May 21, 1940. J. H. MATTHEWS 2,201,191

FRICTION MATERIAL

Filed Feb. 24, 1939

Fig. 1.

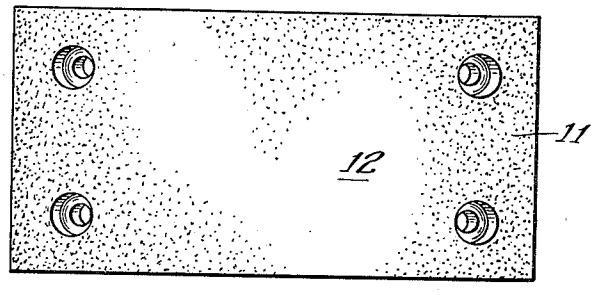


Fig. 2.

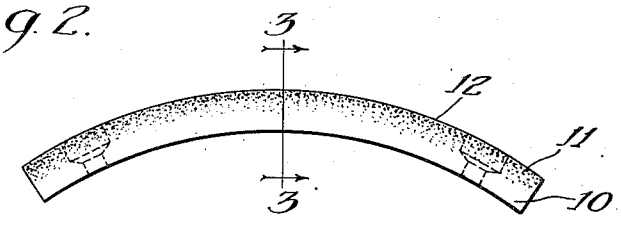


Fig. 3.

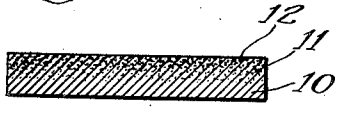
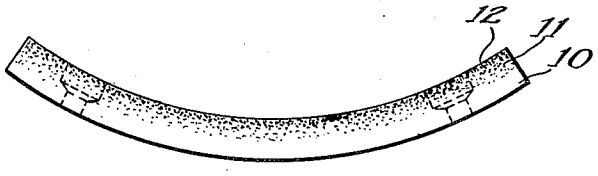


Fig. 4.



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FRICTION MATERIAL

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Application February 24, 1939, Serial No. 258,240

8 Claims. (Cl. 188—251)

This invention relates to friction materials, such as brake blocks, clutch facings, brake linings, and the like frictional engaging surfaces, and has for its particular object the production of molded, non-woven friction elements provided with abrasive operating surfaces adapted for limited abrasive action on the brake drums or other metallic cooperating surfaces.

One particular application of my invention relates to the formation of brake blocks for use in oil field draw works, hoists, winches and other like heavy duty equipment. It has been found that the severe usage to which such equipment is subjected causes the rims or metallic surfaces against which the brake blocks engage to take on a hard, glazed, brittle skin formation which "heat checks" or becomes formed with minute cracks from repeated expansion and contraction. If these cracks are not arrested or eliminated the cracks soon extend into the rim and destroy it.

By the use of an abrasive brake block or friction lining these hard surface skin formations may be abraded off during operative engagement, thus eliminating the necessity for re-grinding of the rims and the prevention of the spreading of the cracks to the point of rim destruction. This is especially true of rims which have had hard and extensive use and on which the surface skin has already formed.

However, it has been found that an abrasive brake block of uncontrolled abrasive characteristic, or which is uniformly abrasive throughout its thickness, and yet which must be sufficiently abrasive to clean up old rims, is objectionable in that it rapidly wears down the rims, and especially is this rapid and continued wear objectionable in new rims. It is therefore the additional object of this invention to provide brake blocks and friction linings which have a limited but efficient abrasive characteristic, suitable for cutting off the skin of old rims and eliminating the detrimental effects of heat checking, and yet at the same time is not detrimental to new installations. This has been accomplished by incorporating abrasive materials into only the operative surface of the friction element and into a limited thickness thereof, and further in a manner whereby the abrasive material and action thereof is lessened and is finally entirely eliminated as the friction element wears down.

The incorporation of abrasive materials with woven friction elements has heretofore been proposed but has been found to be inefficient for a number of reasons, the prime reason being that the surface of a woven material is inherently uneven and thus will not grind the rim as smoothly as can be accomplished with a molded friction element. Further, woven materials do not lend themselves to the degree of impregnation and uniformity thereof as can be accomplished by intimate mixture of fibres, binder and abrasive in molded materials. Again the controlled extent and variable density of incorporated abrasive cannot be controlled in woven materials as expeditiously as can be done with molded materials where the object is readily accomplished by slight alterations in the mix.

Another adaptation of my invention is the use of my brake blocks or linings for cleaning up the surfaces of brake rims and the like cooperative surfaces which have become oxidized or covered with rust due to protracted periods of disuse of equipment, or as a result of the equipment having been subjected to corrosive influences. Thus by utilizing my improved elements, the metallic cooperative surfaces may be cleaned and smoothly abraded to present a new surface and inhibit further deterioration.

Another adaptation of my invention is found in use with new brake drums for the proper finishing of their surfaces so as to prevent undue erosion of the friction element itself. In the manufacture of brake drums, especially automotive brake drums, helical tool marks are usually left as the finishing tool is backed out of the drum. The tool marks file off the facing every time the brake is applied. A high finish on the frictional engaging surface of brake drums or fly wheels is impractical because of the cost, the danger that it may be marred in assembly, and the difficulty of production. These drums may be polished in service by the use of my improved friction material, which due to the uniform incorporation of the abrasive, the smoothness of the molded surface, and the limited depth and variable degree of its incorporation, will smoothly polish the brake drum so as to remove the tool marks and as the lining simultaneously wears down the abrasion ceases, leaving an efficient brake rim and friction element which is no longer subject to erosion.

In the drawing:

Fig. 1 is a plan view of a molded friction element illustrative of my invention as applied to an internal brake block, and

Fig. 2 is a side view thereof.

Fig. 3 is a section on the line 3—3 of Fig. 2.

Fig. 4 is a side view of an external brake block formed in accordance with my invention.

Referring to the drawing, the figures illustrate brake blocks of the heavy duty type, and are intended to diagrammatically illustrate my invention, it being understood that my invention extends equally to various shapes and sizes of friction elements of essentially dry molded construction. Thus the internal brake block of Figs. 1 to 3 and the external brake block of Fig. 4 comprises a molded body structure 10 formed essentially of fibrous asbestos and a suitable heat hardenable binder, in which there is incorporated

discrete particles of abrasive material 11. This abrasive material is so incorporated that it is in greatest concentration at the operative surface 12, and extends interiorly therefrom in substantially progressive decreased density. It is to be understood that in accordance with the manner of construction or compounding, hereinafter discussed, the depth and concentration of the abrasive particles may be varied, and that the degree of density decrease to zero abrasive content may be irregular, fairly abrupt, or in uniform progression.

In molding friction materials by the dry process, as herein contemplated, suitable proportions of fibrous asbestos and dry comminute or finely divided heat hardenable binders, such as rubber, the synthetic resins and other like binders well known to the art, together with other compounding ingredients and fillers, to which no particular claim is here made, are mixed in a tumbling barrel or a Werner-Pfleiderer mixer to form a homogeneous mixture. This mixture is then placed in a mold in a layer about two and a half or three times as thick as the thickness desired in the final product, and then heated at elevated temperatures and pressures to mold the materials and to cure and harden the binder. It will also be understood that this cure and molding treatment may be carried out in a series of steps as known to the art. The final product may then be ground and machined to accurate dimensions.

In carrying out my invention, I proceed in the general manner above outlined except that I incorporate into a thickness of the mixture to be molded, discrete particles of an abrasive substance such as for example carborundum or alundum, or other abrasive substance which can cut and abrade metal and which can eliminate the hard glaze formations hereinbefore discussed, and which in itself will not be conducive to glaze formation. Various methods of incorporation may be used. For example I make up the mixture which forms the general basic components of the friction material and place them in the mold to an incomplete thickness. Thereafter I incorporate into that portion of the mixture which forms the remaining and operative surface thickness the abrasive particles by means of the mixing device and add it to the mold to form the balance of the required thickness. Thereafter the molding and curing operations are carried out, and by reason of the flow of the binder during the heat treatment, the layers partly blend so that while the abrasive particles are concentrated on and adjacent to the operative surface of the cured friction element, they extend inwardly to an irregular degree. I may in like manner provide for a more uniform degree of inwardly progressing reduction in degree of abrasive particle density by adding a plurality of upper layers of molding mixture to the lower basic mixture in the mold. Thus the first added layer may be pre-mixed with a relatively small percentage of abrasive particles, and the uppermost layer may be mixed with the greatest desirable percentage, and varying numbers of such layers may be used to obtain greater tapering effects, prior to molding. I may also place the entire thickness of molding mixture into the mold and then uniformly sift onto the surface the particles of abrasive material, and since the mixture before compression is porous to a considerable extent, an abrasive surface thickness with gradual inward tapering off will be obtained, and the so combined materials may be molded and cured in the conventional manners.

I claim as my invention:

1. A friction element adapted for cooperative engagement with a metallic brake drum surface or the like, comprising a fibrous non-woven molded material having incorporated therewith and to a limited operative surface thickness thereof discrete grains of an abrasive substance, and adapted for limited abrasive action with said metallic surface.

2. A friction element adapted for cooperative engagement with a metallic brake drum surface or the like, comprising a molded element of the class described having incorporated therewith abrasive material concentrated at and adjacent to the operative surface thereof.

3. A friction element adapted for cooperative engagement with a metallic brake drum surface or the like, comprising a substantially non-abrasive molded friction element of the class described and having embedded therein and to a limited operative surface thickness thereof abrasive material.

4. A friction element adapted for cooperative engagement with a metallic brake drum surface or the like, comprising a molded element of the class described and comprising grains of abrasive material, the said abrasive material being in greatest concentration adjacent to the operative surface of said element and of substantially progressively decreasing concentration inwardly therefrom to adjacent the center of the thickness of said element.

5. A friction element adapted for cooperative engagement with a metallic brake drum surface or the like, comprising a surface thickness of abrasive material terminating irregularly and inwardly therefrom, and adapted to polish said metallic surface and to remove surface irregularities, accumulations and the like therefrom.

6. A friction element adapted for cooperative engagement with a metallic brake drum surface or the like, comprising a surface thickness of abrasive material terminating irregularly and inwardly therefrom, and adapted to polish said metallic surface and to remove surface irregularities, accumulations and the like therefrom, and to thereafter frictionally cooperate therewith in substantially non-abrasive relationship.

7. A friction element adapted for cooperative engagement with a metallic brake drum surface or the like, comprising a molded asbestos base friction material, a limited operative surface thickness thereof comprising abrasive material and adapted to abrade said metallic surface during cooperative engagement therewith to a uniformly smooth condition, and to thereafter cooperatively engage therewith in substantially non-abrasive relationship.

8. A friction element adapted for cooperative engagement with a metallic brake drum surface or the like, comprising a molded asbestos base friction material and comprising a substantially non-abrasive thickness and an abrasive thickness merged therewith and forming the initial operative surface of said friction element and adapted to abrade said metallic surface during cooperative engagement therewith to a uniformly smooth condition and to remove therefrom surface irregularities, accumulations, and the like, and to thereafter cooperatively engage therewith in substantially non-abrasive relationship.

JOHN H. MATTHEWS.