April 17, 1962 L. A. RUNTON 3,030,248

LOW FRICTION MOLDED FABRIC BEARING

Filed Feb. 20, 1958

Fig. 1.

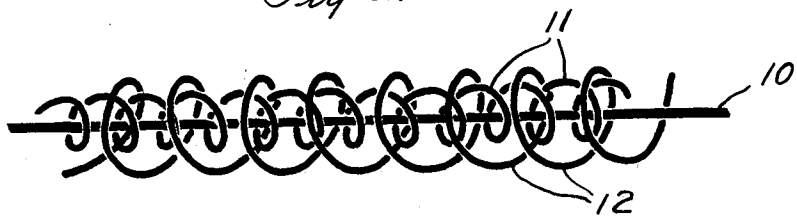


Fig. 2.

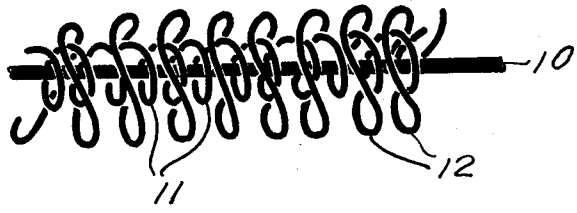


Fig. 3.

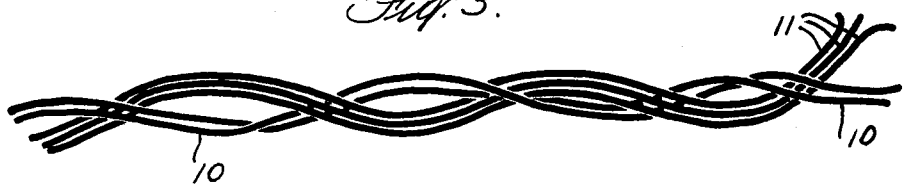


Fig. 4.



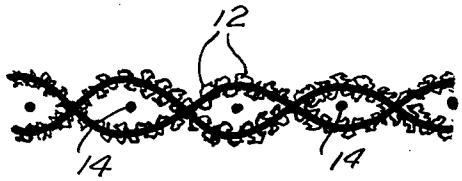


Fig. 5.

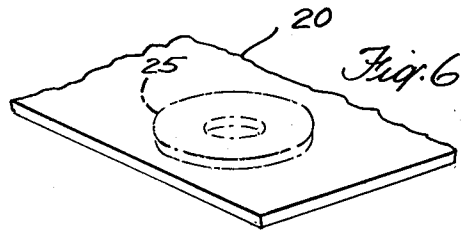


Fig. 6.

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LOW FRICTION MOLDED FABRIC BEARING

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This invention relates to molded fabric bearings and more particularly to a fabric for such purposes having improved characteristics.

An object is to provide a fabric composed of a compound yarn having plies of low friction material and other plies composed of a bondable material so disposed that the low friction plies are exposed at the surface and the bondable plies are bonded by an impregnating resin.

Another object is to provide a fabric of the above type wherein the yarn contains a ply of shrinkable material which is adapted, when the fabric has been resin impregnated, to be shrunk for increasing the density of the fabric and forcing the low friction plies to the surface.

Other objects and advantages will be apparent as the nature of the invention is more fully disclosed.

The nature of the invention will be better understood by referring to the following description, taken in connection with the accompanying drawing in which a specific embodiment has been set forth for purposes of illustration.

In the drawing:

FIG. 1 is a diagramamtic view of a yarn embodying the invention;

FIG. 2 is a diagrammatic view of the yarn of FIG. 1 after shrinking;

FIG. 3 is a view similar to FIG. 1 illustrating a further embodiment of the invention;

FIG. 4 is a diagrammatic view of the yarn of FIG. 3 after shrinking;

FIG. 5 is a diagrammatic view of a fabric woven from the yarn of FIG. 1; and

FIG. 6 is a perspective view of a molded sheet made from the fabric of FIG. 5.

Referring to the drawing more in detail the yarn is shown in FIGS. 1 and 2 as composed of a core **10** of a shrinkable material. The material may be of the heat-shrinkable type such as continuous filament Dacron or polyethylene or may be wet-shrinkable, such as cotton. A ply **11** of a low friction material of the polymeric fluorocarbon type, such as tetrafluoroethylene (Teflon), monochlorotrifluoroethylene (Kel-F) resins and fluorothene is wrapped around the core **10** in a compact helix. Around the wrapping **11** is wound in the reverse direction a ply **12** of a bondable material such as cotton, spun Dacron or other synthetic material which is capable of bonding to a resin impregnant. The ply **12** may be wound in the form of an open helix to expose the ply **11** between turns.

The yarn of FIG. 3 is similar to that of FIG. 1 except that the inner wrapping of low friction material consists of a multifilament yarn instead of the monofilament shown in FIG. 1. Also the outer wrapping **12** is omitted.

FIGS. 2 and 4 illustrate the form taken by the yarns of FIGS. 1 and 3 respectively after the core **10** has been shrunk to pull the wrappings into more compact helixes and to force the inner wrapping **11** into exposed position.

For making bearings the yarns above described prior to shrinking may be woven as warp chains with filler shots **14** as shown in FIG. 5.

The filler shots are composed of a bondable material similar to the core **10** or the outer wrapping **12** above mentioned. When this fabric is impregnated with a bonding resin and molded under heat and pressure the plies **12** bond to the fillers **14** and thus secure the low friction plies **11** in place.

The fabric may be impregnated with a moldable bonding resin and dried but not cured. For example, the fabric may be impregnated with a high strength phenolic bonding resin derived from the reaction product of phenol, cresol or a homologue with formaldehyde under controlled conditions. The mixture is preheated to remove the solvent and the resin content polymerized until a residual volatile content of 5% to 7% is attained.

The drying temperature serves to heat shrink the cores **10** if the cores are formed of a heat-shrinkable material, or the moisture in the resin impregnant serves to shrink the cores if they are composed of a wet-shrinkable material such as cotton. This shrinking of the cores serves to compact the weave and at the same time to force the low friction wrapping **11** to the surface. Since the fillers **14**, the core **10** and the outer wrapping **12** are bondable to the resin these elements are bonded together in the fabric to produce a structure wherein the exposed low friction and non-bondable plies **11** are firmly secured in place by the bondable plies.

The impregnated fabric thus dried may be stored for subsequent use or may be shipped to a distant point for molding.

For forming the bearing the fabric is then molded under heat and pressure into the form of a sheet **20** as shown in FIG. 6. The conversion of the resin into a thermoset form may be accomplished at a temperature of 300° F. to 350° F. for from thirty to sixty minutes at pressures of 10 tons to 100 tons, depending upon the area of the object being molded.

Other resin compositions may also be used as the impregnant, for example, polyvinylchloride or the epoxy resins.

In the case of a liquid, such as polyvinylchloride the mold may be heated to the polymerizing temperature for polyvinylchloride i.e. 350° F. to 360° F. and immediately cooled to set the resin to solid form with the fabric embedded therein.

The epoxy resins are thermosetting and may be applied to the mold in the form of a molding powder. The mixture is cured by heating to the proper temperature to convert the resin into the form of a solid body in which the fabric is embedded.

A bearing disc **25** is stamped out of the sheet **20**. This disc **25** has low friction yarns exposed on both surfaces to constitute an anti-friction thrust bearing or seal which can be used for long periods of time without lubrication or excessive wear.

Although a specific use has been illustrated, the disc may be used generally where self-lubricating seals or thrust bearings are required.

The sheet **20** may of course be formed into other shapes as required for bearings for example into the form of a cylinder or a half cylinder from which cylindrical or segmental bearings may be cut. The sheet of the impregnated fabric may also be formed into a conical or hemispherical shape prior to curing to produce correspondingly shaped bearing elements.

What is claimed is:

1. A fabric for making a molded bearing composed of a compound yarn having a straight core of shrinkable organic material and a layer of a yarn composed of a member of the group consisting of polytetrafluoroethylene and polychlorotrifluoroethylene wrapped around said core and exposed at least in part at the surface of said fabric, and a moldable resin in the dried but uncured state impregnating said fabric.

2. A fabric for forming molded bearings embodying a compound yarn composed of a straight core of a shrinkable organic material which is capable of bonding to a resin impregnant a layer of a yarn composed of a member

of the group consisting of polytetrafluoroethylene and polychlorotrifluoroethylene wrapped around said core in a given direction, an outer wrapping of a yarn composed of a material capable of bonding to a resin impregnant disposed around said first layer and wound in the opposite direction, yarns composed of a material capable of bonding to a resin impregnant crossing said first yarns and a resin impregnant in the dried but uncured state impregnating said fabric and bonding said bondable yarns together.

3. A molded fabric bearing comprising a heat curable thermosetting resin in the hard compacted state characteristic of a resin cured under heat and pressure, and a woven fabric embedded therein and bonded thereby, said fabric being composed of a compound yarn having a straight

core formed of a shrinkable organic material which is bondable to said resin and having disposed around said core a wrapping of a yarn composed of a member of the group consisting of polyetetrafluoroethylene and polychlorotrifluoroethylene which is not bondable to said resin, said wrapping forming the exposed surface of said bearing.

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