

and light trucks, particularly when they may be operated under severe conditions, and which embody as a friction-controlling agent finely divided dust-like particles which resist heat decomposition and heat depolymerization and excessive softening and loss of friction stability resulting from such decomposition, and which are also highly resistant to carbonization at the high temperatures to which such friction elements are subjected in use.

An additional object of the present invention is to afford a new and improved friction element, and method of making the same, employing finely divided particles of a synthetic rubber-like elastoprene of the butadiene-acrylonitrile copolymer type as a friction-controlling or friction-stabilizing ingredient therein and in which the desired degree of hardness and heat resistance and related properties and characteristics which it may be desired to impart to said finely divided particles, and to a friction element containing said particles, may be readily controlled and varied by employing in the making of said finely divided particles a butadiene-acrylonitrile copolymer containing a selected and predetermined percentage of acrylonitrile as a component of the copolymer material.

A further object of the present invention, ancillary to the immediately preceding object, is to afford a new and improved friction element, and method of making the same, containing as a friction-controlling or friction-stabilizing ingredient finely divided particles of a synthetic rubber-like elastoprene of the butadiene-acrylonitrile copolymer type and which particles possess improved properties and characteristics as compared to finely divided particles of vulcanized soft scrap rubber including markedly superior heat resistance and the additional desirable advantage which resides in the fact that the degree of such increased or superior heat resistance possessed by the new friction-stabilizing particles may be predetermined and controlled and varied by employing in the making of said new friction-stabilizing particles a butadiene-acrylonitrile copolymer containing a selected and predetermined percentage of acrylonitrile, thus enabling friction elements containing said friction-stabilizing particles to be readily adapted or adjusted to particular and varying requirements and uses.

Other and further objects of the present invention will be apparent from the following description and claims and from the accompanying drawings.

In the drawings,

Figs. 1 and 2 are graphs illustrating certain properties or characteristics of finely divided particles composed of materials heretofore employed as friction-controlling ingredients in friction elements and illustrating comparable properties or characteristics of the friction-controlling materials which are employed in the practice of the present invention.

We have found, among other things, that friction elements embodying as friction-controlling or friction-stabilizing agents finely divided dust-like materials or so-called dispersed discrete particles composed essentially of certain vulcanizable synthetic rubbery elastoprenes or so-called synthetic rubbers, which are referred to hereinafter, overcome or are substantially free from the foregoing and other difficulties and objectionable features which have been experienced heretofore in the use of friction elements embodying friction-controlling or friction-stabilizing materials

in the form of finely divided dust-like particles or so-called dispersed discrete particles composed of the materials heretofore employed for this purpose, while at the same time being free from the aforesaid and other objectionable characteristics of harsh abrasive materials.

More specifically, we have ascertained that friction elements embodying as a friction-controlling or friction-stabilizing ingredient finely divided dust-like particles composed essentially of one or more vulcanizable synthetic rubber elastoprenes or so-called synthetic rubbers of the butadiene-acrylonitrile copolymer type, compounded with a relatively low sulphur content, are highly resistant to heat decomposition and heat depolymerization and carbonization even at the high temperatures to which heavy duty friction elements are subjected in use upon heavy duty trucks and buses and the like. Moreover, we have ascertained that friction elements embodying the finely divided dust-like materials which have been found useful and advantageous as friction-controlling agents in the practice of the present invention do not tend to form a relatively high percentage of benzol-extractable material upon being subjected to relatively high braking temperatures and hence do not tend to exhibit the consequent loss of friction stability which is exhibited by friction elements embodying the finely divided dust-like materials which have been employed heretofore as friction-controlling agents in friction elements, but retain substantially their original friction stability and other desirable characteristics.

Hence, it will be seen that the present invention is primarily concerned with friction elements containing as a friction-controlling ingredient finely divided particles or dust-like materials composed essentially of one or more vulcanizable synthetic vulcanized rubbery butadiene-acrylonitrile copolymer elastoprenes, compounded with a low sulphur content, and which may be subjected to severe service conditions without exhibiting objectionable heat decomposition or heat depolymerization and softening or carbonization resulting from or incidental to the high temperatures and severe service conditions to which friction elements are frequently subjected in use, and as may occur in the use of friction elements embodying as a friction-controlling ingredient therein the finely divided particles or dust-like materials heretofore employed for this purpose while being, at the same time, substantially free from the objectionable characteristics of the harsh finely divided abrasive materials which have been employed heretofore as friction-controlling ingredients in friction elements.

The class of finely divided particles or dust-like materials which may be employed as friction-controlling or friction-stabilizing agents in friction elements, in the practice of the present invention, is that class of vulcanizable synthetic rubbery elastoprenes or so-called synthetic rubbers which are essentially copolymers of the butadiene-acrylonitrile type and which are exemplified by, but not limited to, the disclosure of United States Letters Patent No. 1,973,000, granted September 11, 1934.

We have found that such materials have desirable properties as friction-controlling agents in friction elements in the practice of the present invention including resistance to heat decomposition and heat depolymerization and softening, as well as resistance to carbonization, under