孔10を設ける必要はなく、パイプ5aの壁部に空気通路11のみを設ければよい。プロテクター12は第1実施例の場合と同じでよい。第6図は第5図のB－B断面を示すもので、パイプ5aと連結軸5bとのスプライン嵌合部には多数の隙間Sがあるため、ブーツ6の内部aとパイプ5aの内部cとはこの隙間Sによつて連通している。

次に上述のように構成した本発明装置の作用を説明する。この伝動系が駆動される場合、前述したようにブーツ6は伸縮したり、折れ曲がるため、ブーツ6の内部aの容積が変化する。しかしながら本発明装置においてはブーツ6の内部aを、貫通孔10またはパイプ5aの内部c、空気通路11、環状溝12b、および連通口12aを介して外部bと連通させてあるため、ブーツ6の内部aの容積が変化すれば、それに応じて空気が前記系路を介して出入する。このため、ブーツ6の内部aの圧力は自動的に調整される。

この場合従来装置では、エアブリーザ7がブーツ6の端部にあつたため、その通気路7a，7bから空気と共に入つた泥水やほこりが等速ジョイント内に入りやすかつたが、本発明装置の外気流入口であるプロテクター12の連通口12aは、等速ジョイント部と離れた位置にある上に、連通口12aと連通口11aとは位相差を設けて配置されているため、たとえ連通口12aから空気と共に泥水やほこりが侵入しても、等速ジョイントの内部まで泥水やほこりが侵入してジョイントの機能を害すると共に、その寿命を縮めるおそれは全くない。

また本発明装置のプロテクター12はブーツ6から離れた中間軸5の中間部に嵌装してあり、この位置は従来装置のエアブリーザ位置に比較して泥水やほこりがつきにくいため、連通口12aをつまらせて圧力調整機能を害するおそれもなくなる。

本発明装置は上述の通りであるから、等速ジョイントのブーツ内の圧力変化を支障なく調整して

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ブーツの変形を防止することができると共に、等速ジョイントの寿命を延長できるというすぐれた効果が得られる。

4.図面の簡単な説明

第1図は従来装置の縦断面図、

第2図はそのA－A断面図、

第3図は本発明装置の縦断面図、

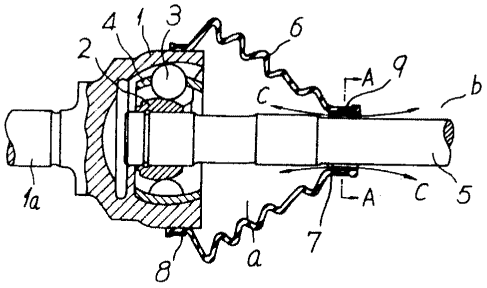
第4図(a)はそのプロテクター部の断面図、同図(b)はその変形例図、

第5図は本発明装置の他の実施例を示す縦断面図、

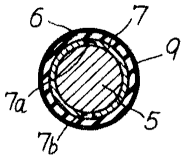
第6図はそのB－B断面図である。

1…等速ジョイントのアウターレース、1a…アウターレースと一体の軸、2…インナーレース、3…ボール、4…ケージ、5…中間軸、5a…パイプ、5b…連結軸、6…ブーツ、7…エアブリーザ、8，9…バンド、10…貫通孔、11…空気通路、11a…連通口、12…プロテクター、12a…連通口、12b…環状溝、13…バンド。

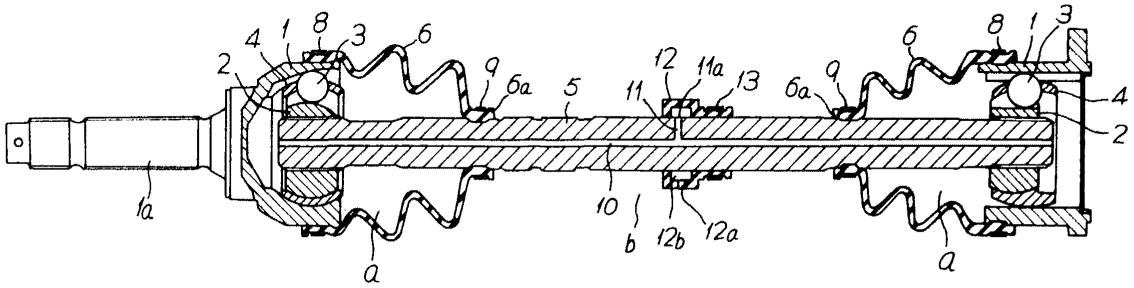
第1図



第2図

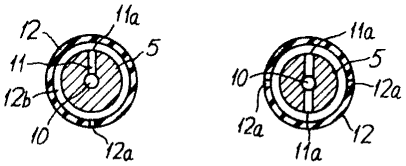


第3図



第4図

(a)　　(b)



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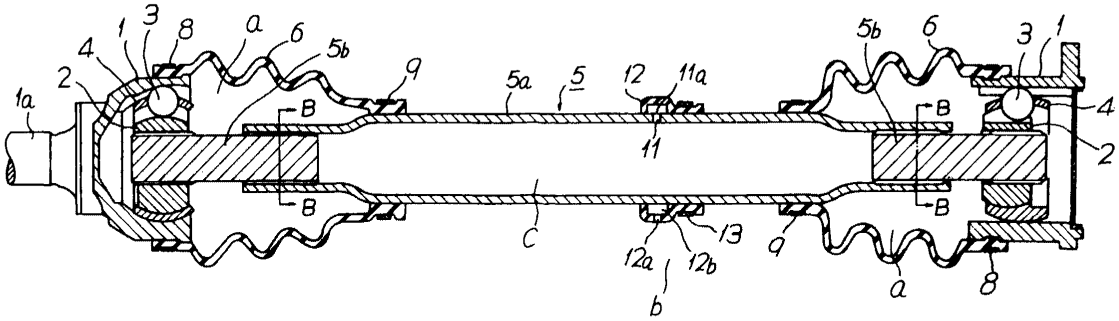
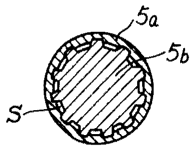
第 5 図



第 6 図



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