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(54) EXHAUST BRAKE VALVE FOR AUTOMOBILE AND AUTOMOBILE

(57) A car engine exhaust braking valve, including valve body, air cylinders which are constituted with plunger cylinder and one-way cylinder, the plunger cylinder transmits the push force to the one-way cylinder, whose pushing bar extends outside of shell of the cylinders and twists with the rocker arm; the exhaust braking valve is small in geometric shape, easy installation, and low maintenance costs.

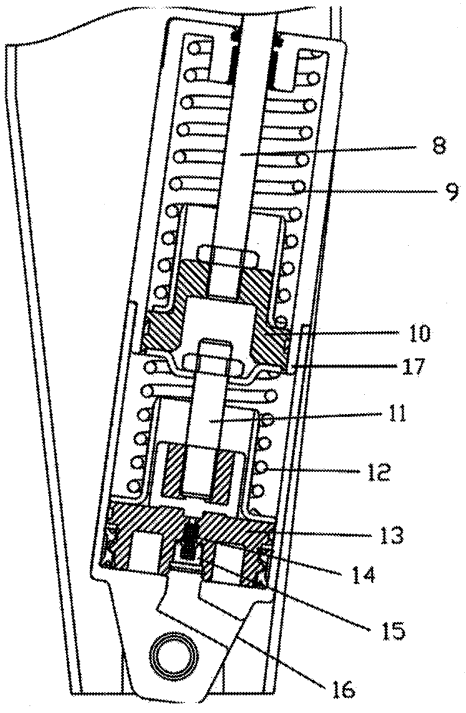


Fig. 2

EP 2 787 199 A1

Description

Field of the Invention

[0001] The present invention relates to a device of auxiliary braking for vehicles, particularly a exhaust brake valve for automobile engines.

Background to the Invention

[0002] Automobile engine brake system is an important safety device in driving the car. When it is need to slow down, especially in the mountains or city buses require frequently braking, and the braker is frequently made, it will cause overheating leaving the brake wheel brake function decline, if not take emergency measures (parking cooling), even lead to complete failure of the braking and dangerous. So it is necessary to used no-recession auxiliary braking system. The auxiliary braking system enhances the braking performance of the vehicles, the speed of the vehicles is able to be controlled to a safe speed within a certain range without or lessly using the brakes (Conventional friction brake), it can be used to avoid braking failure, in particular, to enhance the security on a long slope under heavy vehicles. It can significantly reduce the frequency of main vehicle braker (friction brakes) while using the retarder, and increase its service life.

[0003] In the currently automotive auxiliary braking devices, the exhaust brakes have simple structure and reliable performance, and they are easy to be operated and easy to be installed, also serve as auxiliary braking devices got into widespread use. The one-way cylinder of exhaust brakes in prior art and piston cylinder using substructure, which is a separate unit, piston-cylinder is located in the output of the one-way cylinders, piston-cylinder is twisted with rocker arm, resulting high cost in manufacturing and maintenance, difficult in replacement, geometry of braking valve is too large, also difficult in installation.

[0004] Chinese utility model whose number is 201120077377.9 disclosed constant pressure exhaust valve for generating auxiliary braking, which has a piston-cylinder assembly and a single-acting cylinders, both connected to the column plug cylinder assembly and hinged arm. This exhaust butterfly valve piston-cylinder assembly and the single-acting cylinders are separated two individual components, and they are connected together. As the piston-cylinder and the single-acting cylinder being separated and long-term storm sticking, piston cylinder contains a piston and a spring constant. Thus, the piston cylinder constants bomb spring and piston prone to corrosion and aging. Moreover, in this scenario of the utility model, the hinge arm and the piston-cylinder assembled complex, poor control of the trip, so easy to make the valve cannot be closed or shut down prematurely, it cannot satisfy the constant pressure function.

Summary of the Invention

[0005] The object of the present invention is to provide a exhaust brake valve for automotive engine, which is small in size and the geometric shape, easy installation, low maintenance cost, long life and other advantages.

[0006] An exhaust brake valve for automotive engine, it includes a valve body and air cylinders and a rocker arm, the cylinders include plunger cylinders and one-way air cylinders which are connected to the plunger cylinders, and the plunger cylinders transmit the pushing force to piston of the one-way air cylinders directly whose pushing bar extends out of shell of the air cylinders and then twists joint with the rocker arm.

[0007] Preferably the air cylinders are integrated in structure which is formed by plunger cylinders and one-way air cylinders.

[0008] Preferably the plunger cylinders include one-way valves which are connected with air inlet of the air cylinders, and the air inlet is located on end of the air cylinders, which is away from the pushing bar.

[0009] Preferably the air cylinders are mounted on supporting stand plate, the supporting stand plate and the valve body form integrated in structure.

[0010] Preferably it is possible for replacing the directly twist joint manner of the pushing bar of the one-way air cylinders and the rocker arm, the pushing bar of the one-way air cylinders is fixed connection to one end of hitch yoke, the other end of the hitch yoke is twist joint with the rocker arm.

[0011] Preferably the shell of the air cylinders is after quenching treatment.

[0012] Preferably the shell of the air cylinders is heated to 200°C in a vacuum furnace in the process of quenching treatment.

[0013] Preferably, after the above steps to remove the shell of the air cylinders from the vacuum furnace and then take the shell of the air cylinders into atmosphere that the concentration of carbon dioxide is more than 90%.

[0014] Preferably, taking the shell of the air cylinders, whose temperature is reached about 97°C in the atmosphere that the concentration of carbon dioxide is more than 90%, and put into the vacuum furnace again and then heat to 500°C, finally, take the shell of the air cylinders into room temperature liquid that containing more than 1% of heavy metal in the weight percentage, then soaking to the natural temperature.

[0015] Experiments show that after the above process or a part of the above process, the intensity of the cylinders is increased by 7% -10%, the fatigue endurance of the cylinders enhances about 9%-13%, the noise of the cylinders, which assembling into other devices, reduces about 8%-9%.

[0016] Preferably, valve sheet of the engine is opened when pressure of the exhaust gas discharged from the engine exceeds a predetermined threshold value in exhaust braking, then the pistons of the one-way air cylin-

ders and the plunger cylinders recede, and the deformation of return spring of the one-way air cylinders and the plunger cylinders change for keeping constant pressure in the above cylinders; the pistons of the one-way air cylinders and the plunger cylinders return since the force of the return spring above mentioned, when the exhaust braking releases.

[0017] Preferably, the air cylinders include over-run device, for limiting the stroke of the plunger cylinder pistons.

[0018] Preferably, the over-run device of the air cylinders is flange.

Beneficial effects:

[0019] The air cylinders force not impacted exhaust valve which is closed; the closing of the valve sheet relies on the pressure push of the piston when exhaust braking, there are two springs which engage with piston in cylinder behind of the air cylinders, and the two springs maintain a constant pressure when the air cylinders closed, the valve sheet all flexibly closed. Closing force of exhaust valves of the prior art are changed with pressure of entire vehicle, big closing force with big pressure of entire vehicle, exhaust valves with big closing force easy to failure.

[0020] Reduce pressure on support plate: exhaust valves are often closed and opened, the exhaust valves on the market now most damage due to the fracture of the support plate.

[0021] As the piston-cylinder is disposed in one-way cylinders, piston and constant pressure spring of plunger cylinders are able to anti-corrosion and anti-aging.

[0022] There is one-way cylinders instead of plunger cylinders which twist joint with rocker arm, so assembly is simplified, stroke control is also easy to implement, and to avoid the valve sheet can be not closed or closed prematurely, and to better meet the constant function.

[0023] The present invention is also efficiency in brake transmission, reliable transmission, no dead spots, and high sensitivity.

[0024] The present invention also relates to vehicle which uses of the exhaust braking valve according to the present invention.

Brief Description of the Drawings

[0025]

Figure 1 is an external outline view of a preferred embodiment of exhaust braking valve in accordance with the present invention;

Figure 2 is a sectional view of air cylinder in accordance with the present invention.

Detailed Description of Preferred Embodiments

[0026] As shown in Fig. 1 and Fig.2, pushing bar 8 in the output end of air cylinder 2 is connected to hitch yoke 3, hitch yoke 3 is rotatably twist joint with one end of rocker arm 4, the other end of rocker arm 4 is fixedly connected to shaft 5, shaft 5 runs through valve body 6 and valve sheet 7, valve sheet 7 can rotate round shaft 5 in valve body 6, shaft 5 is offset with respect to center line of valve sheet 7, support plate 1 and valve body 6 form an integral structure, or support plate 1 is fixed on valve body 6, air cylinder 2 is fixed on support plate 1, shaft 5 is offset with respect to extend straight of output end of pushing bar 8 in air cylinder 2.

[0027] Air inlet 16 is set up in portion of far away end from pushing bar 8 of air cylinder 2, air cylinder 2 which having an integral structure includes a plunger cylinder and a one-way air cylinder, the plunger cylinder in air cylinder 2 is close to the air inlet 16, pushing bar 8 of the one-way air cylinder which is connected to the plunger cylinder extends out of air cylinder 2. Plunger cylinder comprises a plunger piston 13, a one-way valve 15, a one-way valve spring 14, a pushing bar of plunger cylinder 11 and a return spring of plunger cylinder 12, Air inlet 16 is connected to one-way valve 15, one-way valve 15 is located on the plunger piston 13, one-way valve spring 14 is set up between one-way valve 15 and plunger piston 13, return spring of plunger cylinder 12 is able to return the plunger piston 13, it is more important that spring of plunger cylinder 12 impacts on open force of valve sheet 7 during exhaust brake, also impacts on engine exhaust pressure threshold value.

[0028] The one-way cylinder includes the pushing bar 8, a piston of one-way cylinder 10 and a return spring of one-way cylinder 9, one end of the return spring of plunger cylinder 12 acts on the piston of one-way cylinder 10, the other end of the return spring of plunger cylinder 12 acts on a spring compression of plunger cylinder, a spring compression is close to the piston of one-way cylinder 10 or lack of the spring seat, and it acts on the plunger piston 13(not shown in the figures). The piston of one-way cylinder 10 includes groove for avoiding movement stroke of the pushing bar of plunger cylinder 11.

[0029] In another preferred embodiment shown, the pushing bar 8 is twisted with rocker arm 4.

[0030] In another preferred embodiment shown, the pushing bar of plunger cylinder 11 is not exist, while the piston of one-way cylinder has no groove. At the same time, the spring seat is set up or not.

[0031] In another preferred embodiment shown, there is no one-way valve within the plunger cylinder.

[0032] In another preferred embodiment shown, the air cylinder 2 includes a over-run device, there is flange on the inner wall of the air cylinder 2 for limiting the stroke of the plunger piston 13. The over-run device is beneficial on: (1) The air cylinders force not impacted valve sheet which is closed: the close of the valve sheet relies on the pressure of the air inlet 16 of the air cylinder 2 pushs on the plunger piston 13 when exhaust braking, the position of the plunger piston is limited when the plunger piston 13 moves to the flange, and it cannot move forward con-

tinually, preferably, the position of the flange 17 is in corresponding with the closed position of the valve within the exhaust valve so that the pressure of the air inlet is no impact to the close of the exhaust valve, the valve sheet can withstand constant force and makes constant of the air cylinder close pressure, the valve sheet is closed flexibility, but in the prior art, the close of exhaust valve is impacted by pressure of the entire vehicle, so big closing force with big pressure of entire vehicle, exhaust valves with big closing force are easy to failure.(2) Reduce pressure on support plate: exhaust valves is often closed and opened, the exhaust valves on the market now most damage due to the fracture of the support plate.

[0033] Working process: in normal driving, the air inlet 16 is no intake, the valve sheet 7 opens and engine exhaust emissions, exhaust brake did not work; exhaust brake when necessary, so that

the air intakes from the air inlet 16, the air pressure pushes the one-way valve15 and the one-way valve spring 14, the plunger piston 13 moves forward and pushes the pushing bar of plunger cylinder 11 and the return spring of plunger cylinder 12 for movement forward. The one-way cylinder piston 10 moves forward which is pushed by the pushing bar of plunger cylinder 11, and pushes the pushing bar 8, the air in front chamber of the air cylinder is discharged into the atmosphere with the pushing bar 8. Movement of the air cylinder 2 is transmitted to the pushing bar 8, and then the pushing bar 8 pushes the hitch yoke 3 which rotate the rocker arm 4 around the shaft 5, the shaft 5 drives the valve sheet 7 close, so that exhaust of engine is blocked and start to exhaust brake; when the pressure of the exhaust gas is discharged from the engine exceeds a predetermined threshold value, the shaft 5 is offset from the centerline of the valve sheet 7, there is different value of force on both sides of the valve sheet 7, when the different value reaches a certain threshold value, the valve sheet 7 opened, the valve sheet 7 transmits the push which from the shaft 5 to rocker arm 4 and the pushing bar 8, the piston of one-way cylinder 10 resists the force of the return spring of plunger cylinder 12 and retreats, the valve sheet 7 opens and exhausts gas whose force beyond the certain threshold value, the valve sheet 7 which is controlled by the return spring of plunger cylinder 12 is automatically close and maintain the pressure of the exhaust brake when the pressure of the exhaust gas of the engine below the set threshold value; after the release of brake, the air inlet 16 is closed, the plunger piston 13 and the piston of one-way cylinder 10 which are controlled by spring move back, the air in the air cylinder exhaust through the one-way valve spring 14, the one-way valve15 and the air inlet 16. And then brake valve restores the initial state.

[0034] Here is only exemplary preferred embodiments of the present invention are described, specific terms are used and described the preferred embodiments of the present invention, but such description is for illustrative purposes only, the person skilled in the relevant arts should be noted that the present invention is disclosed merely an example, and it should be understood that changes and variations may be made without departing from the scope of the claims of the invention.

[0035] Exhaust braking valve of the present invention includes any combination of the above parts and the technical program which is constituted by the above parts, space is limited, inconvenient enumerate here.

[0036] The person skilled in the relevant arts will readily appreciate that the present invention is an improvement over the prior art, each of which also contains a large number of parts constituting the prior art, however, the present invention which is combined with prior art technical solution, is condensated inventor's hard creative work, including extensive research and experimentation.

Claims

1. An exhaust brake valve for automotive, it includes a valve body and air cylinders and a rocker arm, wherein the air cylinders include plunger cylinders and one-way air cylinders which are connected to the plunger cylinders, and the plunger cylinders transmit the pushing force to piston of the one-way air cylinders directly whose pushing bar extends out of shell of the air cylinders and then rotary connected with the rocker arm.

2. An exhaust brake valve in accordance with claim 1, wherein the air cylinders are integrated in structure which is formed by plunger cylinders and one-way air cylinders.

3. An exhaust brake valve in accordance with claim 1 or 2, wherein the plunger cylinders include one-way valves which are connected with air inlet of the air cylinders, and the air inlet is located on end of the air cylinders, which is away from the pushing bar.

4. An exhaust brake valve in accordance with claim 1 or 2, wherein it is replaced the directly twist joint manner of the pushing bar of the one-way air cylinders and the rocker arm, the pushing bar of the one-way air cylinders is fixed connection to one end of hitch yoke, the other end of the hitch yoke is twist joint with the rocker arm.

5. An exhaust brake valve in accordance with claim 3, wherein it is replaced the rotary connection manner of the pushing bar of the one-way air cylinders and the rocker arm, the pushing bar of the one-way air cylinders is fixed connection to one end of hitch yoke, the other end of the hitch yoke is twist joint with the rocker arm.

6. An exhaust brake valve in accordance with claim 1 or 2 or 5, wherein the air cylinders are mounted on supporting stand plate, the supporting stand plate

and the valve body form integrated in structure.

7. An exhaust brake valve in accordance with claim 3, wherein the air cylinders are mounted on supporting stand plate, the supporting stand plate and the valve body form integrated in structure.

8. An exhaust brake valve in accordance with claim 4, wherein the air cylinders are mounted on supporting stand plate, the supporting stand plate and the valve body form integrated in structure.

9. An exhaust brake valve in accordance with claim 1, wherein valve sheet of the engine is opened when pressure of the exhaust gas discharged from the engine exceeds a predetermined threshold value in exhaust braking, then the pistons of the one-way air cylinders and the plunger cylinders recede, and the deformation of return spring of the one-way air cylinders and the plunger cylinders change for keeping constant pressure in the above cylinders; the pistons of the one-way air cylinders and the plunger cylinders return since the force of the return spring above mentioned, when the exhaust braking releases.

10. An exhaust brake valve in accordance with claim lor 3 or 9, wherein the air cylinders include over-run device, for limiting the stroke of the plunger cylinder pistons.

11. An exhaust brake valve in accordance with claim 10, wherein the over-run device of the air cylinders is flange.

12. Vehicles, include exhaust brake valves, wherein the exhaust brake valves is any one which is described in the above mentioned claims.

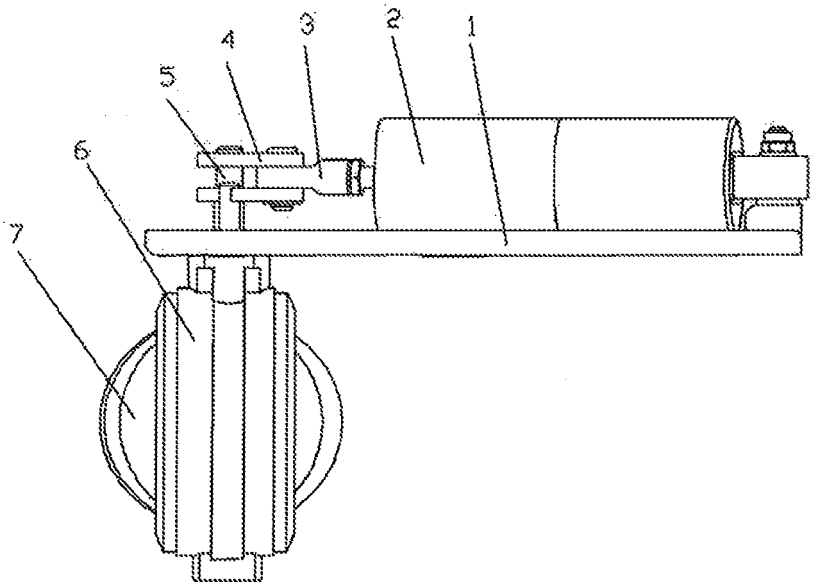


Fig. 1

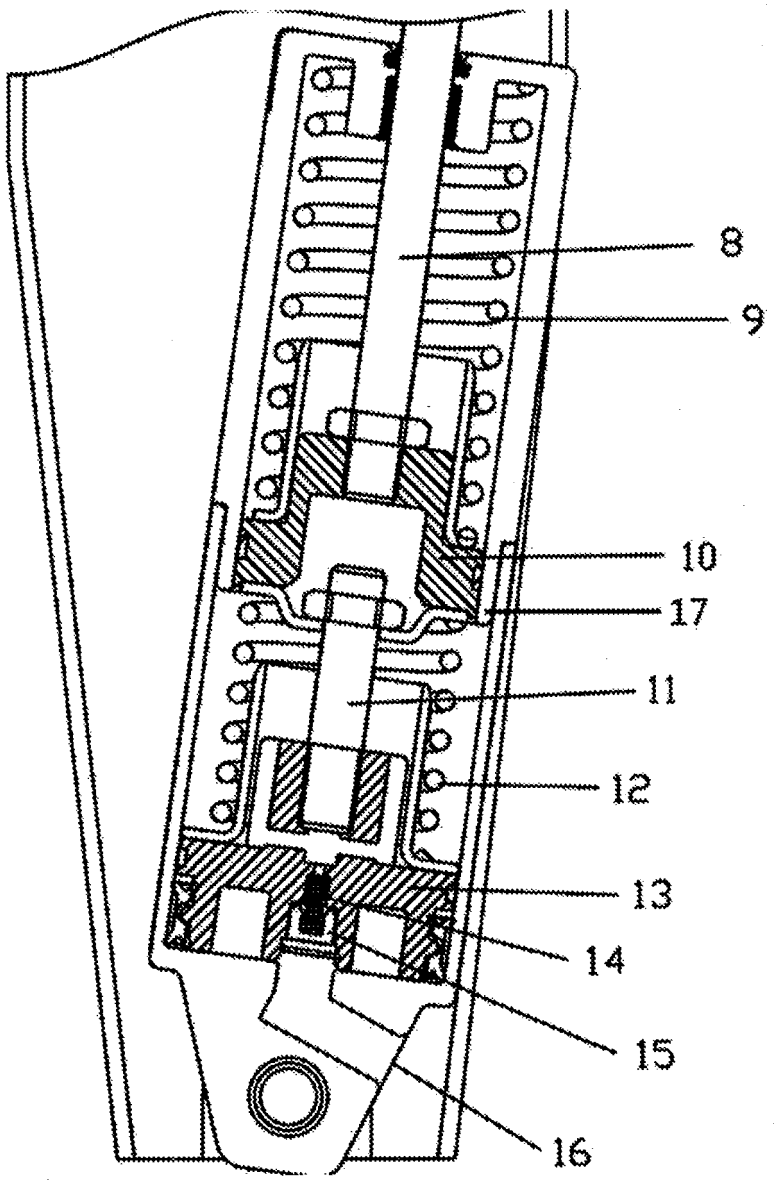


Fig. 2

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2012/071044

A. CLASSIFICATION OF SUBJECT MATTER

F02D 13/04 (2006.01) i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC: F02D; F15B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

WPI, EPODOC, CPRS, CNKI: exhaust w brake, exhaust w braking, valve, cylinder, plunger

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
E	CN 202338400 U (RUILI GROUP RUIAN AUTO PARTS CO LTD) 18 July 2012 (18.07.2012) the whole document	1-12
A	CN 102052159 A (WUHU SHENGLI BRAKE CO LTD) 11 May 2011 (11.05.2012) paragraphs 14-27 of description and figures 1-2	1-12
A	CN 201982180 U (JINAN BAIHUI AUTOMOBILE PARTS CO LTD) 21 September 2011 (21.09.2011) paragraphs 9-12 of description and figures 1-2	1-12
A	JP 8-303261 A (JIDOSHA KIKI CO) 19 November 1996 (19.11.1996) the whole document	1-12
A	GB 2072265 A (EXHAUST BRAKE SALES & SERVICES) 30 September 1981 (30.09.1981) the whole document	1-12

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

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"&"document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
29 August 2012 (29.08.2012)	**18 October 2012 (18.10.2012)**
Name and mailing address of the ISA State Intellectual Property Office of the P. R. China No. 6, Xitucheng Road, Jimenqiao Haidian District, Beijing 100088, China Facsimile No. (86-10)62019451	Authorized officer HU, Tao Telephone No. (86-10) **62085251**

Form PCT/ISA /210 (second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2012/071044

Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
CN 202338400 U	18.07.2012	None	
CN 102052159 A	11.05.2012	None	
CN 201982180 U	21.09.2011	None	
JP 8-303261 A	19.11.1996	None	
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Form PCT/ISA /210 (patent family annex) (July 2009)

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- CN 201120077377 **[0004]**