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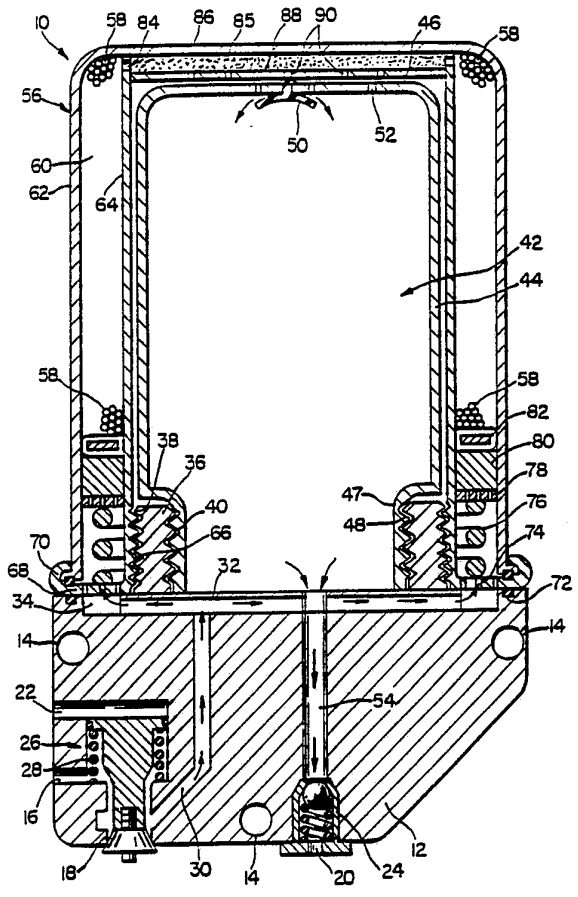
(54) Title: COMPRESSED AIR DRYER

(57) Abstract

A compressed air dryer includes a base (12) and a "spin-on" desiccant canister (56) which is retained on the base (12) through a threaded connection (66). Accordingly, when the desiccant (58) within the canister (56) which dries the air must be replaced, the canister (56) is removed from the base (12) by rotating the canister (56) relative to the base (12), and is replaced accordingly by a new canister (56).



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COMPRESSED AIR DRYER

This invention relates to an air dryer for a compressed air braking system.

Heavy duty vehicles, such as trucks and buses, are commonly equipped with a braking system in which the brakes are actuated by compressed air. Moisture entrained in the compressed air can cause significant problems. For this reason, it has become common to provide a compressed air dryer in such compressed air braking systems to remove the moisture entrained in the compressed air. Such air dryers include a desiccant material which adsorbs moisture. The desiccant is periodically regenerated when the compressor which generates the compressed air goes off load. However, the desiccant must be replaced periodically, as it eventually can no longer be regenerated effectively. Accordingly, air dryers require periodic service, including the replacement of the desiccant. Most air brake system air dryers in use today also include an integral purge volume, in which a quantity of compressed air dried by the air dryer is kept segregated and is used to regenerate the desiccant. These air dryers require almost a complete disassembly of the air dryer in order to replace the desiccant, which can be quite time consuming.

The present invention solves the aforementioned problems by providing an air dryer with a desiccant cannister which surrounds the purge volume. The cannister is connected to the dryer base by a threaded connection, so that cannister can be removed and replaced by merely "spinning off" the old cannister and "spinning on" the new cannister. Since the cannister surrounds the purge volume, the air dryer is relatively compact.

These and other advantages of the present invention will become apparent from the following description, with reference to the accompanying drawings, the sole Figure of which is a longitudinal cross-sectional view of an air dryer made pursuant to the teachings of the present invention.

Referring now to the drawings, an air dryer generally indicated by the numeral 10 includes a base 12

having mounting holes 14 for attachment to the frame of the vehicle on which the air dryer 10 is to be used. The base 12 defines an inlet or supply port 16, an exhaust port 18, an outlet or delivery port 20, and a control port 22. A check valve 24 permits communication out of the outlet or delivery port 20, but prevents communication in the reverse direction. A combination inlet and exhaust valve generally indicated by numeral 26 is responsive to pressure at control port 22 for controlling communication through the supply port 16 and the exhaust port 18. When pressure at the control port is vented, spring 28 urges the valve 26 into the position illustrated in the drawing, closing off exhaust port 18 and communicating supply port 16 with passage 30 defined within the base 12. When a pressure signal is received at control port 22, the inlet and exhaust valve 26 is urged downwardly, closing off the supply port 16 and opening the exhaust port 18. The valve 26 is more completely disclosed in U.S. Patent 4,955,994.

The passage 30 communicates with transverse passages 32 which communicate the passage 30 with a circumferentially extending groove 34 on the upper surface of the base 12. Base 12 further includes a circumferentially extending, axially projecting flange 36 which carries grooves 38 on its outer circumferential surface and grooves 40 on its inner circumferential surface. A purge volume or compartment generally indicated by the numeral 42 is defined by circumferentially extending wall 44 and transverse wall 46. Purge air is stored in the purge volume or compartment 42 for later use for regeneration of the air dryer as will be hereinafter explained. A circumferentially extending wall 44 terminates in an offset portion 47 which is provided with threads 48 which engage the threads 40 when the purge volume is installed on the base 12. A one-way check valve 50 and purge orifice 52 are carried in the transverse wall 46, and the function of which will be hereinafter explained. A passage 54, which is circumscribed by groove 34, communicates the purge

volume or compartment 42 with check valve 24 and outlet or delivery port 20.

A desiccant cannister generally indicated by the numeral 56 includes desiccant beads 58 which are contained within an annular chamber 60 defined between an outer circumferential wall 62 and an inner circumferential wall 64. The lower portion (viewing the Figure) of inner circumferential wall 64 is provided with threads 66 which engage the threads 38 on flange 36 when the desiccant cannister 56 is installed on the base 12. A transversely extending, annular closure wall 68 closes the lower end of the annular chamber 60 and is crimped to the outer wall 62 as at 70. A circumferentially extending seal 72 circumscribes the groove 34 and sealingly engages the closure wall 68. Circumferentially spaced apertures 74 communicate the air to be dried from the groove 34 into the annular chamber 60. Although the purge compartment or volume 42 is illustrated as a separate container, the hollow inner diameter of the cannister 56 could be used to define the purge volume, thereby eliminating the separate container.

Air entering the annular chamber 60 passes around a circumferentially extending coiled spring 76 which extends around the annular chamber 60 and circumscribes the purge volume 42. Spring 76 bears against a porous annular member 78, which transmits the force of the spring 76 through an annular, conventional, crushed aluminum oil separating member 80. Another porous annular member 82 separates the crushed aluminum oil separator 80 from the desiccant beads 58. Both the members 78 and 82 are porous to permit communication of air to be dried therethrough. Accordingly, the force of spring 76 is transmitted through members 78, 80, and 82 to provide a compacting force on the beads 58. It has been found in prior art air dryers that the beads 58 must have a compacting force applied to them in order for them to be most efficient. A porous member 85 is mounted in the chamber defined between transversely extending outer wall 86, which extends across the entire upper end (viewing the Figure) of the cannister 56

and transversely extending inner wall 87 which bridges the upper end of inner circumferential wall 64. Inner walls 64, 88 are provided with apertures 84, 90 to permit air to communicate from the desiccant to pass to the purge volume or chamber 42 through the check valve 50.

In operation, air is communicated through supply port 16 and passes to passage 30, it being assumed that the valve 26 is in the position illustrated in which the exhaust 18 is closed. Air in passage 30 is communicated into the groove 34 through passage 32 and passes through apertures 74 into the annular chamber 60. Oil entrained in the air is removed by the oil separating member 80, and moisture is removed from the air by the desiccant beads 58. The air then passes through aperture 84 and the chamber defined between the walls 86 and 88, and then passes through openings 90 and through check valve 50 into the purge volume or compartment 42. Compressed air is then communicated out of the purge volume or compartment 42 through the passage 54 and check valve 24 to the delivery port 20, and from there to a storage reservoir (not shown).

When the vehicle air compressor (not shown) which generates the compressed air which is dried by the air dryer 10 comes off load, a pressure signal is communicated to control port 22 in the conventional manner. Pressure at control port 22 acts against the valve 26 to close off supply port 16 and open exhaust port 18 to atmosphere. Accordingly, passages 30, 32, groove 34 and the annular chamber 60 are reduced to atmospheric pressure, causing the compressed air stored in the purge volume or chamber 42 to backflow through flow restricting orifice 52 into the volume 60 and eventually back through the passages 32 and 30 to the exhaust port 18. The purge orifice 52 limits flow to a predetermined rate, and purging continues until the pressure level in purge volume or compartment 42 is reduced to nearly atmospheric pressure or until the signal control port 22 terminates, whichever first occurs. Compressed air is prevented from backflowing into the purge

volume 42 through the delivery or outlet port 20 by the check valve 24. The air dryer 10 is cycled as described above between drying and regeneration cycles depending upon whether the compressor is on or off load.

Although the desiccant can be purged an indefinite number of times, it eventually can no longer efficiently dry compressed air. At this time, the desiccant must be replaced. According to the invention, the cannister 56 is "spun off" the base 12 by simply rotating the cannister relative to the base, so that the threaded connection between threads 38 and 48 are unscrewed. A new cannister 56 can then be installed by reversing the process. The cannister containing the depleted desiccant can then be returned to the factory or rebuilder, which can replace the desiccant with new desiccant so that the cannister may be reused an indefinite number of times. Accordingly, none of the other components of the base or the purge volume or compartment 42 need be displaced when the desiccant is changed. Therefore, changing the desiccant is reduced to a relatively simple procedure requiring only seconds, instead of in prior art air dryers where much of the air dryer had to be disassembled in order to replace the desiccant.

Claims

1. Compressed air dryer comprising a base (12) having an inlet (16) communicated to a compressed air source, an outlet (20) communicated to a storage reservoir, an exhaust (18), and valve means (26) responsive to a control signal for opening and closing said exhaust (18); securing means (36,66) for securing a desiccant canister (56) to said base (12); a desiccant (58) in said desiccant canister (56), a transversely extending end wall (86) closing one end of said desiccant canister (56); a purge compartment (42) within said desiccant canister (56) for storing purge air for periodic backflowing through the desiccant (58) for regeneration of the latter; said base (12) extending across the other end of said desiccant canister (56) and purge compartment (42); and a flowpath defined by said base (12), said desiccant canister (56), and said purge compartment (42) for communicating compressed air from said inlet (16) to said outlet (20), characterized in that said desiccant (58) is stored in an annular chamber (60) defined between inner (64) and outer (62) walls of said desiccant canister (56) and said purge compartment (42) is located within the volume defined by said inner wall (64), said transversely extending end wall (86), and said base (12), whereby said purge compartment (42) is surrounded by the desiccant (58).

2. Compressed air dryer as claimed in claim 1, furthur characterized in that said securing means (36,66) includes cooperating manually releasable means (66) carried by said canister (56) and by said base (12) to permit removal of the canister (56) from the base (12) without disassembly of the base (12).

3. Compressed air dryer as claimed in claim 2, furthur characterized in that said releasable means (66) includes a threaded connection (66) permitting said canister (56) to be removed from the base (12) by rotating the canister (56) relative to the base (12).

4. Compressed air dryer as claimed in claim 3, furthur characterized in that said threaded connection

(66) includes threads carried on said inner wall (64) and on said base (12).

5. Compressed air dryer as claimed in claim 1, furthur characterized in that said purge compartment (42) is defined by wall means (44) within the inner wall (64) of the desiccant canister (56), said securing means (36,66) includes cooperating manually releasable means (66) carried by said canister (56) and by said base (12) to permit removal of the canister (56) from the base (12) without removal of the wall means (44) defining the purge compartment (42).

6. Compressed air dryer as claimed in claim 1, furthur characterized in that said transversely extending end wall (86) extends across said purge compartment (42), said purge compartment (42) being defined by wall means (44) within the inner wall (64) of the desiccant canister (56), and a flow path defined between said wall means (44) of the purge compartment (42) and said end wall (86) directed said compressed air radially inwardly from said annular chamber (60) into said purge compartment (42).

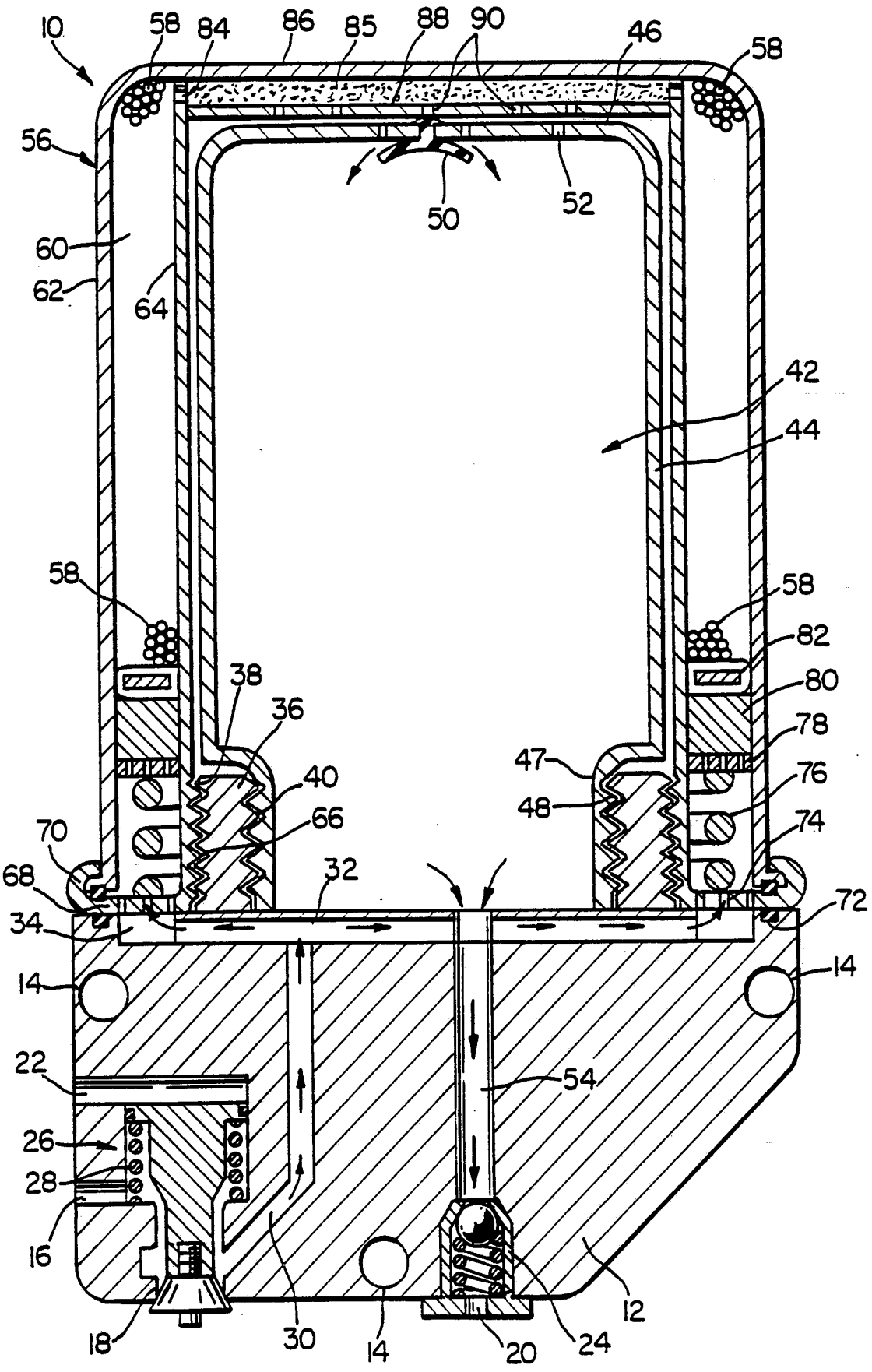
7. Compressed air dryer as claimed in claims 1 or 6, furthur characterized in that said canister (56) includes a transversely extending annular closure wall (68) closing the end of the annular chamber (60) opposite the end closed by said end wall (86), said closure wall (68) engaging said base (12) when the canister (56) is installed on said base (12), and passage means (30,32,34,74) extending through said base (12) and said closure wall (68) for communicating compressed air to said annular chamber (60).

8. Compressed air dryer as claimed in claim 7, furthur characterized in that said base (12) includes an engagement surface engaging said closure wall (68) and said passage means (30,32,34,74) includes a circumferentially extending section (34) defined within said engagement surface for feeding compressed air into said annular chamber (60), said closure wall (68) having

circumferentially spaced apertures (74) registering with said circumferentially extending section.

9. Compressed air dryer as claimed in claim 8, furthur characterized in that said circumferentially extending section (34) circumscribes an outlet passage (54) defined within said base (12) communicating said purge compartment (42) with said outlet (20).

10. Compressed air dryer as claimed in any of the preceeding claims, furthur characterized in that spring means (56) within said annular chamber (60) yieldably urges said desiccant (58) within said annular chamber (60) away from said base (12).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INTERNATIONAL SEARCH REPORT

International Application No PCT/US 92/07847

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all)[6]

According to International Patent Classification (IPC) or to both National Classification and IPC

Int.Cl. 5 B60T17/00; B01D53/26

II. FIELDS SEARCHED

Minimum Documentation Searched[7]

Classification System	Classification Symbols
Int.Cl. 5	B60T ; B01D

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched[8]

III. DOCUMENTS CONSIDERED TO BE RELEVANT[9]

Category °	Citation of Document,[11] with indication, where appropriate, of the relevant passages[12]	Relevant to Claim No.[13]
A	US,A,4 713 094 (ICHIRO YANAGAWA) 15 December 1987 see column 3, line 16 - column 4, line 47; figures 1,2 ---	1
A	GB,A,2 126 124 (ROBERT BOSCH GMBH) 21 March 1984 see page 2, line 44 - page 3, line 119; figures 1-5 ---	1-3,10
A	GB,A,2 096 015 (CLAYTON DEWANDRE CO) 13 October 1982 ---	
A	FR,E,50 653 (JAUBERT) 20 February 1941 -----	

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IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
13 JANUARY 1993	28. 01. 93
International Searching Authority	**Signature of Authorized Officer**
EUROPEAN PATENT OFFICE	HARTEVELD C.D.H.

ANNEX TO THE INTERNATIONAL SEARCH REPORT ON INTERNATIONAL PATENT APPLICATION NO.

US 9207847
SA 64908

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report. The members are as contained in the European Patent Office EDP file on 13/01/93
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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US-A-4713094	15-12-87	None	
GB-A-2126124	21-03-84	DE-A- 3232742	08-03-84
		FR-A,B 2532557	09-03-84
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FR-E-50653		None	