To all whom it may concern:

Be it known that we, Carl Kochmann, a citizen of the German Empire, residing in Charlottenburg, in Germany, and Jørgen G. Seldal, a citizen of Norway, residing in Gentofte, near Copenhagen, in Denmark, have invented certain new and useful Improvements in Processes of Manufacturing Textile Belts, of which the following is a specification.

The subject-matter of this invention is a process of manufacturing textile belts of any desired length which are not affected either by moisture, high temperatures or powerful vapors, and which are superior to the best leather belts both as to their strength and little dilatation.

The invention consists in the operations described hereinafter and pointed out in the claims.

The process substantially consists in treating webs of fabric formed from vegetable fibrous materials or threads with strong sulfuric acid of such a concentration that the fibers of the textile material are not carbonized or destroyed but the surface of the fabric is converted into an amyloid-like adhesive mass, whereupon the webs saturated with acid are placed one on another while still moist and are united by pressure, without sewing or special adhesive substances, or the insertion of untreated strips of fabric. The action of the acid may last only a very short time, and both the time and the strength and the strength of the fabric. The pressure is preferably effected in a press made of lead or other material which is not attacked by sulfuric acid, e.g.

A roller press, in which the desired number of the webs coming out of the acid bath are placed one on another and united by severe pressure. The excess acid which is pressed out is returned into the bath. The free acid is then completely removed by first washing in a rapidly flowing water-bath and then soaking in a still water-bath, the finished textile belt being finally dried.

One form of apparatus adapted for carrying the process into practice is diagrammatically represented by way of example in section in the accompanying drawing.

Referring to the drawing, the webs are rolled up on rollers a, six thereof being shown in the drawing, and pass separately over guide-rolls b, c, d and through the sulfuric acid bath e. When rapidly drawn through the bath e both sides of each web are pachmentized at the surface. e, converted into an adhesive amyloid, the guide rolls d separately journaled in a frame f and the guide rolls d journaled in the frame g preventing the individual webs sticking together. The rollers d may be provided with devices for returning into the bath e the excess acid pressed out of the webs. The webs then pass under the press rollers h and k which press them together, against a large drum i. The rollers h and k and the drum i are made of an acid-proof material or are covered with such a material. The pressure of the rollers h and k against the periphery of the drum i can be regulated by, for example, placing weights on them. The webs pressed together can be washed with water by means of a washing device located between or behind the rollers h and k. The drum i may be rotatable, in which case a strong uniform pull is exerted on the webs which can be regulated by suitably braking the rollers a. Also, a reeling apparatus o may be arranged at the delivery end of the entire apparatus, by which the webs are subjected to tension.

The united webs pass from the drum i into the rapidly flowing water-bath m in which they remain for a long time. The webs which are united by the acid process and the subsequent severe pressure while still moist are so firmly connected together that they do not separate anywhere during this treatment in the flowing water-bath. This treatment not only completely removes the acid, but also increases the flexibility and strength of the belt because the strong current of flowing water exercises a kind of fulling or scouring action on the belt, whereby its strength and flexibility is increased. This treatment in the flowing water is continued for a time depending on the thickness of the belt, under certain circumstances for several days, until the belt is quite free from acid which can be readily determined by testing the belt or the discharging water with litmus paper or the like.

The belt passes out of the flowing water-bath m into a still water-bath n in which the washing process is continued for some
time. The treatment in the flowing water can be shortened and the belts still containing some acid may be passed through one or more still water-baths arranged one behind another, alkaline substances, bases or salts which neutralize the acid being added to the water if desired. The belts are then subjected to a drying process, e.g., by heating them in a drying chamber, if desired after circulating the alkaline salts.

The sulfuric acid bath has preferably been added to it thickening agents consisting of powdered substances which are not decomposed by sulfuric acid, e.g., barium sulfate or other sulfates not dissolved or attacked by sulfuric acid, or other salts, silicates, brownstone and the like, as well as suitable coloring agents which impart the desired leather color or other colors to the belt after the treatment. The belts may however be colored after they have been made while impregnating them in known manner by means of wax, oil or the like.

Instead of employing flowing water for washing the belts the belt itself may be severely agitated in still water, in which case provision will be made for frequently renewing the water which comes into contact with belts containing much acid.

The belt or the like made according to this invention is characterized by great resistance, durability and strength, and retains its strength and coherence even at high temperatures and in rooms containing aqueous or chemical vapors. Owing to these properties of the product of the described process it is suitable not only for making conveyer belts and bands for conveying moist and hot products, but also for use in factory rooms, and for use as protective coverings, hoods for wagons and motor-cars, tents and other articles exposed to the weather, as well as for making boats, coverings of hulls of ships, and the like. Also, containers, such as buckets, vats and the like, which are to be acid-proof and waterproof, can be made of material made according to this process. In general, the materials made according to the invention are suitable for almost all purposes for which leather is employed, thus for the soles of shoes and the like. Any desired number of layers may be employed. For example, belts can be made according to this process from two, three and more webs or layers of material. The product is like leather; it is flexible and more or less elastic and stiff depending on the thickness and nature of the fabric which is employed, on the substances admixed with the sulfuric acid bath and on the number of the layers or webs. It can be worked and united like leather by cutting, stamping, pressing and sewing as well as nailing. A product provided with holes arranged regularly can be made by perforating the finished belt by means of suitable tools, and fishing nets, strainers for liquids and the like can be made in this manner. The principal employment is, however, for use as driving belts for machinery.

In order to connect the ends of the belts any desired known means for joining belts can be used. Rosinous and oily adhesive substances adhere very well to the belt. If endless belts of predetermined length are made in the mill itself, the ends of the belt can be united by the described treatment in the acid bath. For this purpose, the layers of the belt at the ends to be united are first kept free from acid for a short distance or are not pressed, and after the remainder of the belt has been made its ends are so placed one in another that each two layers of one end of the belt have located between them one layer of the other end. This place will then be preferably treated separately in the acid bath and the layers united by pressure as described above, washed, and dried. In order to prevent the part of the belt where the two ends are joined being too thick, this place can be made equal in thickness with the remainder of the belt by more severe pressure. Individual layers may however be wholly or partially cut away before the treatment at the joint or connecting point so that the joint formed is just as thick as the remainder of the belt.

We claim:

1. A process of producing textile belts and the like which consists in treating webs of fabric formed from vegetable fibrous material with strong sulfuric acid at a temperature not exceeding 65 degrees Fahrenheit until the surface of the material is converted into an amyloid-like non-explosive adhesive mass which is highly resistant to the action of both heat and chemical agents, the sulfuric acid being of such a concentration that the fibers of the material will not be carbonized or destroyed, then placing the so treated webs one on another while still moist, then uniting said webs by applying pressure thereto, and then removing the free acid and drying the belt.

2. A process of producing textile belts and the like which consists in treating webs of fabric formed from vegetable fibrous materials with strong sulfuric acid until the surface of the material is converted into an amyloid-like adhesive mass, the concentration of said acid being such that the fibers of the material will not be carbonized or destroyed, then placing the so treated webs one on another while still moist, then uniting said webs by applying pressure thereto, then removing the free acid and increasing the strength and flexibility of the fabric by first washing it in a rapidly flowing water bath and then soaking it in a still water bath and then drying the belt.
3. A process of manufacturing textile belts of any desired length from a plurality of webs united one with another, consisting in treating the individual webs separately with concentrated sulfuric acid for a short time and in uniting them by pressure while still moist, in then completely removing the free acid by washing first in a quickly flowing water-bath and then in a still water-bath containing a neutralizing agent, and in drying the finished belt.

In testimony whereof we have hereunto set our hands in presence of two subscribing witnesses.

CARL KOCHMANN.
JÖRGEN G. SELDAL.

Witnesses for Carl Kochmann:
HENRY HASPER,
WOLDEMAR HAUPT.

Witnesses for Jörgen G. Seldal:
CHARLES HUDE,
WILH. MARTEN.