July 29, 1941. A. M. GOODLOE 2,250,863

FLEXIBLE CABLELIKE FORMATION OF KNITTED METALLIC FABRIC

Filed Oct. 8, 1940 2 Sheets-Sheet 1

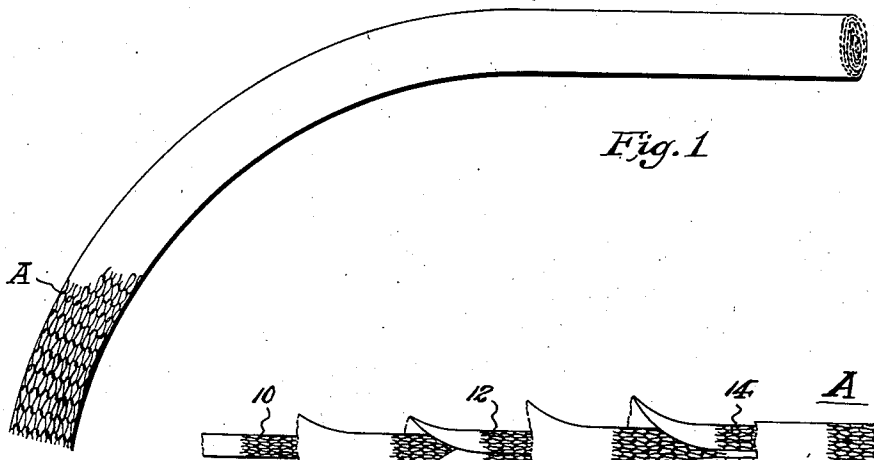

Fig. 1

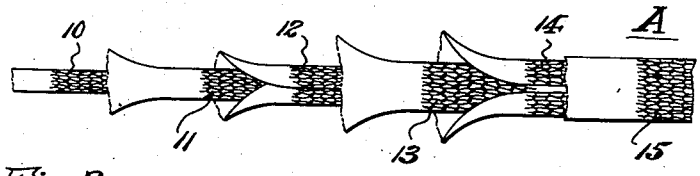

Fig. 2

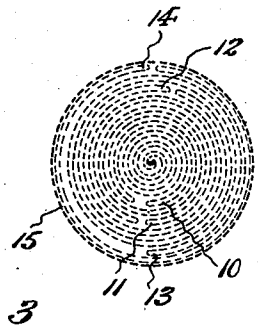

Fig. 3

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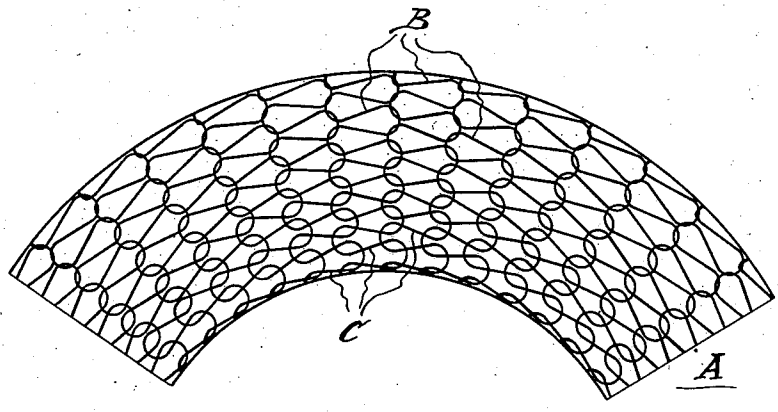

Fig. 4

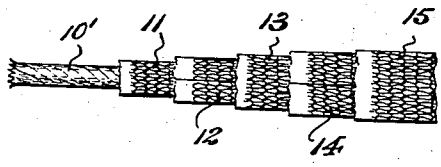

Fig. 5

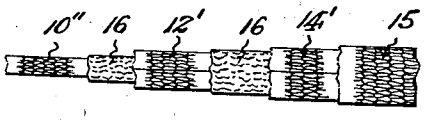

Fig. 6

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Patented July 29, 1941 2,250,863

UNITED STATES PATENT OFFICE

2,250,863

FLEXIBLE CABLELIKE FORMATION OF KNITTED METALLIC FABRIC

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Application October 8, 1940, Serial No. 360,220

9 Claims. (Cl. 66—170)

This invention relates to an improved material of indeterminate length and suitable cross-sectional shape formed from knitted metallic fabric to provide a body which is highly resistant to transverse crushing pressure and yet possessive of a high degree of flexibility along its longitudinal axis: such material being of cable-like form, of desired cross-sectional shape, and suitable for many uses including, for example, use as a packing or gasket material, with or without impregnation by various other substances or incorporation therewith of other materials; or as power transmission shafting of flexible character; or for many other uses in connection with which a cable-like formation of flexible characteristics would be desirable.

This invention, therefore, has for an object to provide a cable-like formation comprising a metallic mesh fabric made from knitted wire which, when subjected to pressure transverse to its longitudinal axis, is sufficiently hard to withstand comparatively high pressure without undue tendency to deformation, and yet of such longitudinal flexibility as to permit the same to be readily conformed to desired annular shapes without stretching or substantially altering the cross-sectional area of the body thereof; such ability being due to a compensating relative sliding action of the interengaged knit wire loops of the metallic mesh fabric from which the body is made, whereby differently located areas of the fabric, respectively subjected to longitudinal stretch and compression, may be relatively elongated and shortened without working, bending or otherwise stressing or straining the metallic wire from which the fabric is made.

Other objects of this invention, not at this time more particularly enumerated, will be understood from the following detailed description of the same.

Illustrative embodiments of the novel cable-like body of knitted metallic fabric are shown in the accompanying drawings, in which:

Fig. 1 is a fragmentary side elevation of the cable-like body; Fig. 2 is a fragmentary side elevation of the body with successive portions of layers of knitted metallic mesh making up the same broken away so as to show the relation thereof in the make-up of said body; Fig. 3 is a schematic cross-sectional view of the body, drawn on an enlarged scale; and Fig. 4 is a schematic side elevation of the body to illustrate sliding play between interengaged knit loops of the metallic mesh fabric to which the longitudinal flexibility or pliability of the body is due, and by which such characteristics are attained without substantially altering the cross-sectional area thereof or stressing or straining the metallic wire from which the body material is made.

Fig. 5 is a view similar to that of Fig. 2, but showing a modified construction of the cable-like body; and Fig. 6 is a similar view of another modified construction of the cable-like body.

Similar characters of reference are employed in the above described views, to indicate corresponding parts.

In making up the novel flexible cable-like body, in one form thereof according to this invention, strips of knitted metallic wire fabric of desired length and suitable width are employed. These strips preferably comprise tubular knit metallic fabric members which are flattened to provide double ply strips; although it will be obvious that flat knit strips constituting single ply strips may be optionally used. A plurality of such strips are used, varying in number according to the diametric size of cable-like body desired to be produced.

For the purpose of illustration, as shown in Figs. 2 and 3, one strip, indicated by the reference character 10, is laterally rolled upon itself to form a center member or core, upon which, in successively applied overlying layers, are superimposed successive strips 11, 12, 13, and 14 by respectively tightly rolling or laterally winding or convolving the same about the said core 10 and one upon another until a body A of desired diameter in cross-section is built up. The knitted loops of the thus assembled strips are all disposed parallel to the longitudinal axis of the resultant body, thus permitting relative sliding action of the interknit loops whereby the longitudinal flexibility of the resultant body is assured, as will be subsequently more fully explained.

Instead of employing a plurality of strips, which is the preferable practice as above set forth, the body may be produced by laterally winding a single strip of knitted metallic fabric of suitable width upon itself, whereby to build up the convolved superposed layers wherein the interengaged knit loops will nevertheless lie parallel to the longitudinal axis of the body and the compensating sliding play between adjacent loops will be permitted.

Preferably, an external cover member 15 of tubular knit metallic fabric is applied over the basic formation to retain the elements thereof against disassociation; although other forms of retaining means may be employed, if desired, and

in some cases such retaining means may even be omitted.

The resultant body, formed as above described by the tightly laminated core and overlying built up strips of knitted metallic wire fabric, will be sufficiently hard or dense to strongly resist pressures applied thereto transverse to its longitudinal axis, and yet, due to the play permitted between the interlinked knitted wire loops, will nevertheless be readily flexible along its longitudinal axis, and consequently may be easily bent into circular or other annular shapes of comparatively small radius without stressing or straining the wire strands from which the fabric is knit.

Owing to the permissible longitudinal sliding play between the interlinked knitted loops in either direction, the fabric elements of the body will readily react to longitudinal stretch at one point or area thereof and to compression at another point or area thereof when the body is flexed or bent along its longitudinal axis. This is schematically indicated in Fig. 4 of the drawings, wherein a section of the body in bent condition is shown. When the body is bent longitudinally, the areas of the fabric elements lying along the outward portions of the bent section will be subject to longitudinal stretch, whereas the areas lying along the inward portions of the bent section will be subject to longitudinal compression or contraction. Upon these conditions, as shown in Fig. 4, the interlinked loops B located along outward areas of the bent section will tend to slide away one from another, whereas the interlinked loops C located along the inward areas of the bent section will tend to slide toward one another. It will be obvious that these different and opposite relative sliding movements of interlinked knit loops in the outward and inward areas of the bent section will be mutually compensating, and consequently the wire strands per se will not be unduly stressed or strained with tendency to breaking or other injury, and yet a high degree of longitudinal flexibility will characterize the body. Furthermore, any tendency of the loops which slide away one from another to elongate and thus laterally contract will be compensated by the tendency of the loops which slide toward one another to laterally expand, and consequently the longitudinal bending of the body will not result in any substantial alteration of the cross-sectional shape and area of said body, nor will wrinkling or bulging occur along the inner areas of the bent body.

The novel cable-like body, having the flexible and other characteristics above set forth, and in the form described, will be found useful for many purposes, such as a packing or gasket material, flexible shafting, as a cushioning medium for absorbing vibration in joints and other mechanical associations, and as a base for friction materials such as brake linings. When used as a packing or gasket material, if so desired, the same may be impregnated or filled with any desirable liquid proofing substance, or it may be impregnated with graphite, rubber or other plastic filler. Furthermore, when used as a packing or gasket, the body may be preformed to cross-sectional shapes other than the circular shape shown in the drawings, such e. g. as of square or other polygonal cross-sectional shape, and this without unduly impairing its desired longitudinal flexibility.

The novel flexible cable-like body may also be provided in variously modified forms in which other materials are incorporated therewith in association with the strip of knitted metallic wire fabric of which it is basicly formed. Examples of such modified forms are shown in Figs. 5 and 6 of the drawings. In Fig. 5, in the modified construction therein shown, the core 10' of the body may comprise a length of flexible cable, rope or cord of textile, metallic or other material, around which are laminated the superposed layers of knitted metallic wire fabric 11, 12, 13 and 14, and, if desired, the external tubular sheath or cover 15 of knitted metallic wire fabric. In Fig. 6, in the modified construction therein shown, the core 10'' and superposed layers of knitted metallic wire fabric 12' and 14', with or without the tubular sheath or cover 15 of knitted metallic wire fabric, may be alternated with interposed layers 16 of fibrous material, such e. g. as asbestos. This last described form would offer special advantages where a heat resistant material for packing or other uses is desired.

It will be understood that other modifications of the basic material may be devised, and that various other changes may be made in the product within the scope of this invention as defined in the appended claims. It is therefore intended that all matter contained in the foregoing description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

I claim:

1. A longitudinally flexible cable-like body comprising knitted metallic wire fabric arranged in laterally convolved superposed layers, wherein the interengaged knit loops of the fabric lie parallel to the longitudinal axis of the body, and wherein sliding play is permitted between longitudinally adjoined loops toward and from each other throughout the mass of the body.

2. A longitudinally flexible cable-like body comprising knitted metallic wire fabric arranged in laterally convolved superposed layers, wherein the interengaged knit loops of the fabric lie parallel to the longitudinal axis of the body, and wherein sliding play is permitted between longitudinally adjoined loops toward and from each other throughout the mass of the body, and a tubular cover sheath of knitted metallic wire fabric enclosing said body.

3. A longitudinally flexible cable-like body comprising a flexible core and knitted metallic wire fabric laterally convolved about said core in closely hugging superposed layers, wherein the interengaged knit loops of the fabric lie parallel to the longitudinal axis of the body, and wherein sliding play is permitted between longitudinally adjoined loops toward and from each other through the fabric mass.

4. A longitudinally flexible cable-like body comprising a flexible core and knitted metallic wire fabric laterally convolved about said core in closely hugging superposed layers, wherein the interengaged knit loops of the fabric lie parallel to the longitudinal axis of the body, and wherein sliding play is permitted between longitudinally adjoined loops toward and from each other through the fabric mass, and a tubular cover sheath of knitted metallic wire fabric enclosing said body.

5. A longitudinally flexible cable-like body comprising, a plurality of strips of knitted metallic wire fabric, one said strip being laterally rolled upon itself to provide a central core, a succession of other strips being laterally convolved about said core in closely hugging super-

posed layers whereby the body is substantially resistant to deforming pressure applied transverse to the axis thereof, the interengaged knit loops of the fabric strips being disposed to lie parallel to the longitudinal axis of the body, and longitudinally adjoined loops throughout the assembled fabric strips being capable of relative sliding play toward or from each other when the body is flexed along its longitudinal axis, to thereby compensatingly permit elongation of outward portions and contraction of inward portions of the flexed body without undue alteration of its cross-sectional shape and area.

6. A longitudinally flexible cable-like body comprising, a plurality of strips of knitted metallic wire fabric, one said strip being laterally rolled upon itself to provide a central core, a succession of other strips being laterally convolved about said core in closely hugging superposed layers whereby the body is substantially resistant to deforming pressure applied transverse to the axis thereof, the interengaged knit loops of the fabric strips being disposed to lie parallel to the longitudinal axis of the body, and longitudinally adjoined loops throughous the assembled fabric strips being capable of relative sliding play toward or from each other when the body is flexed along its longitudinal axis, to thereby compensatingly permit elongation of outward portions and contraction of inward portions of the flexed body without undue alteration of its cross-sectional shape and area, and a tubular cover sheath of knitted metallic wire fabric enclosing said body.

7. A longitudinally flexible body of suitable cross-sectional shape comprising a flexible core and a plurality of strips of knitted metallic wire fabric successively laterally convolved about said core, the interengaged loops of the fabric strips being disposed to lie parallel to the longitudinal axis of the body, and longitudinally adjoined loops throughout the assembled fabric strips being capable of relative sliding play in longitudinal directions under flexing stresses applied to said body.

8. A longitudinally flexible body of suitable cross-sectional shape comprising a flexible core and a plurality of strips of knitted metallic wire fabric successively laterally convolved about said core, the interengaged loops of the fabric strips being disposed to lie parallel to the longitudinal axis of the body, and longitudinally adjoined loops throughout the assembled fabric strips being capable of relative sliding play in longitudinal directions under flexing stresses applied to said body, and a tubular cover sheath of knitted metallic wire fabric enclosing said body.

9. In a longitudinally flexible body as defined in claim 7 wherein layers of fibrous material are interposed between two or more of said convolved strips of knitted metallic wire fabric.

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