

(19) World Intellectual Property Organization  
International Bureau



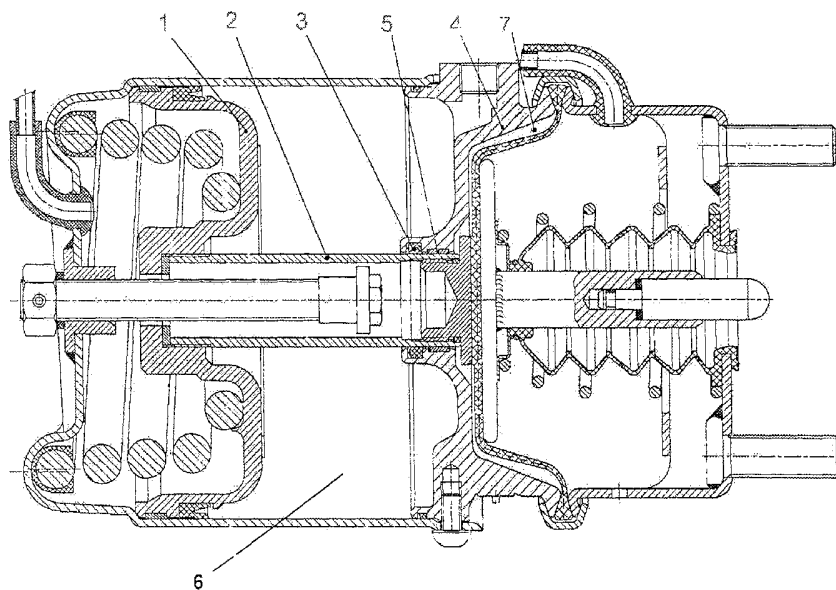
(43) International Publication Date  
2 October 2003 (02.10.2003)

PCT

(10) International Publication Number  
**WO 03/080418 A1**

- (51) International Patent Classification<sup>7</sup>: **B60T 17/08**
- (21) International Application Number: PCT/TR02/00036
- (22) International Filing Date: 17 July 2002 (17.07.2002)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:  
2002/00762 21 March 2002 (21.03.2002) TR
- (71) Applicant (for all designated States except US): **ARFESAN ARKAN FREN ELEMANLARI SAN. VE TIC. A.S.** [TR/TR]; Gebze Organize Sanayi Bölgesi, Ihsandede Cad. 300.Sok. Gebze, 41480 KOCAELI (TR).
- (72) Inventors; and
- (75) Inventors/Applicants (for US only): **ARKAN, Ahmet** [TR/TR]; Gebze Organize Sanayi Bölgesi, Ihsandede Cad. 300.Sok. Gebze, 41480 KOCAELI (TR). **BILSEN, Serkan** [TR/TR]; Gebze Organize Sanayi Bölgesi, Ihsandede Cad. 300.Sok. Gebze, 41480 KOCAELI (TR). **AKIN, Ahmet** [TR/TR]; Gebze Organize Sanayi Bölgesi, Ihsandede Cad. 300.Sok. Gebze, 41480 KOCAELI (TR).
- (74) Agent: **AKSOY, Melike**; 1. Cadde 5/6, Bahcelievler, 06570 ANKARA (TR).
- (81) Designated States (national): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZM, ZW.
- (84) Designated States (regional): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).
- Published:  
— with international search report
- For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: SPRING BRAKE ACTUATOR WHICH ACCOMODATES DOUBLE O-RING ON ITS ADAPTER PLATE FOR IMPROVED SEALING



(57) Abstract: The present invention concerns spring brake actuators, which provide braking power for motorway vehicles used in commercial transportation such as trucks, busses and trailers. The spring brake actuator, which is the subject of this invention, is composed of the "Service Brake Chamber" which operates when the vehicle is in action and the "Spring Chamber" which operates when the vehicle is parked. The spring brake actuator, which accommodates double O-ring in its adapter plate for improved sealing, consists of the main elements of adapter plate (4), guide ring (5), spring chamber (6), service brake chamber (7), first O-ring groove (8), second O-ring groove (9), guide ring groove (10), area between O-rings (11) and the second O-ring (12).



WO 03/080418 A1

## SPRING BRAKE ACTUATOR WHICH ACCOMMODATES DOUBLE O-RING ON ITS ADAPTER PLATE FOR IMPROVED SEALING

This invention is about the spring brake actuator, which provides the braking  
5 power in highway vehicles used for commercial transportation such as trucks, busses and  
trailers.

The spring brake actuator, which is the subject of this invention, is composed of  
two chambers: the "Service Brake Chamber" which operates when the vehicle is in action  
and the "Spring Chamber" which operates when the vehicle is parked.

10 The Service Brake Chamber and the Spring Chamber in spring brake actuators  
operate with pressurized air coming from different lines and are controlled by various  
valves in the cab.

In the spring brake actuators, the subject of this invention, contaminants such as  
chips, burr, and dye particles from the internal parts get caught between the aluminum  
15 pipe and the O-ring in time and cause the sealing characteristic to disappear and result in  
air leakage. Furthermore, the system which is greased during installation loses its  
lubrication in time causing the O-ring to abrade and rotate in its slot. When parts shrink  
and harden in excessively cold temperatures the sealing system loses its property. Due to  
the facts stated above air leakage occurs in the system and the brake element, which is a  
20 vital element, faces failures which require immediate repair.

In the spring brake actuators, the subject of this invention, produced according to  
prior art there is one "O-ring" and one "Guide ring" in the core of the adapter plates.

The spring brake actuator which accomodates double o-ring on its adapter plate  
aims to prevent or minimize probable air leakage due to any reason occuring in the area  
25 between the "Service Brake Chamber" and the "Spring Chamber."

In order to fulfil this aim, double "O-ring" and a single "Guide ring" is used instead  
of the single "O-ring" and "Guide ring" on the core of the adapter plates in the spring brake  
actuators produced according to prior art. Thus, the risks mentioned above have been  
reduced to a great extent.

30 The illustrations (figures) in order to aid in the understanding of the spring brake  
actuators which accommodate double O-ring on their adapter plates are provided in the  
annex. The definitions of the figures are as follows:

Figure 1 – Sectional view of the spring brake actuator produced according to prior  
art.

35 Figure 2 – Sectional view of the spring brake actuator developed by this invention.

Figure 3 – Sectional view of the adapter plate produced according to prior art.

Figure 4 – Sectional view of the adapter plate developed by this invention.

For a better understanding of the illustrations (figures) related to the spring brake actuators which accommodate double O-ring on their adapter plates for improved sealing developed by this invention the parts have been given numbers, and the definition of the numbers are as follows:

- 5           1. Aluminum piston
2. Aluminum pipe
3. O-Ring
4. Adapter plate
5. Guide ring
- 10          6. Spring Chamber
7. Service Brake Chamber
8. First O-Ring Channel
9. Second O-Ring Groove
10. Guide ring Groove
- 15          11. Area between O-rings
12. Second O-Ring

The spring brake actuators which accommodate double O-ring on their adapter plates for improved sealing developed by this invention are composed of the following main elements: adapter plate (4), guide ring (5), spring chamber (6), service brake chamber (7), first O-ring groove (8), second O-ring groove (9), guide ring groove (10), area between O-rings (11), and second O-ring (12).

The aluminium piston (1) and the aluminium pipe (2) in the spring brake actuators which accommodate double O-ring in their adapter plates for improved sealing developed by this invention are guided and move freely. The surface of the aluminium pipe is covered with eloxal and is smooth. The aluminium pipe (2) and the O-ring (3) provide a sealing system and prevent the transfer of pressurized air between the spring chamber (6) and the service brake chamber (7). The guide ring (5) ensures proper operation of the sealing system by centring and guiding the complete piston unit which is formed by aluminium piston (1) and aluminium pipe (2).

One of the O-rings (3) is placed in the side of the Spring Chamber (6) and the other (12) in the side of the Service Brake Chamber (7). The pressure in each brake chamber is held by the sealing provided by the O-ring next to them. The O-rings (3 and 12) are placed in the O-ring grooves (8 and 9) machined on the adapter plate (4). If a problem occurs in one of the O-rings, sealing is provided by the other O-ring as in the case of the brake actuators produced according to prior art. The double O-ring system in the spring brake actuators which accommodate double O-ring in their adapter plates developed by this invention provides enhanced safety.

Grease put in the area (11) between the two O-ring systems (8, 9, 3 and 12) provides long time lubrication of the system since this area is closed at both ends thereby preventing shrinkage and failure resulting from the lack of grease.

5 In the spring brake actuators which accommodate double O-ring in their adapter plates for improved sealing developed by this invention, air leakage in one of the O-rings due to shrinkage in the parts in excessively cold weather conditions or the hardening of the O-rings is prevented by the other O-ring. This further enhances the system safety.

10

15

20

25

30

## CLAIMS

- 1- Spring brake actuator which accommodates double O-ring in its adapter plate for improved sealing consisting of the main elements of adapter plate (4), guide ring (5), spring chamber (6), service brake chamber (7), first O-ring groove (8), second O-ring groove (9), guide ring groove (10), area between O-rings (11) and the second O-ring (12).
- 2- According to Claim 1, spring brake actuator, which accommodates double O-ring in its adapter plate for improved sealing, with aluminium piston (1) and the aluminium pipe (2) screwed to it guided and moving freely; the surface of the aluminum pipe (2) covered in eloxal and smooth; the aluminium pipe (2) and the O-ring (3) providing a sealing system and preventing the transfer of pressurized air between the spring chamber (6) and the service brake chamber (7); the guide ring (5) ensuring proper operation of the sealing system by centering and guiding the complete piston unit which is formed by aluminium piston (1) and aluminium pipe (2).
- 3- According to Claims 1 and 2, spring brake actuator, which accommodates double O-ring in its adapter plate for improved sealing, characterized by the first O-ring (3) placed in the side of the Spring Chamber (6) and the second O-ring (12) placed in the side of the Service Brake Chamber (7).
- 4- According to Claims 1, 2 and 3, spring brake actuator which accommodates double O-ring in its adapter plate for improved sealing, characterized by two O-rings (3 and 12) placed in the O-ring grooves (8 and 9) machined on the adapter plate (4).
- 5- According to Claims 1, 2, 3 and 4, spring brake actuator, which accommodates double O-ring in its adapter plate for improved sealing, characterized by grease in the area (11) between the two O-ring systems (8, 9, 3 and 12) providing long time lubrication of the system since this area is closed at both ends, thereby preventing shrinkage and failure resulting from the lack of grease.
- 6- According to Claims 1, 2, 3, 4 and 5, spring brake actuator, which accommodates double O-ring in its adapter plate for improved sealing, characterized by the prevention of air leakage in one of the O-rings due to shrinkage in the parts in excessively cold weather conditions or the hardening of the O-rings by the other O-ring.

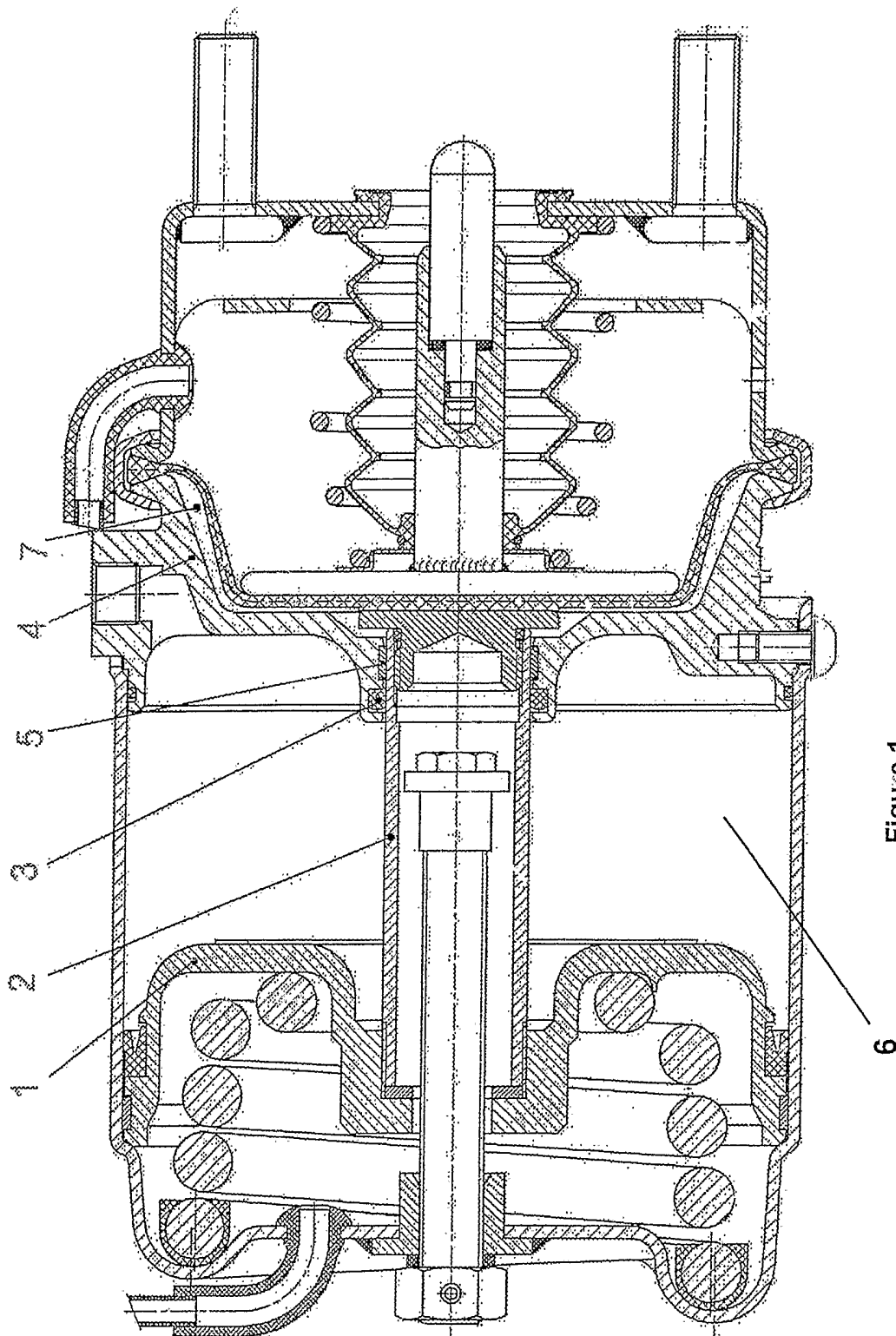


Figure 1

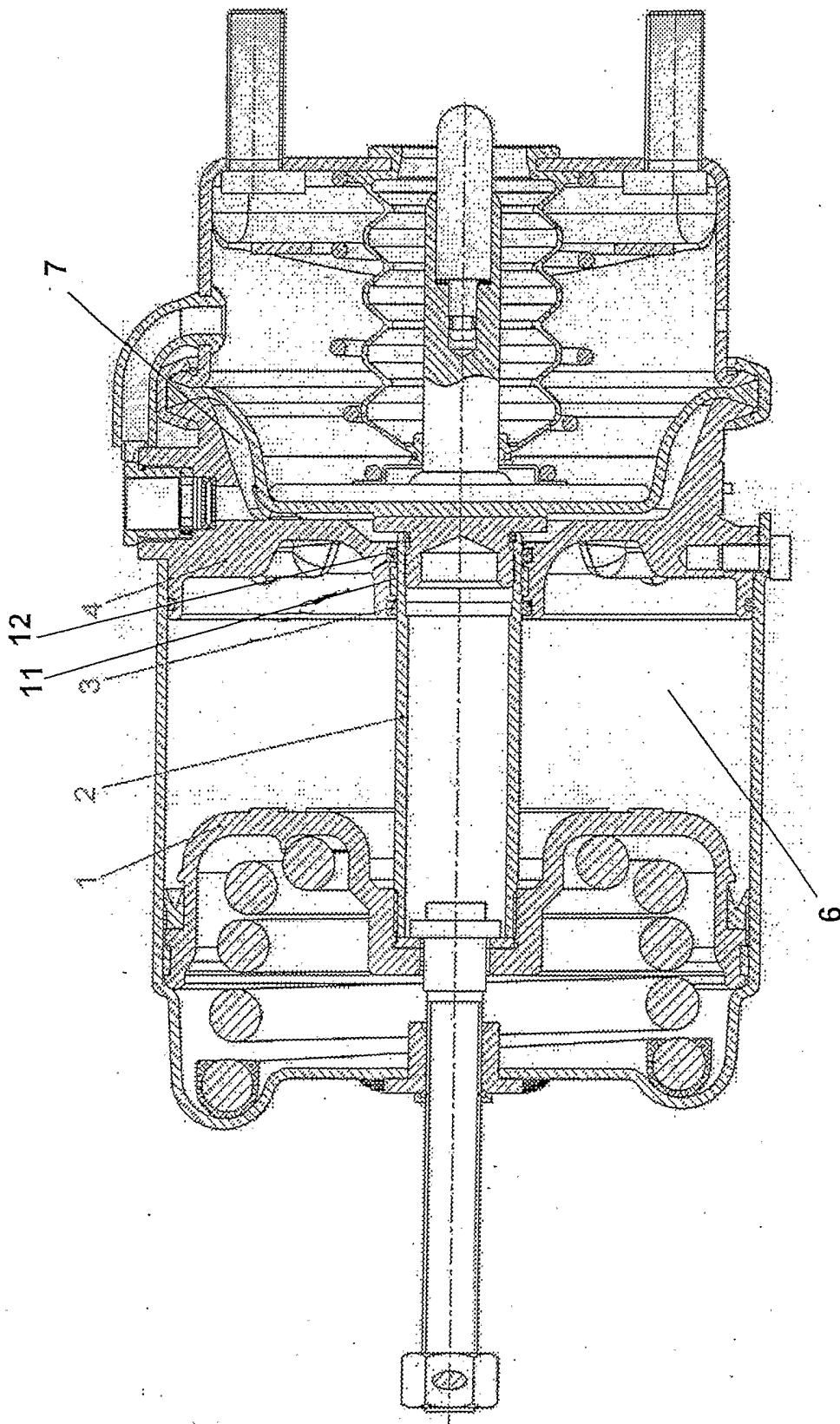


Figure 2

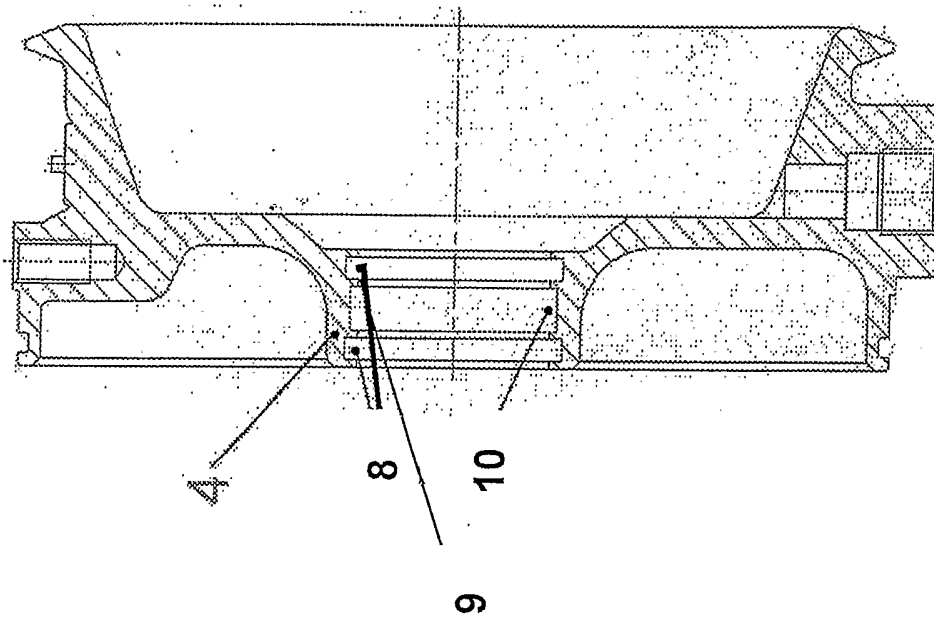


Figure 4

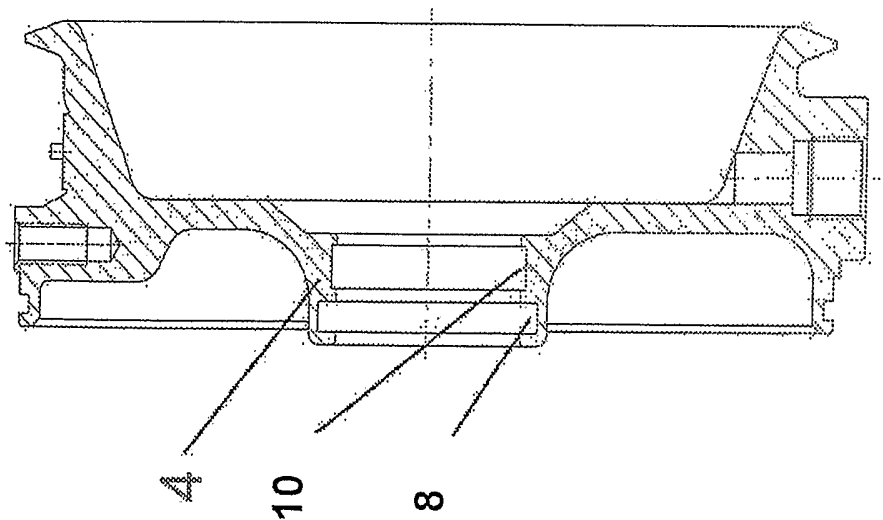


Figure 3



## INTERNATIONAL SEARCH REPORT

PCT/TR 02/00036

A. CLASSIFICATION OF SUBJECT MATTER  
IPC 7 B60T17/08

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 7 B60T

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 practical, search terms used)

EPO-Internal, WPI Data, PAJ

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 490 841 A (BENDIX HEAVY VEHICLE SYST) 17 June 1992 (1992-06-17) abstract; figures 1-8 column 3, line 35 - line 46 ---	1-6
A	WO 96 28331 A (NAI ANCHORLOK INC ;STOJIC STEVEN M (US); ALVAREZ FRANCISCO J (US)) 19 September 1996 (1996-09-19) abstract; figures 1,5 ---	1
A	DE 39 32 524 A (BOSCH GMBH ROBERT) 11 April 1991 (1991-04-11) abstract; figure 1 ---	1
A	GB 2 261 472 A (BENDIX LTD) 19 May 1993 (1993-05-19) abstract; figure 1 -----	1

Further documents are listed in the continuation of box C.

Patent family members are listed in annex.

° Special categories of cited documents :

- \*A\* document defining the general state of the art which is not considered to be of particular relevance
- \*E\* earlier document but published on or after the international filing date
- \*L\* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- \*O\* document referring to an oral disclosure, use, exhibition or other means
- \*P\* document published prior to the international filing date but later than the priority date claimed

- \*T\* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- \*X\* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- \*Y\* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- \* & \* document member of the same patent family

Date of the actual completion of the international search

13 May 2003

Date of mailing of the international search report

23/05/2003

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2  
NL - 2280 HV Rijswijk  
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,  
Fax: (+31-70) 340-3016

Authorized officer

Beckman, T

## INTERNATIONAL SEARCH REPORT

PCT/TR 02/00036

Patent document cited in search report		Publication date		Patent family member(s)	Publication date
EP 0490841	A	17-06-1992	IT	1241352 B	10-01-1994
			EP	0490841 A1	17-06-1992
			US	5215170 A	01-06-1993
-----					
WO 9628331	A	19-09-1996	WO	9628331 A1	19-09-1996
			AU	2118495 A	02-10-1996
-----					
DE 3932524	A	11-04-1991	DE	3932524 A1	11-04-1991
			HU	58622 A2	30-03-1992
			SE	9003098 A	30-03-1991
-----					
GB 2261472	A	19-05-1993	NONE		
-----					