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UNITED STATES PATENT OFFICE

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NONCORROSIVE SOLUTION.

No Drawing.

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This invention relates to a solution comprising castor oil, alcohol and a neutralizing or catalytic agent such as a compound of arsenic or phosphorus soluble in alcohol, the solution being intended primarily, although not necessarily, as the fluid medium of a hydraulic braking system for automobiles.

Heretofore, it has been common practice to use a solution of alcohol and castor oil in substantially equal proportions for actuating the pistons in so-called hydraulic braking systems. This solution has been used because of the fact that castor oil thus dissolved in alcohol has no detrimental effect upon rubber used for cup washers and for piping, and at the temperatures encountered in practice has a sufficiently constant viscosity for practical purposes. It has been found in practice that even chemically pure castor oil, when mixed with either ethyl or methyl alcohol brings about a gradual corrosion of the commonly used metals, such as iron, steel, brass, copper and the metals found in die casting alloys. To minimize this corrosive effect, the interiors of certain parts of the fluid braking systems have been electro-plated with cadmium, but although this retards the action, it has been found that the action continues to some extent, with the result that a material which I designate as "cadmium soap" is formed. This soap-like material results from the contact of cadmium with castor oil in the presence of alcohol and is sufficiently insoluble in the quantity of alcohol present in the braking solution that it eventually forms a hard and obstructive precipitate of a soap-like character.

I have found that the corrosion of the above named metals is greatly decreased by the addition to the castor oil-alcohol solution of a neutralizing or catalytic agent—preferably a compound of arsenic—and that these compounds have no detrimental effect upon the rubber of the hoses or cup washers used in the system. When the copper of the system is thus cadmium plated, and particularly when the compound added to the solution is one of arsenic, the formation of the product which I have termed "cadmium soap" is also prevented.

Almost any of the soluble arsenic compounds have a beneficial effect, but I have found that potassium arsenite (KA_2O_2) and

sodium arsenite ($\text{Na}_2\text{HA}_2\text{O}_2$) are the most satisfactory, although comparatively good results have been obtained by the use of potassium arsenate ($\text{K}_3\text{A}_2\text{O}_4$) and sodium arsenate ($\text{Na}_3\text{AsO}_4 \cdot 12\text{H}_2\text{O}$).

I have found that the solution of alcohol and castor oil will dissolve about two grams of arsenic compound per gallon, and that this proportion of arsenic satisfactorily prevents corrosion and the formation of soap-like material. I have also found, however, that as small a proportion as one-half gram of arsenic compound per gallon of alcohol-castor oil mixture prevents corrosion and saponification to substantially the same degree as the saturated solution above mentioned.

One of the forms of the above mentioned corrosion which has given rise to trouble in the operation of fluid operated vehicle brakes, is the copper sulphide which forms as a result of the presence of sulphur in the rubber with which the brake solution comes in contact and the presence of copper in the tube which conducts the brake solution to the work cylinders. This copper sulphide forms along the interior of the copper tubing, creating a thin scale which, through vibration of the tubing, becomes dislodged and is carried by the solution into the brake cylinders where it eventually lodges between the rubber cup and the cylinder wall, causing abrasion of the rubber and leakage of the fluid.

I believe that the compound of arsenic acts as a negative catalytic agent, which very materially slows down the action of the dissolved sulphur upon the copper. I believe, further, that the same negative catalytic action is responsible for the diminution of the corrosion of other metals which come into contact with the brake fluid.

While I prefer to use the compounds of arsenic herein mentioned, I have found that other substances also give satisfactory results in minimizing the action of the sulphur on the copper or other metals,—and especially compounds of phosphorus such as tri-sodium phosphate ($\text{Na}_3\text{PO}_4 \cdot 12\text{H}_2\text{O}$). This apparently acts as a catalytic agent similar to the above described arsenic compounds.

Although my invention has been described for use in a fluid braking system, it is equally applicable to any other system mak-

ing use of a solution of castor or other oil in alcohol.

I claim:

1. A solution of castor oil in alcohol, rendered non-corrosive by the addition of an alkali metal salt including a metal of the arsenic group.
2. A non-corrosive solution containing substantially equal parts of castor oil and alcohol, rendered inert and non-corrosive by the addition of a small proportion of an arsenic salt soluble in said solution.
3. A non-corrosive solution comprising alcohol and castor oil containing substantially one gram of an alkali metal arsenic compound per gallon of solution.
4. A non-corrosive brake fluid, containing equal parts of alcohol and castor oil, and a soluble quantity of potassium arsenite.
5. A non-corrosive solution, containing alcohol and an oil soluble in alcohol and a small quantity of an alkali metal arsenic salt.
6. The combination with a liquid medium, comprising a castor oil and alcohol solution in contact with a metal and vulcanized rubber, of an alkali metal arsenic compound held in solution by the medium.
7. A liquid medium for fluid actuated braking systems which comprise metal and sulphur-containing vulcanized rubber in contact with the medium, the medium comprising a solution of castor oil and alcohol with a small portion of an arsenic salt in solution therewith for minimizing the corrosion of the metal by the sulphur.
8. In a fluid system exposed both to copper and to sulphur-containing vulcanized rubber,

the combination therewith of a liquid medium including alcohol and castor oil, and means for preventing the corrosion of the copper by the sulphur, comprising a small portion of an arsenic salt in solution with the medium.

9. The process of minimizing the corrosion of copper by the sulphur in vulcanized rubber, which consists in covering the area of copper exposed to the sulphur with a liquid medium containing castor oil, alcohol, and an alkali metal arsenic compound.

10. The combination with a solution of castor oil in alcohol and small amounts of sulphur, of means for minimizing the corrosion of metallic copper with which the solution comes into contact, comprising a small portion of an arsenic salt held in the solution.

11. In a fluid system exposed both to cadmium plated copper and to sulphur-containing vulcanized rubber, the combination therewith of a liquid medium including alcohol and castor oil, and means for preventing the formation of "cadmium soap," comprising a small portion of an alkali metal arsenic compound in solution with the medium.

12. The combination with a solution of castor oil in alcohol and small amounts of sulphur, of means for minimizing the corrosion of metallic copper with which the solution comes into contact, comprising a small portion of an arsenite of an alkali metal held in the solution.

In witness whereof, I hereunto subscribe my name this 2nd day of March, 1926.

MORTON ROLAND SHERBINO.