July 29, 1947. A. H. DAVIS 2,424,743

COMPOSITE TEXTILE STRAND AND FABRIC

Filed March 31, 1945

Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

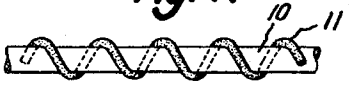


Fig. 5.

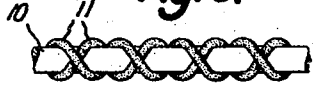


Fig. 6.

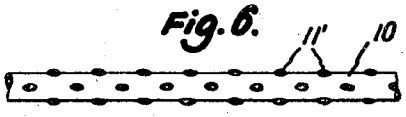


Fig. 7.

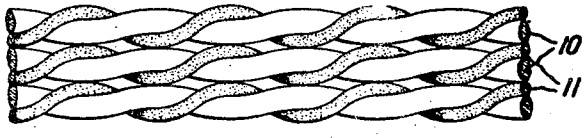


Fig. 8.

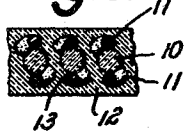
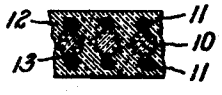


Fig. 9.



Inventor:

Archibald H. Davis

By Pierce & Scheffler

Attorneys.

Patented July 29, 1947 2,424,743

UNITED STATES PATENT OFFICE

2,424,743

COMPOSITE TEXTILE STRAND AND FABRIC

Archibald H. Davis, Washington, D. C.

Application March 31, 1945, Serial No. 585,879

9 Claims. (Cl. 28—82)

1

This invention relates to novel composite textile strands in which the base fiber or fibers are inorganic, particularly silicious, in compositions and to textile fabrics, including woven, knitted, plied and laminated sheets, webbing, belts, tapes, cordage and the like.

A general object of the invention is to greatly reduce or eliminate the disadvantageous qualities of the inorganic type of fibers while retaining in full degree their advantageous qualities, such as tensile strength, resistance to atmospheric influences and to biological attack, and heat stability.

A further object of the invention is to increase the utility of textile fabrics having an inorganic fiber base.

Another object of the invention is to improve the adhesion of coating compositions to textile fabrics having an inorganic fiber base.

Another object is to produce a wide variety of textile fabrics of inorganic fiber base of novel or improved industrial utility.

Other objects and advantages of the invention will appear from the following description.

The invention includes composite textile strands comprising one or more fibers of inorganic material and an organic plastic composition covering a portion only of the surface of the inorganic fiber and projecting therefrom to a greater effective diameter in the strand than the inorganic fiber. The invention also includes textile fabrics broadly, woven, knitted, plied and laminated from the strands of the invention into sheets, webbing, belts, tapes, cordage and the like, which may be coated, laminated or otherwise treated by known methods to produce articles of improved utility or appearance.

Typical of the inorganic fibers useful in the invention are glass fibers produced in the known way of any desired dimensions, composition and color. Other inorganic fibers suitable for use in the invention are asbestos fibers, mineral wool fibers, and metallic fibers or wires.

The organic plastics useful in the invention may be selected from a wide variety of classes of organic resins and elastomers including cellulose esters and ethers; polymerization and co-polymerization products of olefinic compounds, such as vinyl compounds, styrene, acrylic acid and its derivatives; synthetic or artificial rubber compositions, such as polymerized dienes and the various modifications thereof, rubber halides and hydrohalides, and chloroprene; urea-, thiourea-, and melamine-aldehyde resins; phenol-aldehyde resins; glycerol-polybasic acid resins; polycarboxylic amide condensation products; and mixtures of two or more resins or elastomers. The plastics may include suitable plasticizers, pigments, fillers and other modifying agents well known in the plastic art.

The composite strands of the invention may

2

be made in a wide variety of ways, such as by plying or twisting together one or more threads or fibers of inorganic material and one or more threads or fibers of organic plastic. In forming the strands by twisting, it is desirable that the relative tensions on the inorganic and on the plastic fibers be such that in the finished strand the plastic fibers or threads overlie or project in the strand beyond the effective diameter of the inorganic fiber or fibers in the strand. If the final fiber or thread diameter of the plastic is the same as or less than that of the inorganic fiber or thread, the tensions should be such that the plastic fiber is given a substantially greater twist. If the final diameter of the plastic fiber is greater than that of the inorganic fiber, the twist of the plastic fiber may be the same or less than that of the inorganic fiber. The plastic fiber may be twisted or plied in a multiple of directions with respect to the inorganic fiber.

The organic plastic composition may also be applied to the inorganic fiber in the form of discontinuous or discrete elements, such as short fiber lengths, or in small mounds or strips, or in any other way which will provide on a portion only of the surface of the inorganic fiber or fibers forming the base of the strand projecting organic plastic material which in an eventual fabric will separate the inorganic fibers of juxtaposed strands and lubricate or float the inorganic fibers in the fabric structure so as to release the full strength of the inorganic fibers while preventing abrasion of juxtaposed fibers, thereby enhancing the strength, flexibility and durability of the fabric structure. The projecting organic plastic fibers or elements of the strand or fabric also provide an ideal base for attachment of coating compositions both by increasing the adhesiveness of the surface of the strands by the related chemical composition of the projecting plastic to the coating composition and by providing an effective mechanical interlocking by virtue of the channels and projections formed by the plastic on the strand surface.

The invention will be more particularly described with reference to the accompanying drawing showing illustrative embodiments of the principles of the invention.

In the drawings:

Fig. 1 is an enlarged diagrammatic representation of a composite strand embodying the principles of the invention;

Fig. 2 is a cross-section of the composite strand of Fig. 1;

Fig. 3 is an enlarged diagrammatic representation of another embodiment of the invention;

Figs. 4, 5 and 6 are enlarged diagrammatic views of further embodiments of the invention;

Fig. 7 is an enlarged diagrammatic plan view of a fabric of the invention, and

Figs. 8 and 9 are enlarged diagrammatic cross-sections of coated fabrics of the invention.

In the figures, the organic plastic elements or fibers are stippled to distinguish them from the inorganic fibers of the strand.

In the strand shown in Figs. 1 and 2, the inorganic fiber 10 and the organic plastic fiber 11 are of substantially the same diameter and the plastic fiber is caused to project to a greater diameter in the strand by giving it a greater degree of twist in the strand, for example, by subjecting the inorganic fiber to greater tension than the plastic fiber while twisting the two fibers into the strand.

In the strand of Fig. 3, the organic plastic fiber 11 has a greater fiber diameter than the inorganic fiber 10 so that when twisted into a strand at substantially the same tension the plastic fiber projects to a greater distance in the strand than the inorganic fiber. In forming strands of the type shown in Fig. 3, the organic plastic fiber at the time of plying into the strand may be of the same size or even smaller than the inorganic fiber and thereafter swollen to greater size by a suitable treatment such as by heating or by treating with a swelling agent.

In the strands of Figs. 4 and 5, organic plastic fibers 11 are plied or twisted about substantially straight inorganic fibers 10. A plurality of plastic fibers of different directions of twist may be utilized, as in Fig. 5.

The strand of Fig. 6 is illustrative of a variety of possible forms of the invention in which discrete elements of organic plastic material 11' are applied to the surface of an inorganic fiber 10.

Fig. 7 shows diagrammatically how the organic plastic elements 11 of the invention act to separate and lubricate, while at the same time interbonding the inorganic fibers in the fabric structure so as to make available the full tensile strength of the inorganic fibers while preventing their abrasion and improving the flexibility and hand of the fabric. It will be obvious that the same combined lubricating and bonding action will be effective when the strands of the invention are interplied, interwoven, knitted or interlaced in any direction and according to any pattern. The inorganic fibers constituting the basis of the fabric will not be in direct contact at any point, although maintaining to the maximum their characteristic strength and resistance.

Figs. 8 and 9 illustrate in diagrammatic cross-section a fabric of the general type of Fig. 7 coated with a coating composition 12, for example, a natural or synthetic rubber compound. In Fig. 8 the fabric is shown with the inorganic fibers 10 and the organic plastic fibers 11 projecting from the plane of the section to illustrate more clearly how the organic plastic elements of the invention bond the coating composition to the plastic structure both by the greater inherent adhesion of the plastic elements and by the mechanical interlocking which is indicated, for example, at 13.

It will be clear from the foregoing description and examples that the construction and arrangement of the elements of the strands and fabrics may be widely varied without departing from the principles of the invention as defined in the following claims.

I claim:

1. A composite textile strand comprising at least one inorganic fiber and discrete elements of an organic plastic composition covering a portion only of the surface of said inorganic fiber and projecting therefrom to a greater effective diameter in the strand than the inorganic fiber.

2. A textile fabric comprising a plurality of inorganic fibers separated from each other in the fabric by discrete elements of organic plastic composition covering a portion only of the surface of the inorganic fiber.

3. A composite textile strand comprising at least one glass fiber and discrete elements of an organic plastic composition covering a portion only of the surface of said glass fiber and projecting therefrom to a greater effective diameter in the strand than the glass fiber.

4. A textile fabric comprising a plurality of glass fibers separated from each other in the fabric by discrete elements of organic plastic composition covering a portion only of the surface of the glass fiber.

5. A composite textile strand comprising at least one siliceous fiber and discrete elements of an organic plastic composition covering a portion only of the surface of said siliceous fiber and projecting therefrom to a greater effective diameter in the strand than the siliceous fiber.

6. A textile fabric comprising a plurality of siliceous fibers separated from each other in the fabric by discrete elements of organic plastic composition covering a portion only of the surface of the siliceous fibers.

7. A textile fabric comprising a plurality of inorganic fibers separated from each other in the fabric by discrete elements of organic plastic composition covering a portion only of the surface of the inorganic fibers, and a coating composition bonded to said inorganic fibers by said organic plastic composition.

8. A textile fabric comprising a plurality of siliceous fibers separated from each other in the fabric by discrete elements of organic plastic composition covering a portion only of the surface of the siliceous fibers, and a coating composition bonded to said siliceous fibers by said organic plastic composition.

9. A textile fabric comprising a plurality of glass fibers separated from each other in the fabric by discrete elements of organic plastic composition covering a portion only of the surface of the glass fibers, and a coating composition bonded to said glass fibers by said organic plastic composition.

ARCHIBALD H. DAVIS.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
2,200,946	Bloch	May 14, 1940
2,306,781	Francis	Dec. 29, 1942
1,820,868	Epstein	Aug. 25, 1931
891,935	Jerrems	June 30, 1908
1,884,069	Mendel	Oct. 25, 1932
2,313,058	Francis	Mar. 9, 1943

FOREIGN PATENTS

Number	Country	Date
43,371	Holland	June 15, 1938
685,047	France	Nov. 16, 1929