BRAKE LININGS OF VARIOUS TYPES

And Their Manufacture

By R. T. Halstead, Manager, Friction Materials and Packings, Johns-Manville Research Center.

This is the third part of Dr. Halstead's article. The first and second parts appeared in our August and September issues.

B. RUBBERIZED FABRIC LININGS.

Linings falling in this category are dependent upon the thermal stability of the rubber compound contained in these friction materials to provide the desired frictional and wear properties. Therefore, the development of a suitable compound for use in this connection is a major consideration in manufacturing this type of product.

The structure of linings of this basic type falls into one of the following three classes:

1. A laminated cloth construction, with each lamination or layer consisting of a wire-inserted asbestos cloth that is rubberized on both sides. These layers, each approximately 1/16" thick, are built up in a multi-layer construction of required thickness and are then cured under the effects of heat and pressure to vulcanize the rubber compound in the structure.

Linings of this laminated cloth construction are frequently referred to as "folded and compressed" type linings. Such linings offer, for all but extremely severe service conditions, exceptionally good resistance to wear and relatively high frictional qualities. Under very severe operating conditions, involving excessively high brake drum temperatures these laminated linings tend to soften to a degree that permits one or more layers of the lining adjacent to the drum to delaminate and strip off under the action of the rotating drum.

2. A loosely woven listing containing ribbons of rubber compound woven into the structure constitutes the base fabric of the second type of rubberized fabric lining; as in the previous case, wire-inserted yarns are normally employed. This listing is impregnated in a cemented rubber compound in order to cover the individual yarns and,

PRODUCED
JM - 83

FILE COPY

PLAINTIFF'S EXHIBIT
AB-190

when dried to expel all solvents, is cured under the effects of heat and pressure in order to consolidate the base fabric structure into a dense product and to vulcanize the rubber compound present.

In the foregoing discussion the term "listing" is employed to designate a multi-layer woven structure which has binder yarns that hold the entire woven entity together. Therefore, in this type of construction, delamination of the plies cannot readily occur due to the action of the binder yarns. This type of lining is in this respect a definite improvement over the laminated cloth construction offered by the folded and compressed type.

3. The third type of rubberized fabric friction material is a modification of that described in 2, in that a much looser and more open wire-inserted yarn structure is woven without the inclusion of ribbons of rubber compound into the base fabric. The finished product of this type usually has a higher yarn content than lining of the type covered by 2 and, in general, offers approximately similar service characteristics.

The chrysotile asbestos yarns used in all of these constructions are normally of so-called "commercial grade"; the wire inserts in these yarns are usually brass, which serves to provide improved resistance to rivet shear and also contributes in a major degree to improvement in the resistance to wear of the lining.

C. WOVEN BRAKE LININGS

Woven linings have a general utility which serves to keep this class of materials in demand, particularly in the industrial field. This type of lining can be readily manufactured to provide a relatively flexible product in roll form and in a variety of widths and thicknesses (up to approximately 1-3/8"). It is admirably suited for use in many industrial applications where its adaptability to various type brake installations permits a range of service conditions to be met with a relatively small inventory of lining.

The base fabric in this type of product generally consists of wire-inserted asbestos yarns woven to provide a substantial structure of somewhat oversized proportions. This listing is generally prepared without additives, altho

in certain instances impregnating solutions, rubber latices and other aqueous dispersons of various compounding materials are added to the yarns while being processed on the loom.

The wire reinforcement adds to the strength of the woven lining and also contributes to the frictional and wear properties of the product. It is noteworthy that there are some woven linings available today with wire reinforcement only in the non-wearing plies, i.e., that portion nearest the brake shoe or brake band and under the rivet heads. Brass wires are most frequently employed in conventional woven linings, altho zinc wire, also lead wire, find some application where it is necessary to modify the braking action of the lining.

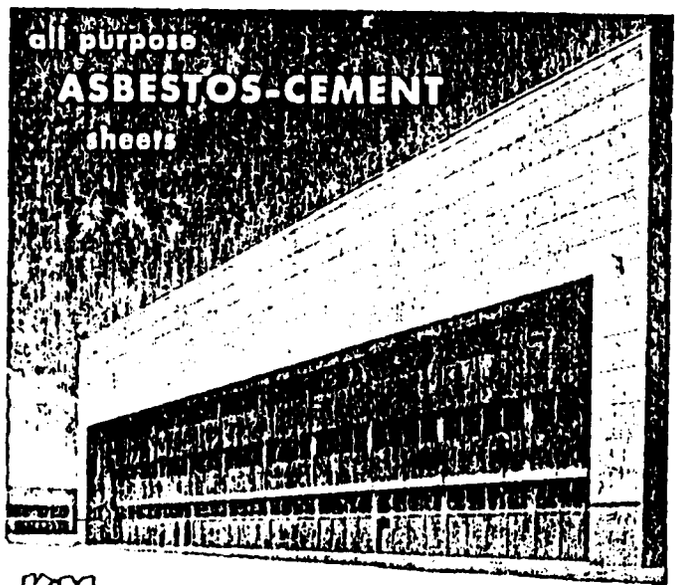
The oversize listing, after being dried, is immersed in an impregnant of such consistency that the lining is completely saturated. Drying oils, resins, bitumens and the like are normally used as saturants. With certain types of treatments, the resultant impregnated listing may be fully baked and then calendered to condense the oversize structure into a compact lining of specified dimensional cross-section; with other impregnants, it may prove necessary to calender the lining intermittently during the baking operations. In all cases, every effort is made to cure the impregnant by employing an adequately long bake at an adequately elevated temperature, thereby assuring relatively stable frictional characteristics; an over-baked condition of the lining frequently manifests itself in the form of brittleness or structural weakness of the finished product.

Many woven linings are surface-ground; this practice often contributes to an improvement in the appearance of the product, increases the flexibility and provides a wearing surface which permits the lining, when installed, to seat more rapidly against the brake drum and to provide more constant frictional properties.

SUMMARY.

The categories of friction materials covered in the foregoing discussion include those types that are of primary commercial importance; passenger car, bus and

PRODUCED
JM - 83



K&M APAC

* Designed and Constructed by Austin Company

The front of this huge aircraft assembly plant shows you another example of Apac's adaptability as an exterior sheathing. Durable, weather-and-fire resistant, K&M "Century" Apac can be put to almost unlimited uses.

In addition to "Century" Apac, K&M manufactures a complete line of Asbestos and Magnesia Insulations, Asbestos Textiles, Asbestos Paper, Packings, Sprayed "Limpet" Asbestos, Asbestos Cement Pipe, Corrugated Sheets, Roofing and Siding Shingles.

Nature made Asbestos . . .

Keasbey & Mattison has made it serve mankind since 1873

K&M Austin Asbestos

KEASBEY & MATTISON
COMPANY • AMBLER • PENNSYLVANIA

PRODUCED
JM - 83



K&M APAC

* Designed and Constructed by Austin Company

The front of this huge aircraft assembly plant shows you another example of Apac's adaptability as an exterior sheathing. Durable, weather-and-fire resistant, K&M "Century" Apac can be put to almost unlimited uses.

In addition to "Century" Apac, K&M manufactures a complete line of Asbestos and Magnesia Insulations, Asbestos Textiles, Asbestos Paper, Packings, Sprayed "Limpet" Asbestos, Asbestos Cement Pipe, Corrugated Sheets, Roofing and Siding Shingles.

Nature made Asbestos . . .

Keasbey & Mattison has made it serve mankind since 1873

K&M Asbestos

KEASBEY & MATTISON
COMPANY • AMBLER • PENNSYLVANIA

PRODUCED
JM - 83