Feb. 16, 1960 W. J. BURKHOLDER 2,925,359

ARTIFICIAL FUR

Filed Dec. 3, 1956 2 Sheets-Sheet 1

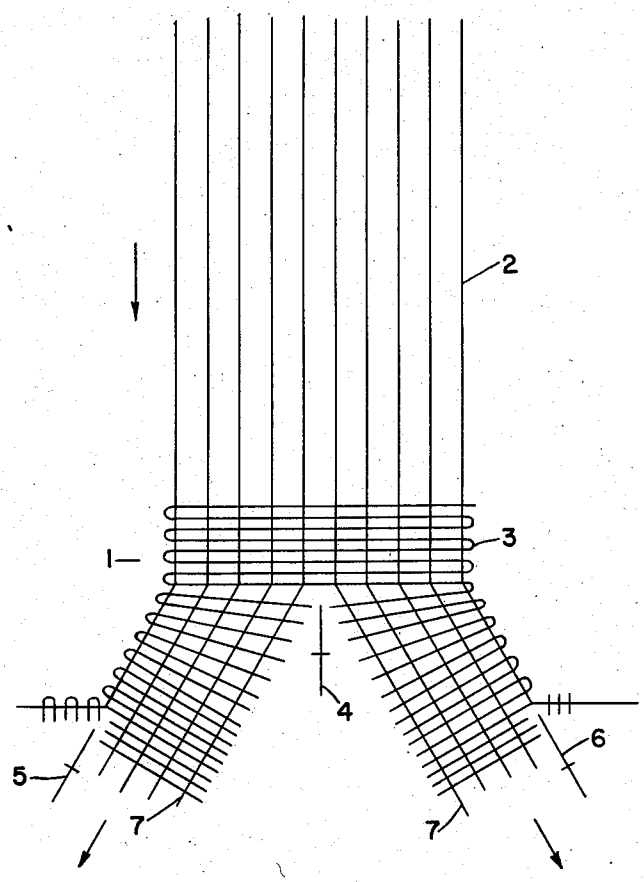


FIG. 1

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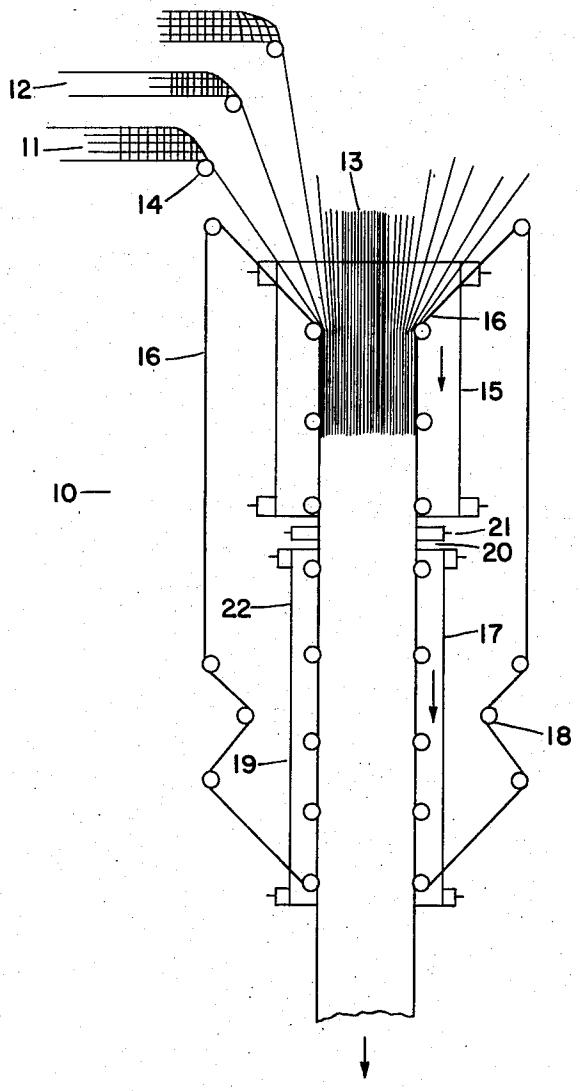


FIG. 2

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2,925,359

ARTIFICIAL FUR

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7 Claims. (Cl. 154—76)

This invention relates to artificial or imitation fur-like materials and it relates more particularly to a novel combination of steps constituting a process for the manufacture of said materials.

Several methods have heretofore been described for the preparation of imitation furs but none, prior to this invention, has resulted in a fur substitute possessing the physical make-up or structure of natural furs.

Fur-bearing animals have two distinct types of hair covering: the guard-hair and the underfur. The guard-hair consists of long spike-like fibers and serves as a raincoat and generally to protect the underfur from matting and wear. The underfur consists of soft downy fibers shorter than the guard-hair and is fine and closely packed. The underfur serves as insulation and to give warmth to the animal during cold seasons.

It is an object of this invention to prepare artificial fur-like materials by a novel combination of process steps.

A further object of this invention is the preparation of artificial fur-like materials in a continuous method by a series of novel process steps to be described more fully hereinafter.

Accordingly, the invention relates to a method of manufacturing artificial fur-like materials which comprises the steps of arranging a plurality of woven webs of varying widths, with their widths in a substantially vertical position and with the lower edges of said webs lying in a common plane, compacting said woven webs, anchoring said co-planar edges in a backing and treating said woven webs to remove the warp therefrom. By the process of this invention there is produced an artificial fur-like material simulating the physical make-up and structure of natural furs.

In manufacturing a substitute fur in accordance with this invention, two fabrics are first woven to simulate the underfur and the guard-fur of the natural fur. In this connection, the fibers or yarn employed in weaving the fabric are selected according to the particular fur desired. This is accomplished by a knowledge or study of the physical and chemical properties of the natural fur to be simulated. With knowledge of the properties of the natural fur it is then necessary to choose or select a fiber or yarn that closely simulates the properties of the natural fur. The particular fiber or yarn selected is then employed to form the weft of the fabric to be woven. The warp material, i.e., the fiber or yarn to be employed in weaving the fabric, is then selected from materials that are known to be capable of being treated to dissolve, decompose, or disintegrate the fiber by the application of a chemical, chemical solution, or other physical, chemical, or mechanical treatment.

Having thus selected the weft and warp materials, the fibers are then woven into a fabric as mentioned above, e.g., into a guard-hair fabric and an underfur fabric.

It will be appreciated that in simulating a natural fur the fiber selected for the guard-hair and the underfur can be of different physical and chemical structure. Accordingly, the weft of the fabric constituting the underfur can be a loosely twisted multifilament yarn of high resiliency of one chemical composition, and the weft of the guard-hair fabric can be a monofilament of less resiliency and of entirely different chemical composition, so long as both materials are substantially unaffected by the treatment which is later employed to remove the warp.

When it is desired to simulate a natural fur only in durability and warmth, the choice of fibrous materials for the weft of the guard-hair and underfur is considerably broadened. Thus the weft of the guard-hair and underfur can be of either the same fibrous material in different forms or they can be of different fibrous materials. As an example, the weft of the guard-hair can be a nylon monofilament of relatively large diameter while the weft of the underfur fabric can be a shorter multifilament nylon yarn of loosely spun construction. On the other hand, the weft material for the guard-hair can be a nylon monofilament while the weft material for the underfur fabric can be made of wool yarn. The invention also contemplates that the fibers employed forming the weft of the fabric can be of heterogeneous multifilament, that is, yarns comprising fibers of nylon, wool, etc. as is well known in the art. From the foregoing, it will be apparent that this invention is not restricted to any particular type of fibrous material. In practice, therefore, the physical properties of any kind of fur can be determined and with such knowledge the proper natural or synthetic fibers can be chosen to form the weft of the woven fabric. The choice of natural or synthetic fibers is, of course, broad and can include animal, vegetable, or mineral fibers such as wool, silk, cotton, flax, glass, as well as any of the various synthetic fibers available commercially and manufactured from such as cellulose acetate, polyacrylic, polyvinyl, polyamide, polyethylene, polyester, and the like materials.

The warp of the fabric consists of any suitable fiber or material that can be treated either physically or chemically to remove it from the woven fabric. It is important and necessary that the weft fibers be resistant to any treatment, i.e., either chemical or physical, to which the warp fibers are subjected. It should be understood that the invention contemplates that the weft fibers of the woven fabric, after the removal of the warp fibers, become the upright hair of the underfur and guard-hair of the artificial fur-like product. Accordingly, the warp of the woven fabric can be selected from any material which, for example, is soluble in a dilute acid or base or other chemical solution that will not affect the weft of the woven fabric. Thus, the warp can be made of a metal which is soluble in a dilute acid or of a water soluble material such as polyvinyl alcohol or casein provided, of course, that the weft fibers are unaffected by either a dilute acid or water.

It is realized that many fibers that are affected by a chemical reagent, for example, a dilute acid or base or are soluble in water, can be chemically treated to render them resistant to such reaction. Accordingly, if desired, the weft materials can be treated to render them resistant to chemical reactions, while the warp is left untreated in order that it can be exposed to such chemicals and dissolved or decomposed thereby. It is apparent therefore, that it is necessary that the fibers chosen for the weft and warp of the fabric be of such a nature that either chemical or physical treatment will dissolve or decompose the warp of the woven fabric while leaving the weft fibers substantially unaffected in the woven fabric.

In a preferred embodiment of this invention, two woven fabrics of different widths and consisting of distinct types of weft fibers and of a soluble or decomposable warp or filling material are prepared by cutting the fabric perpendicularly to the weft to form tapes of widths corresponding to the desired length of the under-

fur and the guard-hair fibers. The underfur tapes are the smaller width materials in order that the finished product will have the physical structure of natural furs. A plurality of underfur and guard-hair tapes are then arranged so that their width is in a vertical position and are placed in alternating arrangement, i.e., an underfur tape is sandwiched between a layer or web of guard-hair tape. The number of tapes arranged in such laminar fashion is not critical and will depend either on the width of the strip of artificial fur desired and/or on the size of the apparatus used for carrying out the manufacture of the artificial fur. After lamination of the tape in the manner aforedescribed, a suitable resilient or pliable permanent backing containing an adhesive composition and the like, is applied to one side, i.e., the lower side of the edges of the tape. In applying the permanent backing, one edge of each upright tape or web is positioned so that it lies in a common plane with the corresponding edge of all other tapes. This arrangement is necessary since the shorter width woven web, after removal of the warp or filling of the fabric is to become the shorter downy fiber of the underfur, while the longer width woven web fibers will be the guard-hair of the simulated fur. The backing, with the lower edges of the laminated woven web anchored thereon, is next treated to set or harden the binder or adhesive material. The fur-like structure, after this treatment, is then passed to a suitable container or vessel where the woven fabric is treated, e.g., with a chemical solution, to dissolve, decompose, or remove the warp. The artificial fur after this treatment is thus seen to consist of long guard-hairs and shorter underfur hairs consisting of the weft fibers anchored to a suitable permanent backing simulating the skin of the natural fur.

Any suitable material can be used for the backing of the fibers. Thus, the backing or binding material can be of a thin soft pliable nature, for example, soft rubber, plastic, and the like. The backing can be reinforced, for example, with loosely knit fabric. The backing and/or the edges of the vertical webs, as heretofore indicated, can be treated with a coating or adhesive, for example, a vinyl plastisol so that the ends of the fibers become embedded thereon.

A more complete understanding of the invention will follow from a detailed description of the accompanying drawings wherein;

Figure 1 shows an enlarged view of a woven fabric being slit perpendicular to the weft fibers in accordance with this invention.

Figure 2 is a diagrammatic plan view of a packing table depicting the general sequence of operations in the method of this invention.

In the drawings, Figure 1 represents an enlarged view of a woven fabric **1** consisting of a soluble warp **2** and an insoluble weft **3**. The fabric is mounted, for example, on a moving belt on a suitable structure (not shown) and is moved in the direction indicated by the arrow towards a rotating blade **4** positioned so as to cut or slit the fabric in a direction perpendicular to the weft. If desired, two additional rotating blades **5** and **6** can be positioned to cut a narrow strip from each edge of the fabric as indicated. This trimming operation is not necessary, however, since the webs or tapes **7** can be fed directly to a packing table or wound on rolls or spools as will be described more fully with reference to Figure 2.

In Figure 2 there is shown a general and somewhat fragmentary plan view of an apparatus suitable for carrying out the steps of this invention. In the drawings, **10** represents generally a packing table consisting of various moving belts and rollers to be described more fully below. Strips or webs **11** and **12** of two different widths representing the guard-hair and underfur and prepared as described above, are fed to the packing table as indicated. The woven webs can be taken directly from the cutting machine or machines as described in Figure 1 above or can be taken from rolls or spools. The webs are arranged so that the guard-hair webs **11** are placed adjacent to the underfur webs **12** so that they constitute plurality of alternating webs of different widths as indicated by numeral **13**. In order that the webs can be fed edgewise, e.g., so that the wefts are in a vertical position, they can be turned through an angle of 90° by a reed indicated generally at **14**. The webs of woven fabric after being fed with their wefts in a vertical position are conveyed by a moving belt **15** traveling at the speed of the feed rate and moving in a direction indicated by the arrow. Side belts **16** are provided to compact the web to the desired degree of contact and travel at the same speed as the conveying belt **15**. It should be mentioned that the moving belts **15** and **16** can be driven or actuated by any suitable power or variable speed driving means (not shown).

The side belts **16** which keep the sandwiched strips or webs compressed move across to a second moving belt indicated generally at **17**, traveling in the same direction as belt **15** as indicated by the arrow. Provision is also made at **18** for a constant tension mechanism in order to keep the side belts **16** at the desired tension and thus control the compactness of the web. Moving belt **17** can be suitably constructed of a metallic material or other heat conductive material.

The position indicated generally at **20** is where a suitable backing or binder material is fed to and carried by moving belt **17**. The moving belt **17** is preferably heated from its undersurface in a heating zone indicated at **22**. At point **20**, a vinyl plastic sheet reinforced with knit fabric is lightly coated on the fabric side with, for example, vinyl plastisol, by any suitable means, e.g., a brush or a coating roller (not shown) and is fed with its coated side up to a heated belt so that it lies between the oncoming web and the moving belt.

Before the laminated fabric webs reach the heated belt and coated plastic vinyl sheet, however, a plastisol applicator or roll **21** positioned between belts **15** and **17** applies a coating of vinyl plastisol to the edges or root ends of the moving web. The roller preferably travels in the same direction as the web, but at a higher speed so that the ends of the fibers are scrubbed with the plastisol. If desired, the roller can travel in a reverse direction at any appropriate speed to accomplish substantially the same object.

Upon contact of the edges of the web fabric with the heated vinyl plastic sheet backing, the fibers are embedded or anchored in the material, i.e., they are fused. The moving belt **17** then carries the material to a cooling section indicated at **19** where the binder or adhesive is set or hardened. The final step in the process consists of passing the fur-like material to a constant feed takeup device into a suitable vessel or other apparatus (not shown) to cause dissolution or decomposition of the warp fibers in the laminated web. After this the material can be dried and treated, i.e., brushing to remove any material remaining loose on the weft fibers.

From the above description, it will be realized that the fibers remaining on the vinyl plastic sheet are the weft fibers of the thin strips of woven fabric. By virtue of having arranged the webs prior to feeding to the packing table in alternating fashion, i.e., having arranged the strips of varying width so that each layer of underfur is sandwiched between a layer of guard-air there is obtained a product simulating a natural fur with guard-hair and underfur.

Having thus described the preferred embodiment of this invention, it will be understood that various modifications can readily be made without departing from its true spirit. Thus, it is apparent that the continuous method of preparing a fur-like material can be modified so that the individual hairs or fibers of the laminated fur can be: (1) of different lengths, (2) different diameters,

(3) mono- or multi-filament yarns or threads or both, (4) different colors, and (5) of different chemical and physical structure.

It should also be understood that while the invention has been described with reference to substitutes for natural furs that it is applicable to the manufacture generally of fur-like materials, i.e., the fur-like physical structure consisting of an underfur and guard-hair. Thus, where it is desired to simulate natural furs only in warmth and durability as mentioned heretofore and not appearance, the choice of fibers can vary quite widely with regard to color, chemical properties, physical nature of the fibers, i.e., mono- or multi-filament yarns or both.

Resort may be had to modifications and equivalents that fall within the spirit of the invention and scope of the appended claims.

What is claimed is:

1. A method of preparing an artificial fur which comprises the steps of forming a plurality of woven webs of varying widths, arranging said webs so that shorter weft webs are interposed between longer weft webs, compacting said webs with their widths in a vertical position, applying a backing material to one side of the lower vertical edges of said webs, anchoring said edges to said backing material and thereafter dissolving the warp fibers from said woven webs.

2. A method of preparing an artificial fur which comprises the steps of forming two woven fabric webs of different widths, a longer width fabric to serve as the guard-hair and a shorter width fabric to serve as the underfur, laminating said woven webs so as to form a plurality of woven webs of alternating longer and shorter width webs, compacting said woven webs with their widths in a vertical position so that one edge of each web is in a plane common to the corresponding edge of the other web, anchoring said co-planar edges in a binder and thereafter dissolving the warp from the woven webs.

3. A method of preparing an artificial fur-like material which comprises the steps of arranging a plurality of woven webs of varying widths with their widths in a substantially vertical position and with the lower edges of said webs lying in a common plane, compacting said woven webs so as to form a plurality of woven webs of alternating longer and shorter width webs, anchoring said co-planar edges in a backing and dissolving the warp from said webs.

4. A method of preparing an artificial fur-like material which comprises the steps of forming a plurality of woven webs of alternating longer and shorter width webs, laminating the wefts with one edge of each web in a plane common to the corresponding edge of the other weft, anchoring said co-planar edges in a backing material and dissolving the warp from the woven webs.

5. A method of preparing an artificial fur-like material which comprises the steps of forming a plurality of woven webs of alternating longer and shorter width webs, laminating and compacting said webs with one edge of each web in a plane common to the corresponding edge of the other web, anchoring said co-planar edges in a permanent backing and dissolving the warp from said webs.

6. A method of preparing an artificial fur-like material which comprises the steps of forming a plurality of woven webs of varying widths, compacting said woven webs so as to form a plurality of woven webs of alternating longer and shorter width webs, applying a pliable backing to the lower edges of said web, anchoring said edges to said backing to produce a permanent attachment to said edges and dissolving the warp from said web.

7. A method of preparing an artificial fur which comprises the steps of forming two woven fabric webs having alternating longer and shorter width webs, one a guard-hair and the other an underfur, forming a plurality of said woven fabric webs by interposing an underfur web between the guard-hair webs, compacting said woven fabrics with their widths in a vertical position, anchoring the lower edges of said woven webs to a permanent backing and thereafter dissolving the warp fibers from said web.

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