

(24) *Formulation of seal mixes*¹³

Standard testing of rubber seals does not give a characteristic picture of their service behaviour. The fullest correlation with wear in laboratory tests is given by the tear resistance and abrasion before and after immersion in oils. It is proposed that all the mechanical testing be carried out according to GOST specifications. On the basis of the method indicated for preliminary assessment of the properties of the seals, for reciprocal motion with high pressure, and of those working under high friction, mixes are formulated on a base of nitrile rubber with polyvinyl chloride and asbestos fibre.

(25) *Sheet material for floors and walls*¹⁴

This material is made from a composition containing a filler such as asbestos, limestone, lead carbonate, barytes and cork, pigments as desired, and a plasticized copolymer of vinyl chloride and vinylidene chloride. A suitable plasticizer for the copolymer is tricresyl phosphate, which may be extended with a mineral oil. The plasticized copolymer comprises 24 to 50 per cent of the total mix.

(26) *Delay cables*¹⁵

The core of a delay cable comprises an inextensible base member of dielectric material such as linear polyamide, asbestos, or glass fibre over which is a mixture of finely divided magnetizable material and a dielectric binder. This binder may be a synthetic plastic such as polyethylene, polyvinyl chloride, polyurethane, or polyisobutylene. The inner conductor is wound on this core. Such a cable has uniform electrical characteristics along its length.

(27) *Beater saturation of asbestos fibres*¹⁶

In treating asbestos with latex, natural or synthetic, some constituents of the asbestos are dissolved out and interfere with the adequate penetration of the rubber into the fibres. The condition is largely corrected by treating the asbestos slurry, before adding the latex, with a sequestrant, such as ethylene diamine tetra-acetic acid.

(28) *Puncture sealing composition*¹⁷

The composition comprises a mixture of filler (powdered mica or other lamellar material 60 to 100 per cent, asbestos or other fine fibrous material 0 to 40 per cent, human hair or other coarse fibred material 0 to 5 per cent); a gelatinous medium (containing one or more of the following: bentonite, water-dispersible gums, stearic or other partial esters of a polyhydric alcohol, water); a humectant (e.g. glycerol); a corrosion inhibitor (sodium benzoate); a bactericide; and a fungicide.

(29) *Use of rubber in gas-main joints*¹⁸

A summary of Report No. IGU/3-55 to the 6th International Congress of the Gas Industry, by the Austrian Gas Association, describes the use of rubber for sealing gas-main joints. Various types of joint with rubber rings, and joints for cast-iron, steel, and asbestos cement pipes, are described in detail and are illustrated.

(30) *Sealing strips*¹⁹

The sealing strip is carried by one member to be joined and either engages the second member or lies sufficiently close to it to provide a good seal in combination with a series of spring clips for gripping the sealing strip and the member on which it is mounted. The sealing strip is in the form of an inherently resilient strip-like component bent transversely into substantially V or U section and has a covering of asbestos cloth or synthetic rubber.

(31) *Deposition of tacky impregnating agents on cellulosic fibres*²⁰

These inventions are designed to prevent the formation of rubber clots when latex, natural or synthetic, is used to impregnate fibres, such as cellulosic fibres, leather, or asbestos fibres. A list of anti-clotting agents is given, for example sodium octyl sulphonate and sodium butyl naphthalene sulphonate.

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most promising and most effective in electrical applications. A typical example of such applications is the electrical tape, the warp of which is made of continuous glass filament or of glass staple fibre yarn and the weft of softly twisted asbestos yarn or roving. In this case, the exceptional strength of glass filaments contributes to tensile properties, while asbestos acts as a cushioning medium improving the flex-abrasion properties of such a composite fabric.

Perhaps the most successful commercial example of glass



Figure 98. Asbestos sleeving for the electrical industry

asbestos combinations is 'Novabestos' tape (trade name of Raybestos-Manhattan Inc.). This tape is composed of 30 to 35 per cent of asbestos spinning fibre of non-critical grade, 60 to 65 per cent of glass fibre, and 3 to 5 per cent of organic binder. When coated with polyvinyl acetate, it provides a tough, flexible, and water- and flame-resistant insulation.

Amongst the organic fibres, cotton is still the most important reinforcing medium for various types of asbestos rovings. Several polyester-asbestos and nylon asbestos combinations have been developed in recent years in which these new man-made fibres are mainly utilized for the purpose of improving the strength of the final product. They are successfully used as a reinforcing core in braiding yarns, rovings, and tapes.

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6. British Patent 624,361. *Compound Sheet Materials*, Westinghouse Electric International Co.
7. British Patent 630,319. *Compound Fabrics*, Impregnating for Electrical Insulation, Westinghouse Electric International Co.
8. British Patent 642,744. *Felted Fibrous Products*, India Rubber Gutta Percha and Telegraph Works Co., Ltd., W. W. Puffett, Hawley Products Ltd. and A. Lewin.
9. British Patent 643,018. *Coated Fabrics, Compound Fabrics*, Corning Glass Works.
10. British Patent 652,801. *Plastic Compositions*, B. B. Chemical Co., Ltd., I. F. Puddfoot and F. C. Allen.
11. British Patent 654,024. *Improvement in or relating to the Manufacture of Electric Cables*, Pyrotex Ltd.
12. British Patent 669,158. *Coated Fabrics*, Electrical Insulating Compositions and Processes, British Thomson Houston Co., Ltd.
13. British Patent 682,044. *Compound Sheet Materials*, British Thomson Houston Co., Ltd.
14. British Patent 729,682. *Electric Insulating Materials*, General Electric Co.
15. British Patent 683,908. *Papier-mache Articles*, Philips Electrical Industries Ltd.
16. British Patent 712,634. *Resinous Compositions*, B. B. Chemical Co., Ltd.
17. British Patent 728,719. *Porous, Fibrous Sheet Material for Electric Accumulators*, Dry Accumulator Co., Ltd.
18. U.S. Patent 2,581,862. *Electrical Insulation Material*, J. S. Johnson and F. L. Schulman to the United States of America (as represented by the Atomic Energy Commission).
19. U.S. Patent 2,460,734. *Impregnation of Asbestos with Tin Oxide*, T. D. Callinan to General Electric Co.
20. British Patent 753,610. *Improvement in Laminated Asbestos Materials*, General Electric Co.

FOR FURTHER READING

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- Rockbestos Wire and Cable. Catalogue No. 10-G 1954, Rockbestos Products Corpn.
- F. Jones. 'Insulation of Rotating Electrical Machinery', *Eng. Elect. J.* (Dec. 1953)

value of twice the tension at which the yarn is required to run. The gate tensioner is then adjusted so that the balance beam floats freely between its two stops. The winding speed may be varied, but the rate of 60 yd/min is recommended for routine tests. The yarn may be passed over the pressure roller and run directly into a waste can.

A full description of this test and several test data have been recently published in the U.S.A.¹³

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RECENT PATENT LITERATURE ON ASBESTOS

Friction materials

British Patent 742,286. *Brake Linings*, British Resin Products Ltd. Anacardic materials, such as cashew-nut-shell liquid, are polymerized by mixing with one or more phenolic sulphonic acids and heating. The products may be further polymerized or they may be reacted with formaldehyde, giving products used in clutch facings and brake linings.

British Patent 757,039. *Friction Linings*, Ierodo Ltd.

The frictional properties of friction linings comprising a fibrous material, such as asbestos, and a binding agent, particularly a mixture of natural rubber and a phenol formaldehyde resin, are improved by incorporating a small amount of molybdenum disulphide.

British Patent 769,212. *Refractory Brake Linings Compositions*, Bendix Aviation Corp.

A friction material for brake linings is formed by a sintered mixture of mullite and a metallic binder. The mixture includes molybdenum or tungsten, which acts to inhibit the formation on the friction surface of a high-melting-point glaze. An apparatus for testing specimens of the friction materials when raised to an appropriate temperature is described.

British Patent 77,768. *Phenolic Resin Metal Composition for Brake Shoes*, Westinghouse Air Brake Co.

RECENT DEVELOPMENTS IN THE ASBESTOS INDUSTRY 245

A composition suitable for making brake shoes for railway vehicles consists of:

	(Per cent)
Phenol formaldehyde resin	8 to 15
Cast iron chips	60 to 75
Asbestos fibre	12 to 20
Unvulcanized powdered rubber	4 to 10
Carbon black	0 to 10

British Patent 784,987. *Bonding of Metal to Moulded Compositions*, Bakelite Ltd.

This invention is for improvements in the bonding of metal components to moulded compositions comprising a filler (e.g. asbestos) and a bonding agent.

British Patent 787,782. *Apparatus for Extruding Brake Linings*, James Hardie and Co. Ltd.

British Patent 789,387. *Friction Elements*, The Raybestos Co.

Ceramic friction element for aircraft or railroad cars comprises a fired ceramic matrix body composed of at least 60 per cent by weight of alumina or zirconia or their mixtures and having a porosity of at least 10 per cent by volume of the fired body.

British Patent 781,586. *Frictional Elements*, Small and Parkes Ltd.

Polyphosphochloronitrides rubbery materials, being whole, inorganic and thermostable and capable of undergoing polymerization at temperatures of 360°C, have been found to be useful as a bonding agent in the manufacture of frictional elements. In one example a mix for producing a friction element contains the following ingredients:

	(Parts)
Asbestos	135
Oily polyphosphochloronitride	40
Red oxide of iron	32

Salter, Elwin J.

'Selecting Friction Material', Part 1. Selection factors. Woven, rubberized, and moulded materials. *Materials in Design Eng.* 46, 5, 130-133 (Oct. 1957)

Brakes, drums, clutches etc.

British Patent 788,703

Brakes. A vehicle etc., brake mechanism with a secondary actuating cylinder is operated alternatively by high- or low-pressure fluid. Fawick, T. L. 30.1.56. (U.S.A.).

British Patent 788,750

Clutches. A magnetic clutch is automatically co-operable with a brake-controlling gear selection in a planetary gearing, e.g. for a vehicle. Eaton Mfg. Co. 16.6.54. (U.S.A.).

British Patent 788,830

Brakes. A split carrier sleeve is frictionally pressed against an automatic adjustment pin, e.g. in an aircraft disk brake, by split rings. Goodyear Tire and Rubber Co. 1.8.55. (U.S.A.).

British Patent 788,841

Disk brake. A caliper shoe subject to frictional drag in brakes of automobiles, etc., is tightened on the disk by the wedge action of inclined bearing surfaces. Coatalen, L. 10.2.56. (France).

British Patent 788,856

One-way clutch. A friction element comprises a variable-compression coil spring. Parkinson and Cowan Ltd. 30.6.54.

British Patent 789,285

Clutch. For example, an aircraft propeller turbine, hydraulically controlled with variable application pressure and high-rate disengagement. A modification of British Patent 690,592. Gen. Motors Corp. 27.6.56.

British Patent 789,287

Clutch disk. Clutch disk which does not chatter, squeak, etc. is divided into

- vanes each carrying linings with grooves extending into the vane material. S.A. Française du Ferodo, 6,7,55 (France).
- British Patent 789,477.
- Brake or Clutch.* Fawick Corpn. A hook-flange assembly by which a base-plate of a friction block is secured to a rubber-surfaced annular, fluid-distensible member.
- British Patent 675,380. *Asbestos-cement Board-making Machines.* F. Y. Brigue. Asbestos-cement slurry in a tank is mixed and shredded by rotary blades, and is deposited through a metering outlet onto a belt travelling over a suction box and conveyed to a wet press and to a making-roller.
- British Patent 677,488. *Improvement in or relating to the Treatment of Fibre-cement Products.* O. H. Waechter. Asbestos-cement is wound up on a making-roller. The sheet stripped therefrom is passed on a conveyor to a rotary cutter, conveyed to a travelling belt which passes through a drying chamber heated by gas, electricity, or radiant heat to 400° to 600° F to dry the outer strata of the sheets and then through a cooling chamber to a platen or roll press with plain, intaglio, or relief rolls, e.g. to emboss a wood-grain pattern on the sheets.
- British Patent 702,301. *Moulding Asbestos-cement.* Soc. due. Fibrociment et des revêtements Flo. Hollow bodies of angular or curved shape, e.g. T-pieces and pipe bends, are moulded from a mixture containing a watery substance in which asbestos and cement predominate, by feeding the mixture after being homogenized under pressure into a moulding space between a mould and a core and having the required non-rectilinear or angular character, the walls of the mould and/or core being perforated and coated or covered with filtering material.
- British Patent 704,701. *Moulding Corrugated Sheets from Fibrous Cement.* J. P. Petritsch. A plant for manufacturing boards from asbestos cement comprises a conveyor system associated with means for corrugating soft sheets on moulds and means for stacking the moulds loaded with the corrugated sheets.
- British Patent 704,089. *Process of an Apparatus for Moulding Articles from Pasty Masses* (e.g. asbestos cement). N. V. Eternit v' H. Eerste. Nederlandsche Fabriek van Asbest cement Platen Martin. The invention enables the production of machine-made bent pipes, sockets, bends, T-shaped articles and the like.
- British Patent 770,912. *Asbestos cement Products covered with Aluminous Cement Compositions.* Amianthis AKT-Ges. A layer of asbestos Portland cement, from which gypsum has been removed with the mixing water during manufacture, is covered with a wet or dry layer of coloured asbestos aluminous cement to which may be added magnesium silico-fluoride and sugar to retard setting. The aluminous cement may be supplied in front of the forming roller.
- British Patent 772,666. *Coating Asbestos Shingles.* Robin and Haas Co. Polymers and copolymers of vinyloxy ethers and the methylol and alkoxy-methyl derivatives are applied to asbestos shingles to impart a protective coating.
- British Patent 775,303. *Cementitious Compositions.* Findlay G. K. A pointing material consists of a dry mixture which is subsequently mixed with a water-absorbent filler such as asbestos fibre, shellac, and a plastic moulding powder.
- British Patent 775,492. *Plastic Compositions.* Insulex Mineral Products Ltd. Thermal insulating lining for pipes is prepared by intimately mixing and grinding together lime and natural silica, e.g. kieselguhr, and adding vermiculite or asbestos and heating the composite material in an autoclave to promote reaction between the lime and silica.
- British Patent 775,919. *Machine for Moulding Concrete Pipes.* Aktiebolaget Otto Verken.
- British Patent 761,744. *Fibre Board.* Karlhoms Aktiebolag. Solid moulded slabs or other shaped bodies of asbestos are prepared by

- precipitating the binding agent on to the fibres suspended in an aqueous solution of the binder, e.g. carboxymethyl cellulose, by acidifying the solution with acid, partially dehydrating the coated fibres, pressing them to form moulded slabs and drying the slabs.
- British Patent 786,555. *Structural Panel Incorporating Corrugated Asbestos Sheet as Reinforcement.* Petredene Ltd., 23-39 Bendon Valley, London, S.W.18. A structural panel for use in building comprises a core of corrugated asbestos sheet covered on at least one side with a layer of hardened gypsum plaster moulded on to the core so as to bridge the crests of the corrugation.
- British Patent 790,040. *Improvement in Moulding Fibrous Cement Pipes.* Coalita S.A., Jorge Juan 1, Valencia, Spain. Internal mould for manufacturing bent, tubular fibre-cement elements, wherein the core, in the form of a solid cylindrical body occupying the interior of a pneumatic rubber tube, is articulated and flexible.
- U.S. Patent 2,528,353. *Apparatus for Producing Pipes.* John Ferla to U.S. Asbestos Cement Pipe Co. The object of this invention is to improve the construction and manner of operation of the machine, particularly in the raising and lowering of the calendaring rolls, and the means used for applying pressure to the formed pipe. A further object of this invention is to improve the manner of extracting the excess moisture from the applied layer and to improve the mechanism for supplying mixtures of asbestos and cement to the mandrel.
- U.S. Patent 2,529,175. *Apparatus for Texturing Asbestos-cement Pipes.* W. L. Nelson to United States Gypsum Co. This invention applies to a machine for impressing a design into the surface of a plastic sheet. It comprises a conveyor belt, a die suspended above the belt, a spring-biased pressure-imparting roller and means to reciprocate this roller.
- U.S. Patent 2,568,023. *Free-filtering Asbestos and Method of Procuring Same.* W. M. Perry to Johns Manville Corpn. This invention relates to an improved free-filtering form of chrysotile asbestos fibres and to a method of treating such fibres to increase their freeness and filterability.
- U.S. Patent 2,588,828. *Composition for and Method of Producing Coated Cement Surfaces and the Product Resulting Therefrom.* S. Griener to Johns-Manville Corpn. Durable, weatherproof, and decorative coatings for asbestos-cement-base sheets are obtained from a suspension of finely-divided mineral pigments and 3 to 6 per cent (dry weight) of silicone resin in an aqueous solution of an alkali silicate.
- U.S. Patent 2,750,302. *Method of Preparing a Non-blooming Cement Shingle and Products.* F. Camarda.
- U.S. Patent 2,785,987. C. L. Blake. Roofing and siding compositions comprise a mixture of about 35 to 50 per cent Portland cement and 15 to 20 per cent asbestos fibre.
- U.S. Patent 2,793,131. Johns-Manville Corpn. A method is described for manufacturing high-temperature insulating blocks and shapes from a slurry containing 35 to 78 per cent diatomaceous earth, 5 to 15 per cent asbestos fibre, 2 to 7 per cent hydrated lime, 0 to 10 per cent bentonite, and 5 to 10 per cent self-setting normal magnesium carbonate.
- U.S. Patent 2,794,752. *Light-weight Concrete.* Internationella Siporex A.B. (Sweden). A cellular concrete block made by expanding with aluminium powder a slurry of cement, lime, and asbestos fibres, is impregnated with silicate and thermoplastic resin to increase its tensile strength.
- U.S. Patent 2,796,843. Streatch Research Corpn. Improved backing rings for the welding of ends of pipe sections are made of porous, shatterable, easily machined ceramic compositions. Mixtures include kaolin, talc, feldspar, kyanite, and asbestos.

U.S. Patent 2,798,822. Thermo-Roof Inc.

An improved surfacing material for roofs is made by applying to a heat-softened asphaltic base a layer of Portland cement, plasticized polyvinyl acetate, short asbestos fibres, marble flour, powdered aluminium silicate, and water.

U.S. Patent 2,813,637. Shingle Take Off, Johns Manville Corp.

Improved method and apparatus for automatically handling and stacking uncured shingles and sheets of asbestos cement.

Recent literature of interest

'Colour on Concrete and Asbestos.' *Bldg. Mat.* 1957, 18, No. 11, p. 473.

The use of internal enamel for the waterproofing and protection of concrete is mentioned.

'Asbestos-cement Decking Tiles for Flat Roofs.' *Bldg. Mat.* 1957, 18, No. 1, p. 16.

Asbestos-cement decking tiles with incombustible finish have been developed for application over asphalt and built-up felt coverings.

'Asbestos-cement Panels for Exterior Walls of Stone.' *House and Home*, 8, 174, (Sept. 1955).

'Asbestos-cement Products. What They Are and How to Use Them.' *Am. Bld.* 72, 83-90 (Oct. 1950).

'The Elastic and Structural Properties of Asbestos Cement.' Chao, Pe Jean, Univ. Microfilms. Publication No. 4127, 158.

'Improvement in the Quality of Asbestos cement Materials by Hydrophilic Additives.' S. B. Salidzhanow. *Doklady Akad. Nauk. Uzbek.*, 6, 37-38, (1955).

Additives are surface-active materials, including soap flakes.

Asbestos in the floor-tiling industry

British Patent 785,059. *Laminates For Flooring Covering*, Soc. Del. Lindem Soc.

A laminated material suitable for floor covering comprises at least two laminae of a highly-plasticized resilient polyvinyl resin and at least one other non-deformable lamina containing little or no filler or plasticizer which is sandwiched between two resilient laminae.

British Patent 785,020. *Floor Covering*, Rubber Improvements Ltd.

A floor covering of plastic or rubber is coated on its undersurface with a tacky cement which is protected by a removable sheet of vinyl chloride polymer.

British Patents 784,488 and 688,373. *Laminated Materials for Covering Walls and Floors*, Marley Floor Tile Co.

A laminated-sheet material suitable for covering walls and floors is formed by saturating a fibrous-base layer, e.g. felt or woven fabric, with coal-tar or a solid or highly-viscous distillation residue of coal-tar, covering one surface of the base layer with an intermediate adhesive layer and laying thereon a wear-resisting layer of a thermoplastic composition consisting of copolymer of vinyl chloride and vinylidene chloride together with a plasticizer, and at least 59 per cent of a filler containing asbestos, cork, barytes, china clay, dolomite, etc.

British Patent 777,748. *Moulding Linoleum Type Sheet Material*, Armstrong Cork Co.

British Patent 777,067. *Bituminous Compositions for Floor Covering*, Semtex Ltd.

A join-filling or floor-covering composition comprises a mixture of tar and 6 to 18 per cent of vinyl chloride resin. Asbestos as a filler may be present in this composition.

British Patent 770,067. *Bituminous Composition*, Semtex Ltd.

The composition which may be used as a join-filling material, as an electrical insulating material, as an adhesive or fixative, or in the construction of roads, airfield runways, floors, or bridges, comprises an oil-gas tar admixed with a

polymer polyvinyl chloride in an amount of from 5 to 60 per cent and may contain fillers, e.g. granulated cork, rubber crump, asbestos fibre, hydrated lime, limestone, or brick-dust, and a plasticizer such as dibutyl phthalate.

British Patent 756,383. *Making Marbled Sheet Material Rubber and Fibrous Composition*, Semtex Ltd.

Examples describe a thermoplastic composition comprising polyvinyl chloride, tricresyl phosphate, asbestos fibre, dried carbonate, dried stearate, gelled castor oil, pigment, and whitening. Vulcanizable rubber composition comprises natural rubber, high styrene-butadiene rubber, asbestos fibre, whitening, zinc oxide, wax, and sulphur.

British Patent 756,384. *Marbled Thermoplastic Sheet Material*, Semtex Ltd.

A process for the production of thermoplastic sheet or rubber-composition sheet materials having a marbled pattern, is described in which a net of the material, e.g. plasticized polyvinyl chloride, is superimposed on a base sheet of the same material but of a different colour and the two bonded together by calendering at an elevated temperature.

British Patent 756,944. *Jointless Flooring Compositions*, R. M. Bushby

Composite flooring materials based on polyvinyl resin latexes are described which give a veined or marbled effect on trowelling.

British Patent 751,733. *Laminated Sheeting Floor Coverings*, Semtex Ltd.

Laminated sheeting suitable for use as floor coverings consists of a vulcanized rubber backing sheet to which is bonded a wearing surface of a filled plasticized polyvinyl resin such as a plasticized polyvinyl chloride resin containing asbestos filler. The sheets are bonded together by applying a rubber-metal resin adhesive to the rubber layer, and an adhesive comprising a mixture of an acrylonitrile copolymer and/or a vinyl resin copolymer and a phenol formaldehyde resin to the polyvinyl resin layer and finally heating the two under pressure.

British Patent 745,955. *Tile Compositions*, Armstrong Cork Co.

Tiles which can be made in light-duty equipment comprise 70 to 80 per cent asbestos filler and 20 to 30 per cent of binder. The binder includes a phenol formaldehyde resin, a vinyl resin, e.g. a vinyl chloride-acetate copolymer and a plasticizer.

British Patent 742,231. *Roller Sheeting Plastic Fibrous Compositions*, R. Klinger and H. Lohr

Examples are given of compositions to be rolled into sheets, suitable for floor surfaces, insulation, and packing. The composition for floor surfaces and packing contains rubber, benzene, zinc oxide, sulphur, and asbestos fibres. Also, for the floor lithopone is added and for the packing, heavy spar.

British Patent 745,149. *Thermoplastic Compositions for Tiles*, Semtex Ltd.

Thermoplastic compositions suitable for the production of tiles of satisfactory indentation, static load, and grease resistance comprise 76 to 50 per cent by weight of filler, e.g. asbestos, and 24 to 50 per cent by weight of binder comprising a polyvinyl resin, e.g. vinyl chloride, vinylidene chloride copolymer, a plasticizer, and a blown vegetable oil.

British Patent 741,001. *Plastic Tiles*, Armstrong Cork Co.

A composition suitable for making plastic tiles comprises 60 to 80 per cent by weight of filler such as asbestos and limestone and 40 to 20 per cent by weight of binder including a vinyl chloride-acetate or vinyl chloride-vinylidene chloride copolymer, a coumarone indene resin or a polystyrene resin or polymers of unsaturated hydrocarbons, a dihydric alcohol-aromatic dicarboxylic acid condensation product, e.g. diethylene glycol phthalate, and plasticizer, e.g. tricresyl phosphate.

British Patent 740,861. *Fibrous Compositions for Floor Tiles*, Etablissement Stallit.

Fibro-cement compositions for floor tiles comprise sawdust treated with calcium chloride and nitrite, volcanic stone, quartz, sand and gravel, and Portland cement.

British Patent 738,794. *Resilient Tiles*, Armstrong Cork Co.

A resilient tile comprises 70 to 80 per cent filler and 30 to 20 per cent binder. The filler contains a finely divided inorganic material, e.g. limestone, and a

fibrous material, e.g. asbestos. The binder contains a resin-modified phenol formaldehyde resin and plasticizer. The composition is hot-rolled into a blanket, then passed through a calender to produce a sheet which is cut into tiles.

Recent literature of interest

Fire Retardant Vinyl Asbestos Tile Flooring.

Manufacturers: Kentile Inc., 58 2nd Avenue, Brooklyn, N.Y.

Press announcement: *The Financial Times*, January 8th, 1958

Reinforcement of Plastics with Asbestos. Anon. *Kautsch. Gummi*, 1957, 10, No. 11, 277-280, 282, 284

This article reviews on the basis of seventeen references, moulding compositions of asbestos and synthetic rubbers, polytetrafluoroethylene and vinyl compounds in brake and clutch materials, seals, acid-resistant coatings, flooring, and coatings.

Floorings. E. Fortum, *Kunststoffe*, 47, 569-578 (1957)

General requirements of good flooring materials are enumerated after which plastic floorings are discussed including that made of polyvinyl asbestos-filled resin and linoleum. Progress made in standardization is reviewed.

Asbestos paper

British Patent 759,319. *Asbestos Paper*, Raybestos Manhattan Inc.

Paper is made from a suspension of chrysotile asbestos fibres having 25 to 100 per cent of the weight of the fibres of a water-soluble soap, e.g. ammonium, sodium or potassium hydroxide reacted with linseed, castor, soya, or fish oil, as colloiding agent.

British Patent 771,080. *Coated Fabric*, Kellogg Co.

Materials such as paper, leather, glass, wood, iron, copper, aluminium, or asbestos may be coated with a resinous polymer of trifluorochloroethylene applied from a dispersion.

British Patent 773,563. *Impregnated Electric Insulation*, B.L.C.C.

A cable conductor is enclosed in a laminated body built up from insulating strips and permeated with a gel formed by subjecting a liquid organo polysiloxane to high energy irradiation. The strips may be of asbestos paper.

British Patents 777,913 and 753,610. *Electric Insulating Paper*, General Electric Co. Electric insulating paper, laminated plates, etc. made from asbestos and containing minor quantities of bentonite, or glass or cellulosic fibres, are impregnated with phosphoric acid compound and heated to 600° to 1,000° C, e.g. for 1 to 15 hr to form products of a low power factor and dielectric constant and of high dielectric strength. The asbestos may have an iron content of 6 per cent, or may be purified to an iron content of less than 1 per cent. Highly viscous aluminium phosphate solutions may be used for bonding the laminates. Alternatively, orthophosphoric acid and asbestos fibres may be moulded and fired.

British Patent 781,512. *Paper Containing Synthetic Filaments*, Du Pont de Nemours and Co.

Paper is made by felting, e.g. on a paper-making machine an aqueous pulp having suspended filaments of polytetrafluoroethylene, asbestos fibres, or flake mica, a setting agent, and antifoaming agent. The polytetrafluoroethylene filaments may be prepared by shredding extruded rod. The paper made may be sintered at 350° to 370° C to improve its strength.

U.S. Patent 2,401,313. *Reinforced Asbestos Paper*, F. G. Quinn

U.S. Patent 2,451,805. *Coating Asbestos Paper*, T. D. Callinan, General Electric Co.

The tensile and dielectric strengths of asbestos paper are improved by treating it with a 20 per cent silver solution of magnesium chloride and drying, dipping in 20 per cent solution of concentrated ammonium hydroxide and drying at 175° C.

U.S. Patent 2,467,540. *Treating Asbestos Paper with Hydrofluoric Acid*, F. M. Marion

Treatment improves the tensile strength.

U.S. Patent 2,493,604. *Insulating Paper of Asbestos and Bentonite*, T. R. Walters to General Electric Co.

U.S. Patent 2,557,715. *Test Strips*, A. Wright

Treatment of asbestos paper for sugar testing.

U.S. Patent 2,661,288. *Forming Asbestos Products from Polyvalent Ion Dispersed Asbestos*, G. D. Barbaras

U.S. Patent 2,626,213. *Asbestos Dispersion*, I. Novak to Raybestos Manhattan Inc.

Asbestos-fibre dispersions for the manufacture of paper.

U.S. Patent 2,791,159. *Cement-bound Asbestos Paper*, S. M. Lillis

A low-cost process for making cement-bonded asbestos paper is described in which the beater slurry comprises 96 to 98 per cent water and 2 to 4 per cent solids, the latter consisting of 80 to 88 per cent asbestos fibres and 12 to 20 per cent Portland cement. A solution of sodium silicate is applied to the partially dried paper.

Laminated materials

British Patent 753,610. *Laminated Asbestos Material*, General Electric Co.

Laminated asbestos products comprise asbestos laminates bonded with an aluminium phosphate and having a varnish coating of an organopolysiloxane resin.

British Patent 761,132. *Laminated Building Board*, Tentest Fibre Board Co.

A sound-absorbing building board for lining ceilings and walls comprises a facing layer of hard material such as hardboard or plastic material formed with perforations, united for example, by gluing, to a backing of softer material such as asbestos.

British Patent 764,335. *Laminated Material*, I.C.I. Ltd.

Articles of clothing that reflect heat radiation are made up from flexible sheet material, e.g. asbestos impregnated with a flame-proofing composition, or coated with polyvinyl chloride and metallized with aluminium.

British Patent 765,562. *Laminated Materials*, Distillers Co. Ltd.

Laminates are produced from materials such as asbestos, using as the bonding agent a mixture of an unsaturated polyester resin, a monovinyl aromatic compound and a finely divided vinyl chloride polymer. The laminates are useful in the production of boats, tubes, ducts, car bodies, and aeroplane parts.

British Patent 771,559. *Thermosetting Synthetic Resin Laminates*, Semtex Ltd.

An antistatic material in the form of a tray or container comprises a polyester resin having a laminated fibrous reinforcement, e.g. asbestos embedded within it and having a small proportion of acetylene black distributed through it.

Mouldings

British Patent 742,011. *Moulding Resin-impregnated Fibrous Material*, Westinghouse Electric Intern. Co.

A refrigerator is made by uniting a mass of fibres, e.g. asbestos with a small quantity of binder, shaping the mass into a desired body impregnating the entire exterior of the body with organic resin, curing and hardening the applied resin. A final coat of enamel may be applied.

British Patent 756,745. *Moulding Fibre Resin Material*, Bristol Aeroplane Co. Ltd.

A turbine blade is produced from resin-bonded asbestos.

British Patent 762,462. *Moulding Resin-impregnated Fibrous Material*, National Research Development Corpn.

In making a built-up aerosol skin by vacuum moulding, use is made of several layers of asbestos felt, which had been impregnated with an aqueous solution of phenol formaldehyde resin and, just before laying in the mould, further impregnated with an acetone solution of a stable resorcinol-formaldehyde resin.

British Patent 766,918. *Moulding Fibrous Blocks or Boards*, Johns Manville Corpn.

A pre-reacted dilute aqueous slurry, e.g. of asbestos, diatomaceous earth, and hydrated lime or bentonite is supplied to a high-pressure piston mould having a brass perforated piston and perforated base-plate, to form blocks or boards.

British Patent 788,063. *Moulding Reinforced Plastic Tubes*, The Distillers Co. Ltd.

The fibrous reinforcing material may be asbestos.

British Patents 778,683, 778,685, 778,684, and 778,661. *Moulding Resin Fibre Articles*, Bristol Aircraft Ltd.

Aircraft wing panels are made of woven or felted asbestos fabric impregnated with thermosetting resin.

U.S. Patent 2,795,510. *Moulding Composition*, J. S. Thompson

Free-flowing moulding composition comprises asbestos fibres sprayed with acid and aluminium metal.

Bituminous compositions

British Patent 742,639. *Bituminous and Fibrous Compositions*, F. Z. Posschl.

An expansion joint composition comprises phenol, pitch, and fillers. The fillers comprise a mixture of asbestos, baryta, and china clay.

British Patent 742,711. *Fibrous Compositions*, Cellon Ltd.

Mastics for use in lagging pipes consist of the following (in per cent): petroleum residues (35), tung oil (35), wood flour (10), short fibre asbestos (16), titanium dioxide (3), and cobalt driers (1).

British Patent 756,723. *Bituminous Composition*, Chemieprodukte Ges.

Anti-corrosion and sealing compositions are described with asbestos fibre as a filler.

British Patent 776,057. *Bituminous Compositions*, Winn and Coates Ltd.

A material which is used as an insulant to prevent galvanic corrosion of metal junctions comprises a carrier of woven or felted fabric made from asbestos.

Filtration

British Patent 770,396. *Paper Coated with Adhesive and Fibres*, Vokes Ltd.

A filter for fluids is produced by deeply pleating a laminated sheet comprising a sheet of paper impregnated with a synthetic resin but leaving the pores open for the passage of filtrate adhered by means of a pervious adhesive which does not form a fluid-tight skin to a layer of felted material, e.g. asbestos.

British Patent 780,265. *Filter Mats*, Ford Ltd.

Mats formed of cellulosic and asbestos fibres for use in filter presses for beer, have directly deposited on one or both surfaces a water-insoluble resin, e.g. urea-formaldehyde applied as droplets, which, after evaporation form particles to provide a permeable film on such mat surfaces.

U.S. Patent 2,614,655. *Filter Material*, S. H. Katz, to U.S.A. as represented by the Secretary of War.

A new type of filtering medium is made by impregnating a filter paper with a finely pulverized asbestos-particle filtrate.

U.S. Patent 2,790,523. *Cigarette-smoke Filters*, Cambridge Filter Corpn.

A composite filter sheet material comprises asbestos, viscose, and cotton fibres.

U.S. Patent 2,795,103. *Screen Filtering*, G. Jenison

Asbestos fibres mixed with foamed gypsum plaster forms a porous mass.

U.S. Patent 2,797,163. *Filtering Material*, W. J. Smith and R. W. James to U.S. Atomic Energy Commission

The sheet is formed by a wet process of glass fibre, blue asbestos, and polyacrylic resin. The resulting sheet has good heat resistance and filtration properties.

Disposal of radioactive wastes at Argonne National Laboratory. W. D. Rodger. *Proc. Ind. Waste Conf.* 8th Conf. 1953, 474-479 (1954)

Gaseous or gas-borne wastes are disposed of by conventional air-cleaning equipment supplemented by use of the A.E.C. filter, a highly retentive paper-asbestos filter, later burned in an incinerator.

Electrical insulation

British Patent 773,282. *Electrical Insulating Material*, General Electric Co.

An electrical insulating structure comprises a sheet of insulating base material impregnated with an organic binder resin and coated with an organopolysiloxane resin.

Base materials may be multi-layered felted-asbestos sheets.

British Patent 777,299. *Laminates for Electric Insulation*, Westinghouse Electric International Co.

Compositions which are useful for preparing laminates and for impregnating electrical coils comprise a polysiloxane, polymerizable through the vinyl group in the presence of a catalyst. The laminates may consist of sheets of asbestos cloth.

U.S. Patent 2,788,052. *Electrical Insulation*, E. L. Schulman to Westinghouse Electric Corpn.

A thin laminated sheet of electric insulating material, having high strength and good resistance to cracking, comprises a sheet of glass cloth bounded on each side by a surface sheet of asbestos paper impregnated with a polyester resin.

U.S. Patent 2,792,871. *Insulating Structure*, P. Doigan to General Electric Co.

Asbestos material impregnated with a polyester resin is wound in the form of cylinders for use as dielectric barriers on transformer cores.

U.S. Patent 2,809,946. *Moulding Composition*, T. R. Blegen and T. G. Custer to General Electric Co.

Moulding composition for manufacture of products having improved water resistance and electrical properties comprises unsaturated polyester resin, chrysotile asbestos, and a lead salt.

Textiles

British Patents 758,640, 746,037, and 746,038. *Waterproofing Asbestos*, Libbey-Owens Ford Glass Co.

Asbestos is waterproofed by the application of a vinylsilanol aqueous dispersion at a pH of between 3 and 8. The material may be immersed in the dispersion or the dispersion applied to the material followed by drying. The silanol condenses to form an insoluble water-repellent silicone.

British Patent 772,088. *Silicone-coated Cloth*, General Electric Co.

Heat-resistant asbestos-cloth is coated with an organopolysiloxanes composition.

British Patent 780,660. *Ironing Presses*, R. Lessing

Use is made of asbestos fabric as a heat-insulating material.

Aluminized Asbestos Keeps Driver Cool. Anon. *Materials in Design Eng.* 46, 7, 210, 212 (Dec. 1957)

Kearby and Mattison's aluminized asbestos cloth used as a protective cover for a catalytic exhaust purifier installed on a fork lift truck.

Fibre recovery

U.S. Patent 2,803,346. *Removing Fibres from an Ore*, D. Weston and A. R. MacPherson

The apparatus and method are described for removing opened asbestos fibres from host rock and unopened fibre bundles.

U.S. Patent 2,813,306. *Dust Removing*, Mc. W. D. Sheldon

The mass of fibres is passed over a screen being subjected to the pulsating air flow which alternatively lifts and redeposits the fibrous material.

U.S. Patent 2,813,626. *Recovering Asbestos Fibres*, C. G. Boss

Good fibres are recovered from the tailings by allowing the latter to fall free through a series of electrostatic fields where asbestos is progressively separated from waste.

Machine for Reclaiming Asbestos Spinning Wastes. (In German.) K. Müller. *Gummi u. Asbest.* 10, 694, 696 (Dec. 1957)

Separates usable fibres from foreign matter and fine asbestos dust.

Miscellaneous

British Patent 752,433. *Patching*, American Marietta Co.

A composition for patching plywood comprises a thermosetting resin, e.g. phenol formaldehyde resin, mineral fillers, e.g. china clay, and fibrous material, e.g. asbestos.

British Patent 783,327. *Composition for Jointing Construction Parts*

The bands, strips, or moulded elements to be used for jointing comprise:

	(Per cent)
Bitumen	50
Rubber	6
Polyvinyl chloride or polyethylene	4
Petroleum jelly	7
Pulverized rock	24
Asbestos	8
Chlorophenol	1

British Patent 766,918. *Mineral Fibre Board*, Johns. Manville Corpn.

The process is described for the manufacture of thermal insulating boards made from amphibole or Amosite asbestos.

INORGANIC FIBRE PAPERS

ASBESTOS PAPERS

Method of manufacture

Asbestos papers are made in thicknesses ranging from 2.5 mils to 60 mils and in widths from 36 in. to 60 in. The equipment and the production technique closely follow those for ordinary cellulose-paper making.

Chrysotile asbestos of paper stock grade is mixed with a large amount of water to the consistency of a thin slurry in a beater of conventional design. The binder, usually of a processed-starch type, is added in the beater in order to improve strength and permit faster wet-end operation. The slurry discharged from the beater by means of plunger pumps passes over settling troughs where rock and foreign matter are removed.

The purified material is afterwards screened immediately ahead of the paper machine in order to eliminate oversize fibres and unopened fibre bundles. At this stage, the material reaches the wet end of the machine and the formation of the paper begins with the pressing of suitably prepared layers of asbestos fibres by felt couch rollers. The sheet thus formed is transferred to the dry end of the machine, where it is passed through a series of steam-heated rollers and wound on a drum.

Uses

Asbestos papers are chiefly used as a low-cost spacing material in the electrical industry and for heat insulation.

Some years ago a range of high-purity asbestos paper was developed by the Johns-Manville Corporation, made entirely of asbestos fibres with no binder, the so-called 'Quinterra' grade, which opened new possibilities in high-temperature dielectrics. Its main characteristics are low thickness, homogeneity, flexibility, and high mechanical and dielectric strengths'. Successful attempts were made to reinforce high-purity asbestos paper with glass fibres, and this material would appear to have possible applications in electrical machines, as its tensile strength and resistance to tearing are quite high.

Another interesting combination of asbestos and glass has recently been introduced; glass cloth and asbestos paper, both of

Cushioning materials between metals and brittle ceramics, and refractories to prevent vibration failure of brittle materials at high temperatures.

Low heat-capacity refractory facings on steel and other metals. Paper can be cemented to metals to afford protection from heat and corrosion.

Gasket between orifice block and feeder bowl in glass furnace fore-hearths.

Seal between refractory sub-assemblies in launder or piping systems conveying molten non-ferrous metals.

Protective sheet to prevent scratching of polished metal during heat treatment.

For production of inorganic or organic bonded laminates²¹.

Properties

Chemical composition	Per cent
Alumina	51.2
Silica	47.1
Boric oxide	0.6
Soda	0.6
Total magnesia, lime, iron oxide	0.5

Thermal conductivity (B.t.u./ft² hr deg. F)

Mean temperature (°F)	'K' factor
600	0.52
1,000	0.73
1,400	0.95
1,800	1.22
2,000	1.36

Physical data

	Series					
	970-A	970-AH	970-F	970-FH	970-J	970-JH
Rated thickness (in.)	0.020	0.020	0.040	0.040	0.080	0.080
Density, lb/ft ³ at rated thickness	19	18.5	16	14	15	14
Ft ² /lb (approx.)	31	32	19	20	9.4	10
Lb/ft ² (approx.)	0.032	0.031	0.053	0.050	0.106	0.100

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