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PAINTS AND OTHER PROTECTIVE COATINGS FOR TIRES

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I. INTRODUCTION

This letter circular has been prepared to answer questions which are frequently asked about materials for increasing the life and mileage of tires.

When rubber was plentiful and tires could be obtained without restriction the principal products sold for applications to tires were paints designed to improve the appearance. The present emergency, however, has led to the development of a number of products which are offered to the public with the claims that they will protect, preserve, and rejuvenate the rubber and increase the mileage of tires. Some of the claims are based on sound scientific principles, while others are incorrect and misleading. Many of them can be evaluated only be experiment.

In the course of the following discussion we shall indicate the real and supposed functions which paints and other coatings may serve, and shall outline some simple tests that may be conducted to determine how well the materials offered will serve their intended purpose.

II. FUNCTIONS OF PAINTS AND OTHER COATINGS

1. Improvement in Appearance

Tire paints are commonly made in white and in black for use on the sidewalls of tires. They are designed to be

quick drying and to withstand flexing without cracking or flaking. The black paints may consist of asphalt varnish or asphalt emulsions, or may be made from carbon black in quick drying spar varnish. The white paints may be made from a variety of materials including titanium-base pigments in quick drying spar varnish or in resin emulsions. This Bureau has made no study of the relative serviceability of these different paints.

All tire paints except the emulsions are made with an organic thinner such as gasoline or some other petroleum distillate. This need not cause apprehension regarding possible damage to the rubber. Although the thinner may swell the rubber slightly when the paint is first applied, no harm will be done if it evaporates quickly.

2. Surface Protection and Preservation of the Rubber

Under ordinary conditions the life of a tire is set by failure from wear or mechanical damage. In the years preceding the present emergency there had been such constant improvement in the aging qualities of rubber compounds that deterioration had become only a minor factor compared with wear or mechanical damage. When deterioration did occur it commonly took the form of cracking or checking of the sidewalls and caused the ultimate failure of the tire by permitting water and grit to reach the cords.

The present emergency, however, will make it necessary for the majority of tires to be used much longer than was anticipated when they were made. Furthermore, many of them will be repeatedly retreaded, and even under the most favorable conditions, the heat applied to vulcanize the new tread will cause some damage to the rubber of the carcass and the sidewalls.

Some authorities think that the emergency conditions make it necessary to give tires some added protection in the form of a treatment with antioxidants and sun-checking inhibitors. Other authorities, however, have voiced the opinion that the antioxidants and other protective agents which are incorporated in the rubber of present day tires at the time of manufacture are adequate for all practical purposes, and that any general or widespread use of protective agents would be unnecessary in the large majority of cases and would represent a waste of materials needed for war purposes.

Two generally recognized facts bearing on the situation are: first, the percentages of antioxidants and sun-checking

inhibitors needed to protect rubber are small, and increasing the amounts beyond a certain minimum gives little additional benefit; and second, the introduction of these materials by surface application is ordinarily much less effective than incorporating them into rubber at the time of manufacture.

Under the circumstances it is recommended that a paint or other coating be applied to tires only when there is specific need for such a treatment. For example, when unused vehicles must be stored outdoors and exposed to the weather for a long period the tires should be coated with an asphalt varnish or other inexpensive, weather-resistant preparation. Tires having white sidewalls should ordinarily be kept painted because white rubber usually deteriorates more rapidly in sunlight and weather than black rubber. Tires which tend to develop radial cracks should be treated with a solution of an antioxidant designed to prevent flex-cracking. The great majority of tires, however, require no special treatment, but only intelligent maintenance and regular care. Superficial checking of the sidewalls need not be viewed with alarm so long as the deterioration does not become deep enough to endanger the cords.

The asphalt varnish referred to above for use on tires is a mixture of high grade asphalt (preferably Gilsonite) fluxed and blended with drying oils and a volatile petroleum distillate. An asphalt varnish conforming to Federal Specification TT-V-51a will meet the following requirements. It can be readily applied by brushing, spraying, or dipping. It will dry to a jet-black, high-gloss, flexible film within 18 hours. The nonvolatile constituents will be not less than 40 percent, and will contain not less than 20 percent of drying oils. Rosin will not be present. The material will be readily miscible with both mineral spirits and linseed oil. The flash point will be not less than 86° F.

Asphalt varnish is known to the trade by several other names such as asphalt paint, black asphaltum, and asphalt enamel. It can be purchased at retail under one or more of these names in most localities.

The purchase of antioxidants and sun-checking inhibitors, however, is not so easy at present. The firms which manufacture these materials have not undertaken to distribute them through retail channels for use on tires. The products sold as preservatives for tires, for the most part, contain no antioxidants or other inhibitors.

The individual wishing to obtain these materials should write to the manufacturer or a large distributor of the tires which he wishes to treat.

No treatment of the tires is necessary when it is possible to store an unused or little used vehicle out of the weather. It is understood, or course, that when a vehicle is to be stored the wheels should be blocked up so as to take the load off the tires. The tires should be kept inflated enough to permit the movement of the vehicle in an emergency. Information about the dead storage of automobiles is given in Letter Circular LC-684, which can be obtained on request from the National Bureau of Standards.

3. Restoration and Rejuvenation of Rubber

The most that any protective or preservative agent can do for rubber is to keep it in its original condition. No method is known for restoring rubber which has aged. Some preparations which are claimed to rejuvenate rubber do improve the appearance and feel, by cleaning and softening the surface and removing incrustations. They may also swell the rubber to such an extent that small cracks are no longer visible. The benefit, however, is more apparent than real from the standpoint of wear. Even though the aged rubber may be softened, the softening does not bring back the original strength, toughness, and resistance to abrasion.

4. Sealing of Pores in Rubber

Some products are claimed to preserve tires by sealing the pores of the rubber against the entrance of moisture and grit. The rubber in a normal tire, however, contains no pores, hence a pore-sealing compound can be of no conceivable benefit. Grit and moisture, of course, are harmful to the carcass of a tire, but they can get to it only through cuts, holes, cracks, or other mechanical faults or injuries to the tread or sidewall. Such faults or injuries can usually be found by careful inspection, and when found should be repaired by a tire repair station.

5. Increase in Mileage of Tire Treads

A paint or other surface coating might conceivably increase the mileage of a tire tread in either of two ways--by forming a film or layer on the surface to take the wear instead of the rubber, or by bringing about a change in the rubber through the absorption of some material which would increase its resistance to abrasion.

At the time of this writing no materials are known which will form a sufficiently strong, adherent, and durable film on the surface of a tire to be of practical value for increasing the wear. Furthermore, no materials are known

which, on absorption in rubber, increase its resistance to wear. On the contrary, most materials which are absorbed cause a marked increase in the ease with which the rubber is cut, torn, or abraded.

Products which do not form a durable film on the surface of a tire and are not absorbed by the rubber cannot have any effect in increasing the mileage. A coating of sulphur and glycerine, for example, cannot be of any benefit because it is not absorbed by the rubber and is lost from the tread after a very few turns of the wheel. This particular treatment should be discouraged not only because it is useless, but also because it wastes glycerine which is urgently needed for war purposes.

III. METHODS OF TESTING

Claims for the benefits from the treatment of tires with proprietary products are often accompanied by testimonials of users who cite the greater mileage or other improvements which they observed after atarting to use the treatment. This kind of evidence is of little value because other changes may have been instituted along with the use of the material. The improved performance may have resulted from more careful driving habits, reduction of speed, or more attention to proper inflation.

The situation is analogous to reports of increases in mileage accompanying the use of gasoline "dopes". When such reports are investigated it is often found that the increase is real but that it is due to adjustment of the carburetor made according to instructions accompanying the "dope".

Tests in which comparisons are made between treated and untreated tires afford a better method of evaluation than the "before and after using" procedure, but a large number of tires are required in order to be sure that uncontrolled variables such as inflation pressure, wheel alignment, position on the vehicle, etc., do not overshadow the effect of the treatment.

Many of the difficultly controlled variables in testing can be eliminated by the simple expedient of marking off test tires into sectors and applying the material under test to alternate sectors. If the product has any definite merit it should be possible to observe a difference between the treated and the untreated sectors after a reasonable mileage or time. Inasmuch as the treated and the untreated areas are side by side on the same tire it may be possible to recognize small effects which would not be evident if

different tires were being compared. If a material has any significant influence on the mileage of a tread this effect should be apparent within 5,000 or 10,000 miles in the case of a tire made from new rubber, or within 1,000 or 2,000 miles for a retread of reclaimed rubber.

When laboratory facilities are available it may be desirable to precede the service test by a simple determination of the extent to which the product under examination adheres to or is absorbed by the rubber. The procedure is as follows. A piece of clean, dry rubber cut from the tread of a tire is weighed accurately by means of an analytical balance. The product is applied to this test piece according to instructions and is allowed to stand or dry for the length of time specified. The coated rubber is then flexed moderately by hand and the degree of adhesion of the coating is noted. The test piece is next washed in running water for a few minutes. If an adherent coating remains after the flexing and washing the product merits further consideration. If, however, the coating is removed by the treatment, and if the rubber test piece after drying shows no significant increase in weight, it can be concluded that the product will be quickly lost from a tire under ordinary conditions of use, and hence merits no further consideration.

IV. SUMMARY

Paints and other protective coatings may serve to improve the appearance of tires and to protect the rubber from cracking and checking caused by sunlight and weather.

No products are now known which will restore or rejuvenate old rubber, or increase the mileage of treads.

Materials offered for use on tires can be tested by applying them to alternate sectors of tires and comparing the treated and the untreated areas after a reasonable mileage. In order for a product to be worth testing on the road it should either form a waterproof, adherent film, or should be absorbed by rubber.

It is recommended that tires having white sidewalls and the tires of unused vehicles exposed to the weather be painged for protection. When protection is needed against radial cracks or severe checking of the sidewalls a solution of an antioxidant and a sun-checking inhibitor should be applied. The large majority of tires, however, require no treatment beyond intelligent care and maintenance.

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