Abstract: A tire sealant and air dispenser apparatus with sealing mechanism is provided in which ball seals are used. Each ball seal has a tube with an optional seat and a ball captured in the tube.

Title: TIRE SEALANT AND AIR DISPENSER APPARATUS WITH A SEALING MECHANISM
TIRE SEALANT AND AIR DISPENSER APPARATUS WITH A SEALING MECHANISM
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Field of the Invention

This invention relates to a fluid and air dispensing apparatus.

Background of the Invention

The fixing of a flat tire for most automobiles involves several steps that include: 1) Pulling safely to the side of the road; 2) Locating the tools; 3) Raising the vehicle; 4) Replacing the punctured wheel assembly with a spare wheel assembly; 5) Lowering the vehicle; and 6) Stowing the punctured wheel assembly. For the average motorist this task can be daunting at best. It needlessly exposes the motorist to inherent roadside dangers for long time periods.

Over the past several years, the task of emergency tire repair has been addressed with a myriad of technologies. These include compact spare tires and full size spare tires. These technologies also include aerosol sealants injected into run-flat tires and tire-pressure monitoring systems. All of these technologies have few benefits and many introduce more problems and higher costs.

Several existing technologies inject fluid into the tire in order to seal a puncture in the tire and then inflate the repaired tire. These technologies dispense fluid using aerosol, piston driven, air pressure driven and others. Each of these different methods and apparatus have drawbacks and limitations. All of these technologies require some method/mechanism to seal the fluid dispensing portion, prevent the fluid from entering the pump and to prevent the air pressure of the tire from forcing the fluid and/or air back into the sealing fluid container. Several sealing schemes exist for sealant containers. Some use a metal or plastic film adhered to the container opening while others use various valves or rubber sealing designs.

Each of these is inherently complex and limited by design or the custom molded or fabricated parts must be manufactured to exacting tolerances. Thus, it is desirable to provide a tire sealant and air dispenser apparatus with sealing mechanism and it is to this end that the present invention is directed.
Brief Description of the Drawings

Figure 1 illustrates a tire sealant and air dispenser apparatus with a sealing mechanism;

Figure 2 illustrates further details of the sealant dispensing assembly of the apparatus shown in Figure 1;

Figure 3 illustrates further details of an embodiment of the sealant dispensing assembly of the apparatus shown in Figure 2; and

Figure 4 illustrates further details of a second embodiment of the sealant dispensing assembly of the apparatus shown in Figure 2.

Detailed Description of Exemplary Embodiments

The apparatus and method is particularly applicable to the injection of tire sealant through a tire valve stem into a tire of a vehicle and it is in this context that the apparatus will be described. It will be appreciated, however, that the apparatus and method has greater utility since it can be more generally used to dispense a fluid and air from a fluid container and can be used with other articles in which it is desirable to be able to seal and/or re-inflate the articles. The apparatus and method also may be used for any application where a fluid might be dispensed using pressurized air as an energy source. For example, similar applications for the apparatus includes paint and coating systems, measured fluid injection devices, oiling devices, and others.

The apparatus and method provides a simple method and mechanism of sealing a container of sealant fluid. In an exemplary embodiment, the mechanism uses balls, such as rubber balls, pressed into injection molded tubes that seals the container of sealant fluid and prevents back pressure of the item being repaired and inflated from forcing the sealant fluid and air back into the sealant container. The mechanism is simple and reliable and the rubber balls are available as a commodity item from various worldwide suppliers. The injection molded tubes are simply inlets and outlets normally formed into a tire sealant dispensing cap. In operation, when compressed air is applied to the inlet, the balls are moved from a seating position in the tubes and the sealant and air is then injected into the tire with no restriction.
Figure 1 illustrates a tire sealant and air dispenser apparatus 12 with a sealing mechanism for repairing and inflating a item 10, such as a tire. The apparatus 12 may include a compressor 11 that has a hose 12 that is connected to an air inlet 13 of a sealant dispensing assembly 14. The compressor may be powered by a power source such as through a power cord that couples to a cigarette lighter of an automobile as shown in Figure 1. The sealant dispensing assembly 14 may have an air and sealant outlet 15 that is coupled to the item being repaired and inflated using the apparatus. In operation, the compressor (when powered) pushes compressed air through the hose 12 and the compressed air enters into the sealant dispensing assembly 14 and then the air with the sealant fluid (from inside of the sealant dispensing assembly 14) is pushed into the item being repaired and inflated using the apparatus. The compressor serves the purpose of inflating the item being repaired and inflated and pushing the sealant fluid within the sealant dispensing assembly 14 into the item being repaired and inflated using the apparatus. The apparatus shown in Figure 1 has a sealing mechanism (described in more detail below) that seals the sealant dispensing assembly so that sealant fluid does not leak out of the sealant dispensing assembly during storage, can prevent air with sealant from entering the compressor and prevents the pressure within the item being repaired and inflated using the apparatus from forcing the sealant fluid and air back into the sealant dispensing assembly.

Figure 2 illustrates further details of the sealant dispensing assembly 14 of the apparatus shown in Figure 1. The sealant dispensing assembly 14 may include a sealant container 20 that contains a sealant fluid used to repair the item being repaired and inflated using the apparatus. In the exemplary embodiment, the sealant fluid may be a ethylene glycol based sealant fluid or a glycerin based sealant fluid. The sealant dispensing assembly may also dispense any liquid sealant including propylene glycol based or sealants based on other antifreeze agents. The assembly 14 has the air and sealant outlet 15, such as a hose with the appropriate connector to couple to a tire, and the air inlet 13 into which the compressed air is introduced into the sealant container. The assembly 14 may further include a cap 26 that incorporates the ball seals and inlets/outlets (described in more detail below in Figures 3 and 4) and provides a resting surface on which the sealant dispensing assembly 14 can rest when the apparatus is being used to repair and inflate the tire.
Figure 3 illustrates further details of an embodiment of the sealant dispensing assembly of the apparatus shown in Figure 2. In this embodiment, the sealant container 20 may be removably coupled to the cap 26 by a connecting mechanism 30 which may be a threaded mechanism wherein the sealant container 20 has a set of threads that can be screwed into the threads of the connecting mechanism. Thus, using the connecting mechanism, the sealant container 20 is removable from the cap 26 so that the sealant container can be refilled or replaced when the sealant fluid is exhausted. The cap 26 may include an air inlet 13 connected to a passageway that is coupled to an inlet seal 32 that may be a ball seal 33 wherein the ball may be a rubber ball. When compressed air is not entering the air inlet 24, the ball 33 is pressed into a tube/against the end of the tube so that the sealant fluid cannot leak out of the sealant container. In this embodiment, the ball is frictionally fit into the end of the tube. In an alternative embodiment, the inlet seal may have a seat 34 wherein the ball can optionally rest against the seat so that the sealant fluid cannot leak out of the sealant container. When the compressed air is being injected into the air inlet, the ball 33 move upwards (as shown by the arrow) being expelled from the tube (that may be an injection molded tube) away from a sealing position into the sealant container 20 due to the air pressure and permits the compressed air to enter into the sealant container 20. Alternatively, the ball 33 may be captured in the tube so that the ball does not enter into the sealant container 20. In both embodiments, the sealant and air outlet 15 is constructed to prevent the ball 33 from exiting the sealant container.

When the compressed air is supplied to the assembly through the inlet, the compressed air forces a mixture of the compressed air and sealant fluid out of a sealant and air outlet 32 that has an outlet seal 35 when a threaded outlet cap 38 is removed from the outlet 15. When the mixture of the compressed air and sealant fluid is not being injected into the tire, a ball 36 of the outlet seal (that may be a rubber ball) can rest against a tube end and or be frictionally fit in the tube (when the outlet seal does not have a seat) or against a seat 37 so that the sealant fluid does not leak out the sealing container. When the mixture of the compressed air and sealant fluid is being injected into the tire, the ball is expelled from the tube (that may be an injection molded tube) or seat by the air pressure that allows the mixture of the air and sealant fluid into the tire to repair and inflate the tire. The outlet 15 has a cut-out portion 39 that permits the compressed air and fluid to flow past the ball 36 when the ball has been expelled from the tube or seal by the compressed air (the dispensing position).
with the inlet seal 32, the ball 36 of the outlet seal 35 may be captured in the tube in one embodiment or captured in the outlet 15 in the other embodiment. The outlet seal 35 also can prevent the air pressure in the tire from forcing air and/or sealant fluid back into the sealant container since the ball 36 will be forced back into the tube, against the end of the tube /against the seat 37 due to the tire pressure. It is noted that the inlet and outlet seals 32, 35 are relatively simple and can be made of readily available materials.

Figure 4 illustrates further details of a second embodiment of the sealant dispensing assembly 14 of the apparatus shown in Figure 2. In this embodiment, the cap 26 has the connecting mechanism 30, the inlet seal 32 and the outlet seal 35. In this embodiment, the inlet seal 32 is a valve core seal 42 that prevents sealant fluid from leaking out during storage and prevents the sealant fluid from fouling the compressed air source. The outlet seal 35 has the ball 36 and seat 37 (along with the tube in which the ball is captured). In this embodiment, both the inlet and outlet seals 32, 35 are adjacent each other in a neck portion 40 of the cap 26. In this embodiment, an outlet cap 38 may be placed over the air and sealant outlet and help to further seal the sealant dispensing assembly 14. As shown above in Figure 3, the outlet has the cut-out portion 39 that permits the compressed air and fluid to move past the ball 36. In an exemplary embodiment, the outlet cap 38 may be threaded and screw onto the air and sealant outlet.

While the foregoing has been with reference to a particular embodiments, it will be appreciated by those skilled in the art that changes in this embodiment may be made without departing from the principles and spirit of the invention, the scope of which is defined by the appended claims.
Claims:

1. An apparatus capable of repairing and inflating an item, comprising:
   a sealant dispensing assembly having a sealant container and a cap having a connecting
   mechanism wherein the sealant container is capable of being removably coupled to the sealant
   dispensing assembly using the connecting mechanism; and
   the cap further comprising an inlet seal having a tube and a ball to prevent a sealant fluid
   from leaking from the sealant container when the sealant dispensing assembly is coupled to the
   sealant container but is being stored.

2. The apparatus of claim 1, wherein the ball frictionally fits into the tube to prevent
   a sealant fluid from leaking from the sealant container when the sealant dispensing assembly is
   coupled to the sealant container but is being stored.

3. The apparatus of claim 1, wherein the ball is captured in the tube.

4. The apparatus of claim 1, wherein the inlet seal further comprises a seat wherein
   the ball rests against the seat to prevent a sealant fluid from leaking from the sealant container.

5. The apparatus of claim 1, wherein the inlet seal ball further comprises a rubber
   ball.

6. The apparatus of claim 5, wherein the tube further comprises an injection molded tube.

7. The apparatus of claim 1, wherein the cap further comprises an outlet having an
   outlet seal having a tube and a ball to prevent air from leaking from an item being repaired into
   the sealant dispensing assembly.

8. The apparatus of claim 7, wherein the ball frictionally fits into the tube to prevent
   a sealant fluid from leaking from the sealant container when the sealant dispensing assembly is
   coupled to the sealant container but is being stored.

9. The apparatus of claim 7, wherein the ball is captured in the tube.

10. The apparatus of claim 7, wherein the outlet seal further comprises a seat wherein
    the ball rests against the seat to prevent a sealant fluid from leaking from the sealant container.

11. The apparatus of claim 7, wherein the outlet further comprises an outlet cap that
    seals the outlet.
12. The apparatus of claim 7, wherein the outlet further comprises a cut-out portion that permits a sealant fluid to flow around the ball when the ball is in a dispensing position.

13. The apparatus of claim 7, wherein the outlet seal ball further comprises a rubber ball.

14. The apparatus of claim 13, wherein the tube further comprises an injection molded tube.

15. The apparatus of claim 1, wherein the cap further comprises an outlet seal having a valve core seal to prevent air from leaking from an item being repaired into the sealant dispensing assembly.

16. The apparatus of claim 15, wherein the cap has a neck portion and wherein the inlet and outlet seals are located adjacent each other in the neck portion of the cap.

17. The apparatus of claim 1, wherein the connecting mechanism further comprises a set of threads and wherein the sealant container has a set of threads so that the sealant container can be screwed into the connecting mechanism.

18. The apparatus of claim 1, wherein the cap further comprises a resting surface on which the sealant dispensing assembly rests during repair of an item.

19. The apparatus of claim 1 further comprising a compressor with a hose coupled to the sealant dispensing assembly and an outlet of the sealant dispensing assembly coupled to an item being repaired by the apparatus.

20. The apparatus of claim 19, wherein the item further comprises a tire.

21. The apparatus of claim 20, wherein the tire further comprises an automobile tire.
INTERNATIONAL SEARCH REPORT

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A CLASSIFICATION OF SUBJECT MATTER
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USPC - 222/394

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(8) B29C 73/00 (2008 04)
USPC 222/394

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
IPC(8) B29C 73/16 (2008 04)
USPC 141/38 (text delimited)

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
PubWEST (USPT, PGPB, EPAB, JPAB), Google/Patents, Google/Scholar
Search Terms: tire, seal, sealant, repair, inflate, compressor, ball, tube, cylinder, rubber, patch, car, automobile, truck, vehicle, cap, lid, cover, top, valve, sphere, inlet, outlet

C DOCUMENTS CONSIDERED TO BE RELEVANT

Category* Citation of document, with indication, where appropriate, of the relevant passages Relevant to claim No
Y US 4,969,493 A (LEE) 13 November 1990 (13 11 1990), Fig 3, col 1, Ins 5-6, col 2, Ins 16-27 1-21
Y US 6,345,650 B1 (PAASCH et al) 12 February 2002 (12 02 2002), col 2, Ins 54-59 15, 16

Further documents are listed in the continuation of Box C

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