ABEX

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FRICTION ELEMENTS BONDED WITH A REACTION PRODUCT OF POLYMERIZED LINSEED OIL, SULFUR AND PHENOL-ALDEHYDE RESIN MIXED WITH A BUTADIENE-ACRYLONITRILE COPOLYMER

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8 Claims. (Cl. 260—19)

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This invention relates to friction elements and to making the same and more particularly, the present invention relates to friction elements of the type which are employed in the brakes of automotive vehicles, including trucks, buses, and passenger cars, as well as for clutch facings and the like.

This application is a division of our copending application, Serial No. 465,734, filed November 16, 1942, on "Friction elements."

Friction elements of the aforesaid character, as now made, are composed, in general, of friction material, such, for example, as asbestos, together with an organic binder and other organic or mineral friction-controlling or imparting agents, together with other materials which may be employed for imparting specific properties or characteristics to such friction elements, such, for example, as greater heat resistance, greater coefficient of friction, and the like.

Friction elements which are intended for heavy duty use upon heavy automotive trucks, buses and the like are commonly subjected to severe service conditions, that is to say, they are subjected in use to repeated and often prolonged braking operations which develop high temperatures in such friction elements, such temperatures frequently approaching 1000° F. on the friction surface of the friction elements, and progressively lower temperatures inwardly of the friction surfaces thereof. Such high temperatures, especially when occurring or repeated frequently, tend to depolymerize or otherwise decompose organic bonding materials, as well as other organic bonding materials which may be incorporated in friction elements, including finely divided granulated or so-called dispersed discrete particles of vulcanized natural soft scrap rubber, finely divided particles of cashew nut shell liquid polymer, or finely divided particles of heat polymerized drying oils, which have been employed in friction elements for the purpose of imparting desirable characteristics to such friction elements, including greater or more stable coefficient of friction, improved wear, and the like. Accordingly, there is a consequent tendency of such friction elements to exhibit loss of stability of friction characteristics due to heat decomposition or due to carbonization of the organic bonding and other agents therein and due to the resulting presence on the friction surface or within such friction elements of depolymerized and otherwise liquefied products of heat decomposition of such organic bonding and other materials. The loss of stability, as aforesaid, in friction elements containing finely divided dispersed and dust-like particles heretofore employed may result from the heat decomposition of such organic bonding and other agents and the consequent formation of a high percentage of benzol-extractable material, and accompanying formation of a glazed surface, or may be enhanced by carbonization of such organic bonding agents and other materials or by both of such causes. It may be said, however, that such loss of friction stability results largely from the baking on the friction surface of the products resulting from the heat decomposition of the organic bonding agent or agents and other materials employed in such friction elements.

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Moreover, the glazed film thus formed on the friction surface of friction elements bonded with organic bonding agents, and which friction elements may contain finely divided and dispersed dust-like particles composed of the materials referred to hereinbefore, cannot readily be removed and is not self-removing since it decreases subsequent friction and heat formation so that a friction element with such a surface not only loses stability of friction characteristics but tends to retain the undesirable glazed film which causes this instability. Hence it will be seen that a friction element so affected cannot recover desired frictional stability through normal use of the friction element. Moreover, this is also true when the organic bonding agents or the finely divided friction-controlling organic particles dispersed in such friction elements undergo carbonization due to the heat of friction incidental to the use of friction elements embodying such materials. These conditions are commonly known in the art as "fade" and "recovery."

Furthermore, the heat decomposition of organic bonding and friction-controlling agents in friction elements is attended by a softening thereof and results in loss of volatile matter which causes the structure of the friction element to become impaired. When the structure is so impaired, it has been observed that there is an increase in friction and that the friction element wears away at a comparatively rapid rate, which obviously is undesirable inasmuch as it materially shortens the life of the element.

Moreover, when the glazed condition, which is referred to hereinbefore, occurs, it is necessary to apply much greater braking forces than normally employed, and under such conditions, and with a softened bond or friction-controlling agent, greater shearing forces are exerted within

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