# United States Patent

**Owens, Jr.**

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## [54] METHOD AND APPARATUS FOR INTRODUCING LIQUID INTO VEHICLE TIRES


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[52] **U.S. Cl.** ..... **141/1**, 23/271, 23/272, 141/38

[51] **Int. Cl.** ..... **F17c 13/02**

[58] **Field of Search** ..... 23/271, 272, 272.5, 272.6, 23/311; 134/93; 137/268; 141/1, 9, 38, 100, 105, 244; 152/415



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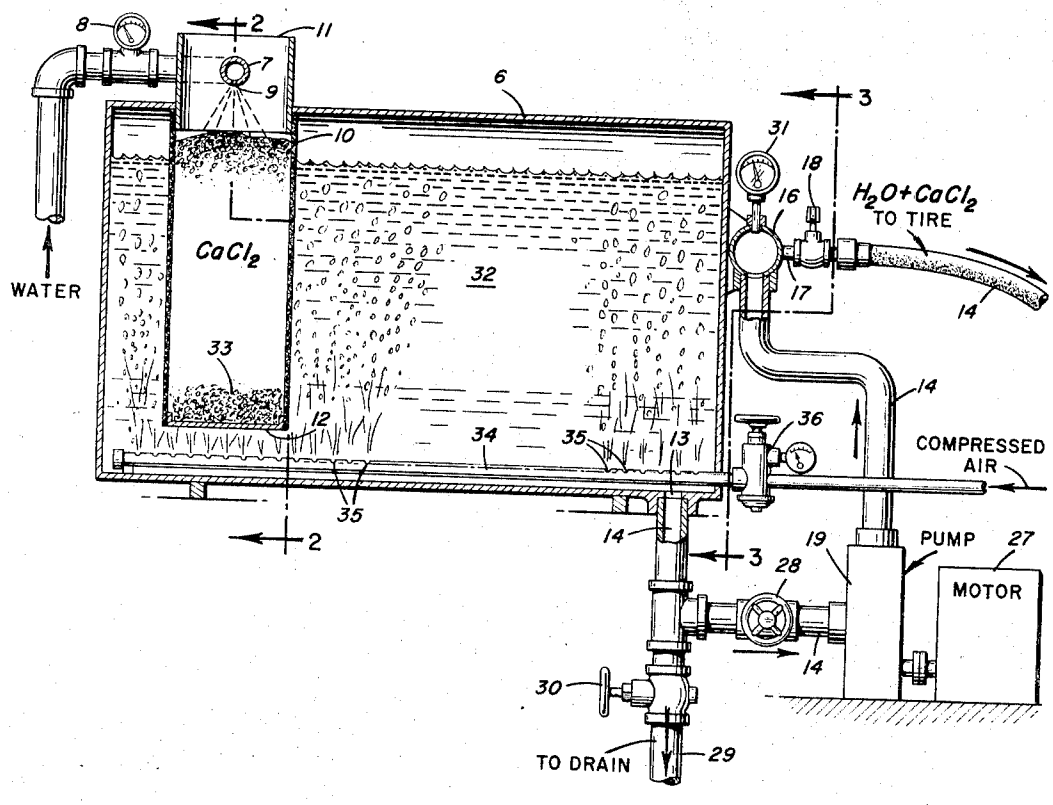
[57] **ABSTRACT**

A device for filling tires with a solution of calcium chloride in water comprising a vessel having inlet means adapted to continuously introduce liquid into the vessel, outlet means adapted to continuously remove liquid from the vessel, and means for transmitting the liquid from the vessel to a tire. A mesh hopper is disposed within the vessel beneath the liquid inlet means. The mesh hopper is adapted to retain particulate material but is readily pervious to liquid.


**6 Claims, 4 Drawing Figures**



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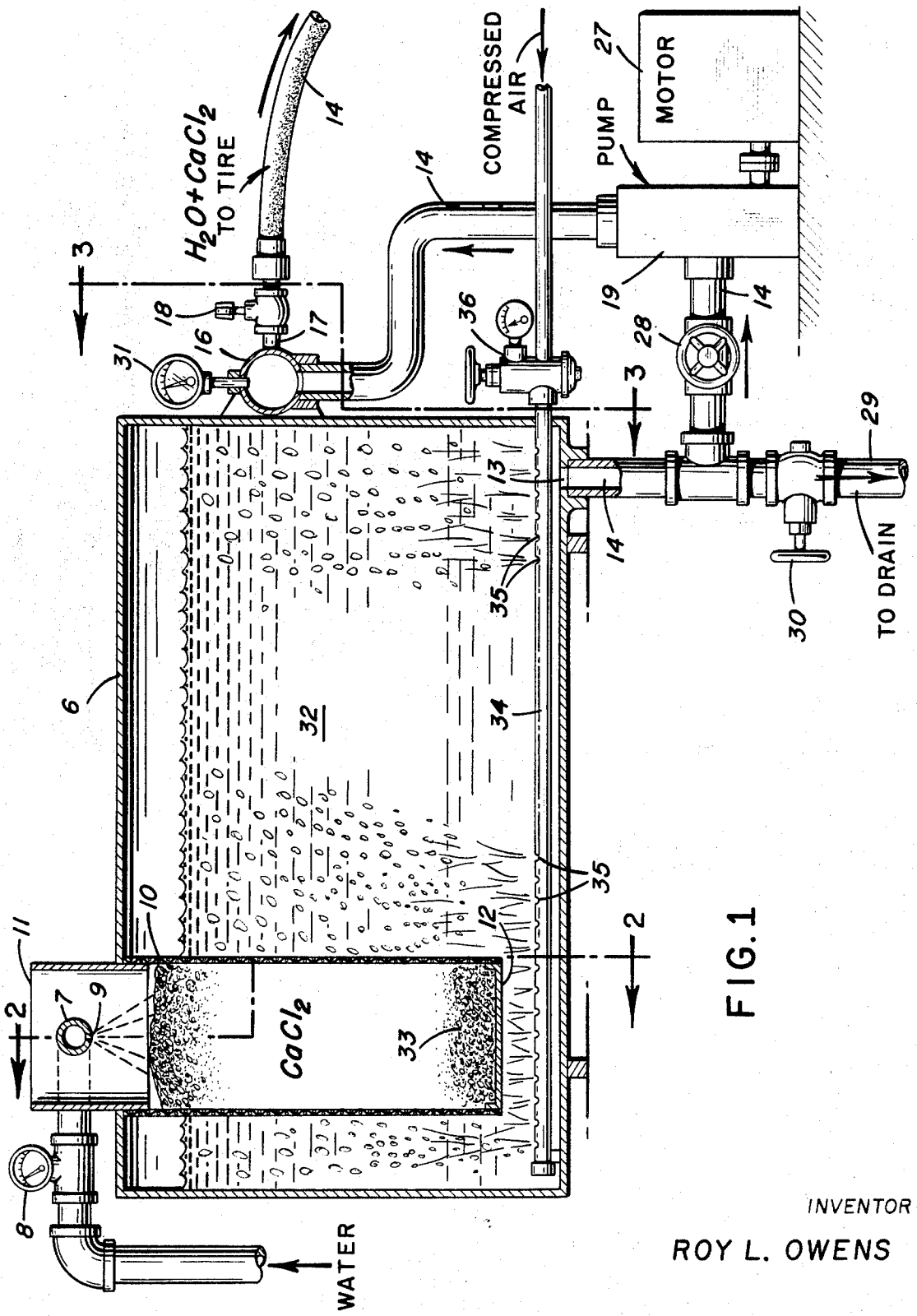


FIG. 1

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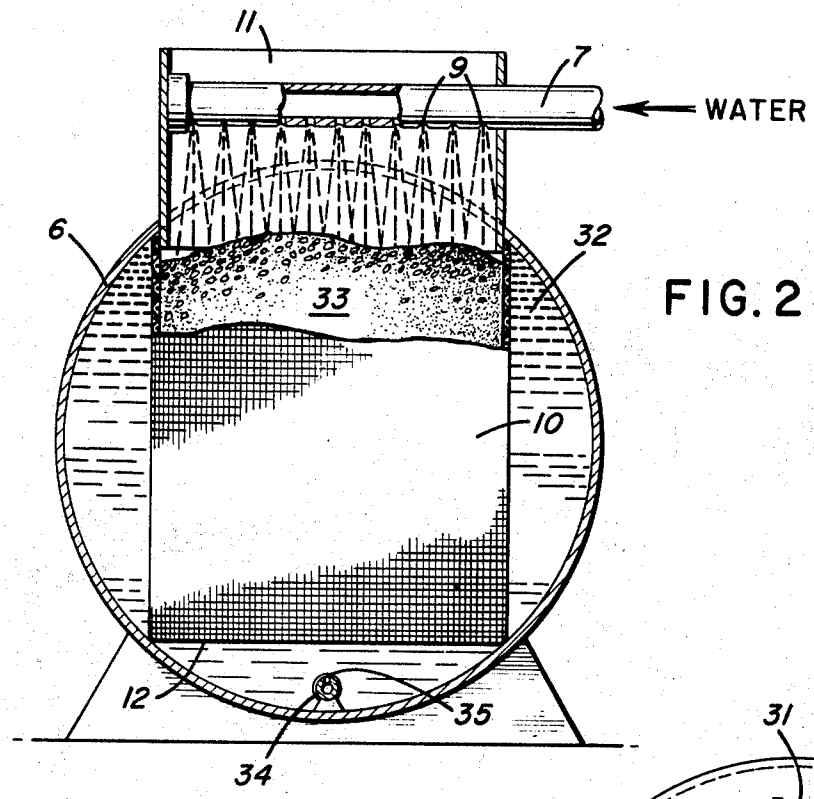



FIG. 2

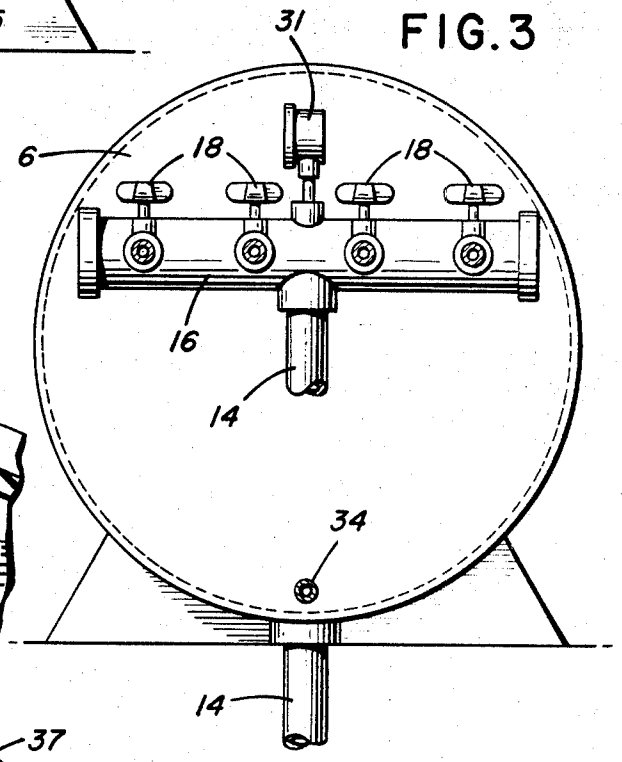
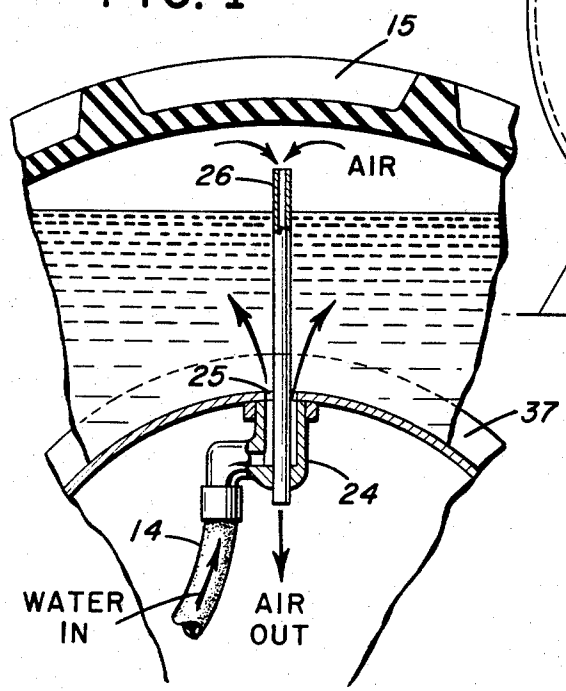



FIG. 3

FIG. 4

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# METHOD AND APPARATUS FOR INTRODUCING LIQUID INTO VEHICLE TIRES

## BACKGROUND OF THE INVENTION

1. Field of Invention

The present invention relates to improvements in methods and apparatus for filling tires with liquid. The present invention is particularly directed to an improved method and device for continuously mixing water with a chemical adapted to lower the freezing point of the water and injecting the resultant solution into tires.

2. Description of the Prior Art

It is well known to fill pneumatic tires of tractors or any earth moving equipment with water. The addition of water to pneumatic tires adds weight at the most effective point to increase traction. Furthermore, the added weight serves to lower the center of gravity of the equipment thereby increasing stability.

In climates where there is a danger that the ambient temperature will drop below freezing, it is necessary to add chemicals to the water to lower the freezing point of the water. Typical anti-freeze materials, such as alcohols and ethylene glycol suffer from several disadvantages. Such materials are expensive and tend to deleteriously affect tires. Often tires which have been filled with liquid containing alcohol or ethylene glycol are extremely difficult to remove from the rim.

For these reasons, it has become common practice to fill tires with a solution of water and calcium chloride. Before such solutions can be used, it is necessary to dissolve solid calcium chloride in water.

Typical techniques for filling tires with water-calcium chloride solution involve merely mixing, using an impellor type mixer, water and calcium chloride, in a vessel such as a 50 gallon drum, and pumping the mixture into the tires. Since the tires on typical earth moving equipment have a capacity of 560 gallons or more, it is readily apparent that such a technique is extremely time consuming.

It is obviously desirable to transport heavy equipment to the site of use with air in the tires. For this reason, it is often necessary to fill tires at remote locations, such as construction sites or strip mines. It is apparent therefore, that it is desirable that tire filling devices be portable. It is equally apparent that the use of very large capacity mixing vessels is not practical because such vessels are not sufficiently portable.

Other techniques have been developed which also suffer from severe shortcomings. The calcium chloride-water solution is very corrosive. This has lead to the development of apparatus in which it is not necessary to transmit the water-calcium chloride solution through a pump. Such apparatus involves the use thereof of a pressure tank in which the water and calcium chloride are mixed and into which air can be injected to force the solution from the pressure tank into a tire. Such a device as shown in U.S. Pat. No. 3,043,348 to Wellsch. Such devices have not gained wide spread acceptance for filling tires of large earth moving equipment. By their very nature, such devices can only be operated on a batch basis. After one batch has been injected into a tire, the tank must be opened, and additional water and calcium chloride added before a second batch can be injected into a tire. It is generally not practical to make such devices both portable and of sufficient capacity so that one batch is adequate to fill even one tire on a piece of heavy earth moving equipment.

Another problem with many of the prior art devices for filling tires with liquid is they do not provide for accurate control of the water-calcium chloride ratio. If the water-calcium chloride ratio is properly controlled, the freezing point of the solution can be regulated down to very low temperatures such as −24° F. However, if too little calcium chloride is introduced into solution the freezing point would not be adequately lowered. On the other hand, if too much calcium chloride is put into solution, the water-calcium chloride solution will freeze at relatively high temperatures, even as high as 70° F.



## SUMMARY OF INVENTION

The present invention is directed to an apparatus adapted for filling tires with liquid comprising a vessel having a liquid inlet means adapted to continuously introduce liquid into the vessel, liquid outlet means adapted to continuously remove liquid from the vessel, and conduit means adapted to transmit liquid from the outlet means to a tire. The liquid inlet means is disposed in proximity to the top of the vessel while the liquid outlet means is disposed in proximity to the bottom of the vessel. The vessel contains a mesh hopper disposed within the vessel under the liquid inlet means. The mesh hopper is readily pervious to liquid but capable of retaining solid particulate material. The mesh hopper is further adapted to receive particulate material while liquid is being introduced through the liquid inlet means.

The present invention is also directed to a process of filling tires with a solution of calcium chloride and water which comprises continuously injecting water into a container containing particulate calcium chloride, collecting the solution resulting from the dissolution of particulate calcium chloride in water, mixing the solution, periodically adding additional particulate calcium chloride to the container without ceasing to inject water into the container, and injecting the solution into a tire. The container which contains particulate calcium chloride is readily pervious to water but capable of retaining particulate calcium chloride.

## BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevational view, partly in cross section, of an apparatus for filling tires with liquid embodying the concepts and principles of the present invention.

FIG. 2 is a cross-sectional end view of the device taken substantially along line 2—2 of FIG. 1.

FIG. 3 is a cross-sectional end view of the device taken substantially along line 3—3 of FIG. 1.

FIG. 4 is a fragmentary longitudinal cross-sectional view of a tire showing a valve adapted for filling tires with liquid.

Similar reference numerals indicate corresponding parts through the several views shown in the drawings.

## DETAILED DESCRIPTION OF THE INVENTION

Referring specifically to the drawings, and in particular FIGS. 1–3, the apparatus of the present invention comprises a vessel **6** adapted to contain a liquid such as water, as designated by numeral **32**. Vessel **6** is preferably a substantially cylindrically horizontally disposed tank which may be adapted to be mounted on a truck or trailer (not shown in the drawing), to render the tire filling apparatus readily portable.

Liquid inlet means **7** is disposed in proximity to the top, and preferably in proximity to one end, of vessel **6**. The liquid inlet means is preferably operatively connected to liquid metering means **8**. Such devices are well known to the art and are capable of measuring the amounts of liquids introduced through the liquid inlet means. The liquid inlet means preferably contain a plurality of liquid passages **9**, through which liquid may pass into the vessel **6**.

Disposed beneath the liquid inlet means is a mesh hopper **10** adapted to retain particulate material, such as calcium chloride as designated by numeral **33**. Mesh hopper **10** is open at the top, as shown at **11**. Particulate material may be introduced into mesh hopper **10** through opening **11** at the same time that the liquid is being introduced into vessel **6** through liquid inlet means **7**. Mesh hopper **10** preferably has a solid bottom **12**.

Liquid outlet means **13** is disposed in proximity to the bottom of vessel **6**. Preferably, the liquid outlet means is located in proximity to the opposite end of vessel **6** from liquid inlet means **7**. Liquid outlet means **13** is connected by conduit means **14** to a tire. As may be seen from the drawings, conduit means **14** may comprise a plurality of sections. Conduit means **14** contains a pump **19** operatively connected to a motor **27**,

and may contain a valve **28** adapted to regulate flow. Conduit means **14** may also contain an outlet **29** regulated by a valve **30** through which vessel **6** may be drained.

Preferably, the conduit means contains a manifold **16** having a plurality of outlets **17**, each of which is connected to a gate valve **18**. Through such an arrangement, it is possible to fill a plurality of tires simultaneously. A pressure gauge **31** is operatively connected to manifold **16**, so that flow of liquid to tires can be terminated when the desired pressure level in the tires is reached.

Vessel **6** contains means adapted to inject air into the vessel thereby agitating liquid in the vessel. The air injection means comprises a conduit **34** extending into vessel **6** and disposed near the bottom of the vessel. Conduit **34** contains a plurality of outlets **35** and a valve **36** adapted to regulate the flow of air into the vessel. The air injection means is connected to a source of compressed air, not shown in the drawing.

FIG. **4** shows a tire **15** mounted on a rim **37** and connected to conduit means **14** through valve **24**. As may be seen from FIG. **4** the valve assembly **24** is especially adapted for filling tires with liquid and provides for the entry of liquid through passage **25** and the exit of air through passage **26**. Valve assemblies especially adapted for filling tires with liquid are well known in the art. Valve assembly **24** may include a safety device, such as a "pop off" valve (not shown in the drawing) to insure that the pressure in the tire does not exceed a predetermined value. As is obvious, if pressure in a tire gets too high there is a danger of bursting the tire. Such safety devices are also well known in the art.

Because of the extremely corrosive nature of calcium chloride-water solutions it is essential that pump **19**, as well as all parts of the tire filling device which come in contact with the solution, be constructed of corrosion resistant material. Suitable materials include high grade stainless steel and other corrosion resistant alloys. Conduit sections **14** may also be constructed of corrosion resistant synthetic rubber, etc.

In operation, water is continuously injected through liquid inlet means **7** into mesh hopper **10** and thus into vessel **6**. Mesh hopper **10** contains particulate calcium chloride **33**; the mesh hopper retains the particulate calcium chloride, but allows the water to pass readily. The readily soluble calcium chloride is dissolved in water and the resultant solution is collected in vessel **6**. As calcium chloride is dissolved, additional calcium chloride may be added to mesh hopper **10** through openings **11** without interrupting the flow of water through liquid inlet means **7**.

Air is injected into vessel **6** through conduit **34** and outlets **35**. The air serves to agitate the liquid in the vessel, insuring that the calcium chloride-water solution is thoroughly mixed.

The water-calcium chloride solution leaves vessel **6** through liquid outlet means **13**, and by means of pump **19**, passes through the conduit means to one or more tires. As may be seen, the device may be operated continuously until the desired number of tires are filled.

The water-calcium chloride ratio employed depends on the grade or degree of purity of the calcium chloride (the higher the purity, the less required). Typically, a ratio of 80–100 pounds of calcium chloride to 25 gallons of water is employed. Such a ratio yields a solution freezing at about −24° F. By regulating the amount of water introduced into vessel **1**, and regulating the amount of calcium chloride introduced into mesh hopper **10**, it is possible to accurately control the calcium chloride water ratio.

What is claimed is:

**1**. A portable apparatus adapted for filling tires with liquid comprising:

A. A vessel having

1. liquid inlet means adapted to continuously introduce liquid into said vessel, said liquid inlet means
   a. disposed in proximity to the top of said vessel, and
   b. operatively connected to liquid metering means, whereby the amount of liquid introduced into said vessel may be measured and regulated,
2. liquid outlet means adapted to continuously remove liquid from said vessel, said liquid outlet means disposed in proximity to the bottom of said vessel,
3. conduit means adapted to transmit liquid from said outlet means to a tire, and
4. air injection means adapted to introduce air into the lower portion of said vessel and thereby agitate liquid in said vessel,

B. Pump means,

1. operatively connecting said outlet means and said conduit means, and
2. adapted to pump liquid from said vessel through said conduit means to at least one tire, and

C. A mesh hopper disposed within said vessel under said liquid inlet means, said hopper

1. readily pervious to liquid but capable of retaining particulate material and
2. adapted to receive particulate material while liquid is being introduced through said liquid inlet means.

**2**. The apparatus in claim **1** in which said vessel is a substantially cylindrical, horizontally disposed tank.

**3**. The apparatus of claim **2** in which said inlet means is disposed in proximity to one end of said tank and in which said outlet means is disposed in proximity to the other end of said tank.

**4**. The apparatus of claim **1** in which said conduit means is operatively connected to a manifold whereby said apparatus may be employed to simultaneously fill a plurality of tires.

**5**. The apparatus of claim **1** in which said liquid inlet means contains a plurality of liquid passages.

**6**. A process of filling tires with a solution of calcium chloride and water which comprises:

A. Continuously injecting water into a container disposed within a vessel, said container containing particulate calcium chloride and being readily pervious to said water but capable of retaining said particulate calcium chloride, whereby at least a portion of said calcium chloride is dissolved in said water,

B. Collecting, in said vessel, the solution resulting from dissolution of said particulate calcium chloride in said water,

C. Injecting air into the lower portion of said vessel to agitate and mix said solution in said vessel,

D. Periodically adding additional particulate calcium chloride to said container without ceasing to inject water into said container,

E. Controlling the water/calcium chloride ratio in said solution so that said solution in said vessel has a freezing point below the normal freezing point of water, by

1. regulating the amount of water injected into said container, and
2. regulating the amount of calcium chloride added to said container, and

F. Injecting said solution into a tire.

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