APPARATUS FOR TESTING FABRIC OR THE LIKE

Filed Sept. 20, 1954

Inventor:

Jack J. Press

Attorneys:

Rodruck & Evans
APPARATUS FOR TESTING FABRIC OR THE LIKE

Jack J. Press, New York, N. Y.

Application September 20, 1954, Serial No. 457,319

11 Claims. (Cl. 73—7)

(Granted under Title 35, U. S. Code (1952), sec. 266)

The invention described herein may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalty therefor.

This invention pertains to the art of testing materials, and more particularly to the art of testing fabrics to determine their wearing qualities. The invention has been employed for testing textile fabrics of various kinds that are used in garments, and has proven particularly useful for that purpose.

The invention is embodied in apparatus for testing fabrics under friction, and comprises a fabric mount, a friction mount, and a motion or drive for moving the fabric and friction mounts relative to each other in frictional or rubbing engagement with each other.

The fabric mount embodies a predetermined area of flat surface which backs the fabric to be tested. A keeper holds the fabric spread evenly over the backing surface in relaxed condition.

It is particularly desirable that the fabric be held by its mount in relaxed condition, and without being under tension that affects the results of the test. Accordingly, the fabric mount is constructed particularly to hold the fabric in relaxed condition, and a tool is provided for applying the fabric to its backing surface in a condition of being relaxed and free from tension.

The friction mount also comprises a flat surface of a friction material spread evenly. A base holds the fabric and friction mounts with their surfaces disposed parallel to each other. An adjustment embodied in the base enables movement of the several mounts towards and away from each other, and alternatively into and out of face-to-face engagement with each other with their opposed surfaces occupying a common plane. The adjustment includes a device to adjust and control the magnitude of pressure engagement between the opposed surfaces, which is predetermined to the quantity desired.

Apparatus of the invention is adapted particularly for producing "pills," so called.

In the normal use of a fabric, in a garment for example, the fabric may become destroyed or consumed by wear. Usually long before the fabric of a garment becomes destroyed by wear, it develops qualities that are undesirable in a garment, and which render the garment practically useless. Fuzzing, nap erosion, shine, etc., are among these undesirable qualities because they detract from the appearance of the fabric particularly, wherefore they render the garment unsuitable and cause it to be discarded. Development of the pills and "pills" hereinbefore presented another of the qualities of undesirable appearance, and the present invention employs the tendency of a fabric to develop pills as an index of the quality of a fabric for normal wear in a garment, especially in the particular case of developing undesirable appearance.

Pills constitute balls or bunches of fibers that form on the surface of a fabric by rubbing, such as the rubbing of normal wear of a garment. Loose ends of a fiber length in a yarn of a fabric constitute the substance of a pill. Within a length of fiber in a yarn, a portion between its ends may be contained in the yarn with a lesser degree of security, and if it constitutes a bite or loop exposed at the surface of a fabric, it may become substance of a pill.

The rubbing of normal wear of a fabric in a garment tends to raise such loose portions of fibers, consisting of free ends and unsecured portions between ends, and to project these away from the surface of the fabric. These raised portions of fibers then become worked into small masses of fibers, which are distributed over the area of fabric that has been subjected to wear. Each such small mass of fibers is termed a pill. Characteristically the mass of fibers in a pill becomes bunched into a spherical shape, by action in rubbing of twisting, rolling, whisking, or tangling. When the wear that produces pills continues long enough, there come a time when the pill remains joined to the fabric surface by a small strand or a few fibers. Ultimately, and with further wear, the small connecting strand may become broken whereby the pill becomes disconnected from the fabric.

The tendency to pill differs in different fabrics. The tendency of a fabric to pill is employed in practice of the present invention as an index of the contemplated fabric, a fabric, in the particular of its suitability for normal wear in a garment, and especially with reference to its ability to retain desirable appearance during normal wear.

In the apparatus of the invention, the motion or drive produces relative movement between the fabric and friction mounts in the plane of their engagement with each other, the relative movement being in an orbit around an axis normal to the plane of engagement between the several engagement surfaces of the fabric and friction mounts. The alternative is obvious that either the fabric or friction mount may be actuated to attain the desired relative movement, with the other element being held stationary by the base of the apparatus, or a motion may be employed that actuates both mounts to produce the desired relative movement between the fabric surface and the friction surface in the plane common to both, whereby to simulate rubbing of normal wear. For practical embodiment of the invention in the simplest possible form, the fabric mount is held stationary by the base, and the friction mount is actuated in the desired orbit of relative movement by a transmission to the friction mount from the motion or drive.

Relative rotation is avoided between the engagement surfaces of the fabric and friction mounts on any axis through the fabric surface which is normal thereto, or disposed otherwise in any possible direction. Such relative rotation is particularly avoided because it detracts from simulation of normal wear of a garment, and is avoided by holding the fabric mount rigidly stationary with reference to the base of the apparatus, and by holding the friction mount rigidly against rotation with reference to the motion to confine its movement to travel in the orbit defined by the motion.

The common plane of the engagement surfaces of the fabric and friction mounts is disposed horizontally, and the friction mount is positioned below the fabric mount. Drive of the friction mount is from below, and the motion that drives the friction mount, as also its transmission, is positioned below the friction mount, positioning its friction surface exposed upwardly. The fabric mount is suspended from above to rest on the friction mount, and control of the magnitude of pressure engagement between engagement surfaces of the fabric and friction mounts is by adjustment that consists of adding or subtracting weights as needed.

For the purpose of testing appearance-retention qualities of fabric, to which the apparatus of the invention is particularly adapted, the friction surface of the friction
mount usually is not abrasive in the ordinary sense. There may be some abrasion in the strictest sense of the term, and although there may be some abrasion in fact, applied either intentionally or incidentally, frictional rubbing that produces pills is depended upon for pills of the test. In general, the object is to apply friction in a manner to simulate rubbing of a fabric in normal wear of a garment. Accordingly, great care has been exercised in selecting the friction material, and from this study there evolved the selection of woven fabrics as most suitable. Balanced weaves, such as plain, twill, herringbone and basket weave, are preferred.

The process has been devised for testing fabric quality, which consists of treating a sample of fabric by an operation like that of the apparatus of the invention in the manner described, and continuing the treatment for a predetermined standard time interval. Such treatment for a time interval from a minute to a few minutes is sufficient to produce a field of pills over the area of fabric that is rubbed, which may be compared with like or similarly treated pieces of other fabrics in a comparable category of fabrics. Such comparison provides a valuable standard of wearing qualities of different garment fabrics, and from the practice there has evolved acceptable standards of fabric qualities, including apparent retention qualities and characteristics that are responsive to feel, which now are adopted generally throughout the textile industry.

The nearest prior-art test standards for fabric quality required rubbing for a long period of time, usually continuing for several hours, and involving more or less severe abrasion. Under such prior-art practices, usually increased severity of abrasion was relied upon as the only means for reducing the extended time intervals of tests. Under practice of the present invention, a test of a given fabric sample is completed in a manner of minutes, and it is found thoroughly satisfactory for determining fabric qualities.

After a fabric sample has been treated frictionally, for example by the apparatus of the invention in the manner explained, it is retained on the fabric mount, and the area of fabric that has been rubbed to produce pills is inked in contrasting color to render the appearance of its pilling more prominently visible. This is done by rubbing the engagement surface of the fabric supported by the mount against a surface that is suitably inked. Inking may be done by operation of the machine, or it may be done manually by rubbing the fabric mount with the fabric from the machine and rubbing the engagement surface thereof over any flat surface that is inked suitably.

The inking medium may consist of a fabric that is coated with ink, and may be of any color that affords the desired degree of color contrast with reference to the color of the fabric that is tested. Ordinary carbon paper, such as is employed for typewritten copy, has been used and proven thoroughly satisfactory for the purpose, especially for testing white fabrics such as broadcloth that is used extensively for men's shirts. The quality of carbon paper is not material, except to the extent that it is essential to establish standards of inking procedure in keeping with standards of the novel fabric testing process of the present invention.

A fuller understanding of the principles of the invention, and of practical embodiment thereof, appears in the accompanying drawings, in which

Fig. 1 is a plan of a machine embodying the invention,
Fig. 2 is a side elevation, with parts broken away for clearness of illustration,
Fig. 3 is a side elevation of a detail, with parts broken away for clearness of illustration,
Fig. 4 is a detail, in side similar to Fig. 2 with parts differently positioned, and with parts broken away for clearness of illustration,
Fig. 5 is a detail in elevation, in cross-section on line 5—5 of Fig. 3, and with parts broken away for clearness of illustration,
Fig. 6 is an inverted plan of a detail, viewed from below in Fig. 4.

Fig. 7 is a perspective, illustrating a tool and its use for practice of the invention,
Fig. 8 is a cross-sectional elevation of the detail in Fig. 7, taken on an axial plane, and
Fig. 9 is a detail in perspective, illustrating an alternative embodiment of one of the elements in Fig. 4.

Apparatus of the drawing that embodies the present invention comprises the fabric mount 11, and the friction mount 12, which are held positioned in opposed relation as seen in Fig. 2 by pair of bolts 13, and indexed generally at 15. The fabric mount 11 and friction mount 12 are positionable alternatively in face-to-face engagement, as seen in Fig. 4, and so positioned they are movable relative to each other in an orbit around an axis that is normal to their plane of engagement. This relative movement is provided by a motion or drive indicated generally at 16 in Figs. 2 and 5.

In the structure of the disclosed embodiment, relative movement between the fabric mount 11 and the friction mount 12 is by movement of the friction mount only, with reference to the fabric mount being held stationary by backlash of means 14. Movement of the friction mount by motion 16 is through its transmission that includes the disc 18.

Fricion mount 12 comprises the rigid plate 19, with downwardly directed legs 26, Figs. 2, 4 and 6, which engage disc 18 near its edge, and constitutes a tripod that rests on a surface 16 for a few hours, and involves more or less severe abrasion. Under such prior-art practices, usually increased severity of abrasion was relied upon as the only means for reducing the extended time intervals of tests. Under practice of the present invention, a test of a given fabric sample is completed in a manner of minutes, and it is found thoroughly satisfactory for determining fabric qualities.

The nearest prior-art test standards for fabric quality required rubbing for a long period of time, usually continuing for several hours, and involving more or less severe abrasion. Under such prior-art practices, usually increased severity of abrasion was relied upon as the only means for reducing the extended time intervals of tests. Under practice of the present invention, a test of a given fabric sample is completed in a manner of minutes, and it is found thoroughly satisfactory for determining fabric qualities.
Engagement of pins 42 and 43 with their respective companion gears 27 and 29 is at corresponding parallel radii of the several gears, and at points located the same radial distances each from the center of its corresponding gear 27 or 29, respectively. The extent of the orbit of travel of friction mount 12 is determined by the radial distance from the center of gear 27 of the engagement journal of pin 42, and the like radial distance from the center of the engagement journal of pin 43 at the corresponding radius of gear 29. Gears 27 and 29 are provided with several sets of bores, the bores of each set being located at the same radial distances in respective parallel radii, and the bores of the several sets being located at respectively different radial distances for adjusting the apparatus to travel the friction mount 12 in orbits of various extents selectively. Bores 44 and 45 in respective gears 27 and 29 are illustrative, are located at a greater radial distance than pins 42 and 43 in Fig. 3, and provide for a correspondingly greater orbit of travel of friction mount 12. To make the adjustment, pins 42 and 43 are lifted out of the bores they occupy in Fig. 3, by lifting the disc 18 upwardly away from the gears 27 and 29, and are reinserted in respective bores 44 and 45, constituting any suitable electrical motor, and rests on foundation plate 31, to which it is secured in any conventional manner.

Foundation plate 31 of base 15 comprises the downwardly directed flange 50, on which the apparatus rests on any suitable flat surface, such as the top of a bench or table. Flange 50 comprises the overhanging arm 56 containing bushing 57, in which shaft 58 is slidable vertically. Fabric mount 11 is secured to the lower end of shaft 58, and is positionable in its upper position of Fig. 2, and alternatively in its lowered position of Fig. 4, in engagement with friction mount 12.

The friction mount 12, with its drive from motion 16 below, provides a top engagement surface 60 with the desired frictional quality and the desired quality of backing, surface 60 being exposed as shown in Fig. 4, and disposed horizontally. Fabric mount 11 is suspended from overhanging arm 56 to project downwardly towards the engagement surface 60 of friction mount 12, and comprises an engagement surface 61 which also is held by base 15 disposed horizontally and parallel with engagement surface 60 of the friction mount 12. By shaft 58 being moved downwardly towards the engagement surface 60 of the fabric mount 11 contacts engagement surface 60 of the friction mount 12 face-to-face as seen in Fig. 4, in a plane of engagement common to both.

Head 63 is secured to the upper end of shaft 58, by means of a set screw for example. Locating pin 64 bears at its lower end in socket 65 of overhanging arm 56, and at its upper end is projected into socket 66 of head 63 to support the fabric mount 11 in its raised position of Fig. 2, where it is out of engagement with surface 60 of the friction mount 12. To lower the fabric mount 11, head 63 is raised slightly to remove socket 66 away from locating pin 64 remaining seated in the socket 65 at its lower end, shaft 58 is then rotated in bushing 55 slightly to position pin 64 in registry with aperture 67, Fig. 1. Head 63 now is lowered, with its aperture 67 sliding along pin 64, until engagement surface 61 of the fabric mount 11 engages engagement surface 60 of friction mount 12. Locating pin 64 functions to hold fabric head 11 against rotation on the axis of shaft 58 when motor 46 is operated to move friction mount 12 in its path of travel through operation of motion 16.

Pressure of engagement between surfaces 61 and 60 of respective fabric and friction mount 11 is determined by the weight of fabric mount 11, which is varied by means of one or more weights 68 being rested on the top of head 63, and on top of each other in the case of more than one weight 68 being used. The magnitude of pressure engagement between engagement surfaces 60 and 61 is adjusted thereby. Each weight 68 has a pin 69 projecting concentrically from one of its faces, which fits into socket 70 at the top of head 63 positioned concentrically of shaft 58. A similar socket 71 in the face of each weight 68 opposite the face of locating pin 69, and positioned concentrically, receives the pin 69 of the next adjacent weight 68, whereby several weights are used, whereby the several weights are held stacked securely on top of each other.

Instrument 73, Figs. 1, 2 and 3 is a timer, which is set to indicate the time interval of a test, and characteristically includes an audible or visible signal to announce when the desired time interval for which it is set has expired. The timer 73 is mounted in the front of housing 52 as shown, and may be operated electrically to include a suitable mechanism to shut off motor 46 automatically when the time interval of a test is completed.

Fabric mount 11 comprises block 75 of rigid material, such as metal for example, and embodies opposite faces 76 and 77, Fig. 8, at the rubbing and supporting ends respectively of block 75, the faces being parallel in the disclosed structure. Between faces 76 and 77, sides 78 are coaxial with the opposite end faces on an axis concentric therewith, and perpendicular to face 77 at the rubbing end. Under preferred practice, a pad 79 of resilient material is secured to the face 77 at the rubbing end of block 75, to provide a resilient backing for the fabric to be tested. The surface of pad 79 is parallel with surfaces 76 and 77.

According to the specific structure of the disclosure, pad 79 is secured by a suitable adhesive in a cavity formed in the face 77 of block 75, and projects out of the cavity above the level of face 77 to raise the engagement surface 61, Figs. 2 and 4, of the fabric mount 11 above the surface of the rigid block 75. The area of the engagement surface 61 of fabric mount 11 is determined by the size of resilient pad 79. The described structure provides a rigid frame for pad 79 in the form of a flat ring, constituting the rigid surface 77 extending from the peripheral edge of pad 79 to the sides 78 of block 75, and the fabric-backing surface of pad 79 projects above its bordering frame.

Annular groove 80 in sides 78 of block 75 is circular and concentric. Resilient band or ring 81 fits into groove 80, and positioned in the groove is stretched and under tension to hold fabric sample 82 pressed against sides 78 of block 75, and secured to fabric mount 11 thereby.

An attaching device for fabric mount 11 is provided from its fabric-backing 83 to annular groove 80, and at or near its supporting end 76. In the present embodiment, the attaching device of fabric mount 11 comprises pins distributed circumferentially of block 75 there being two diametrically-opposite pins 84 and 85 in the specific structure. Cavity 86 is projected into supporting face 76, and pins 84 and 85 are projected into cavity 86 radially towards each other. Pin 84 is rigid and pin 85 contains a spring-backed ball 83.
At its lower end, shaft 58 comprises attaching device 87, comprising to the attaching device of fabric mount 11, that includes the pins 84 and 85. Attaching device 87 of shaft 58 is a block secured to the lower end of the shaft in any suitable manner. Block 87 fits into cavity 86 of block 75, and contains diametrically-opposite lengthwise slots 88, which receive their companion pins 84 and 85 of block 75 when fabric mount 11 is attached to shaft 58 by being slid onto block 87. Spring-backed ball 83 of pin 85 holds fabric mount 11 against falling off of shaft 58 in raised position of Fig. 2.

The results of a fabric being tested by rubbing may be affected by the fabric being under tension and, in the case of light rubbing pressure for a short period of time that characterizes practice of the present invention, fabric tension may affect results enough to render them questionable and unreliable. Therefore, it is particularly desired that fabric sample 82 be in relaxed condition when it is tested. By means of tool 90, Figs. 7 and 8, fabric sample 82 is secured to fabric mount 11 easily and certainly, and without tension but in relaxed condition.

Tool 90 comprises the frusto-conical outer sides 91, described on an axis normal to, and concentric with, the internal, flat face or ring 92, which fits the rigid frame 93 and pad 79. Tool 90 constitutes a metal block. When internal ring 92 of tool 90 is placed in engagement with rigid surface 77 of block 75, the tool does not engage the resilient pad 79, and counterclockwise 93 constitutes a void of material of the block of tool 90 which prevents pressure engagement between the tool and resilient pad 79 when the tool is used. Internal cylinder 94 is an additional void of material of the tool 90 that reduces unnecessary weight, and also enables the operator to look through the tool to observe the fabric sample 82 in the process of it being secured to fabric mount 11.

At its upper end, the periphery of frusto-conical surface 91 is less than the inside of resilient band 81 in relaxed condition. The periphery of frusto-conical surface 91 at its base is greater than sides 78 of block 75, and extends downwardly below the level of surface 77 of block 75 to a position proximate to groove 80. Resilient ring 81 is a toroid with circular cross-section, which enables it to be rolled downwardly along the frusto-conical sides 91 of tool 90.

To secure a fabric sample 82 to fabric mount 11 in preparation of a test, the mount is removed from shaft 58 and is placed with its supporting face 76 resting on any convenient flat surface. Fabric sample 82 is spread evenly over the upwardly exposed surface of pad 79, and is allowed to drape loosely around the sides 78 of block 75. Tool 90 now is placed or rested on top of the fabric sample 82, with its internal ring bearing on the bordering ring 77 of resilient pad 79. It will be observed particularly in Fig. 8 that there is no pressure engagement of tool 90 with resilient pad 79, which is relaxed accordingly, and the tool operates to press the fabric sample 82 against the frame of rigid surface 77 without bearing against pad 79 at any point.

With tool 90 in place on fabric mount 11, resilient band 81 is dropped onto frusto-conical surface 91 as seen in Fig. 8, and is rolled down its sides and beyond the base of the cone. Band 81 is subjected to tension thereby, and snaps against the sides 78 of block 75, striking at a position proximate to annular groove 80. By this process, resilient band 81 falls into groove 80 without additional adjustment being necessary to locate the band for holding the fabric sample 82 on the mount 11.

Tool 90 now is removed, and fabric mount 11 is projected onto attaching block 87 of shaft 58 in raised position of Fig. 2. Ball 83 of pin 85 pressing opposed to rigid pin 84 holds fabric mount 11 against falling off of shaft 58. The head 63 of shaft 58 now is lifted up and away from locating pin 64, is rotated slightly to position aperture 67 in registry with pin 64, and is lowered to project pin 64 through aperture 67. Fabric mount 11 is thereby lowered, guided by aperture 67 traveling along pin 64, until engagement surface 61 engages and rests against engagement surface 60 of friction mount 12. Fabric mount 11 then is actuated in place by the gear and the gear train of motion 16. Friction mount 12 is actuated thereby in the plane of engagement between surfaces 60 and 61, traveling in an orbit around an axis normal to the plane of engagement, fabric mount 11 being held stationary by shaft 58 being held by rigid arm 86 and locating pin 64 holding the shaft against rotation on its axis.

Fabric mount 11 bears on friction mount 12 under weight, and this operates to subject pad 77 to more or less pressure depending upon the magnitude of the weight. This pressure on pad 79 relaxes the position of fabric sample 82 opposite the frame 77 because the area confined by the fabric is reduced. This is an additional certainty that fabric 82 is held spread smoothly and evenly over the surface of pad 79, without tension and in relaxed condition, by frictional engagement with the surface of the pad.

Much attention has been given to the quality of engagement surface 60 of friction mount 12 to devise standards of surface quality to be established and adopted for piling tests under practice of the present invention.

Woven fabrics contain the desired quality of friction surface, and seem to be the best. Plain, twill, herringbone and basket weaves are most suitable. Warp and weft should present a balanced engagement surface, and surface cover within the limits between 4-to-3 and 3-to-4 of warp against weft is preferred, containing weaving floats between 1/4 inch and 3/16 inch. It is preferred that the friction fabric be calendered, to flatten the yarns, and to present uniform warp and filling projection with high area of contact.

Synthetic yarns have been found particularly satisfactory for filament and spin fibers, with either in the warp or filling, or in both, in alternations of spun fibers and filaments in the warp or in the weft, or in both. Synthetic yarns of various gages have been used, which have been set flat and woven in flat condition. Various standards have been tried and adopted. However, the present invention is not limited to the particular standards that prevail currently.

Sometimes friction rubbing that includes more or less abrasion is desired for certain tests to determine character of durability also, for soft-knit goods for example, and for filled wool-blend fabrics. Abrasion-resistant woven plastics have been used for this purpose, and sometimes metal fabrics that are more abundant, and metal containing fabrics of various kinds. Fabric fabrics that are selected for their properties to abrade also are preferred to have balance of surface cover within the limits between 4-to-3 and 3-to-4 of warp against weft, however, with weave floats from 1/8 inch to 1/4 inch. These fabrics also are calendered preferably, for uniform warp and filling projection, and/or for crisp setting under temperature and pressure.

The backing for the fabric of frictional surface 60 also has been given much attention, both as to its surface quality and the foundation it affords. In Fig. 4, friction fabric 96 is cut to form a disc coextensively with the circular upper surface of rigid plate 19. In the embodiment of Fig. 4, a rubber pad 97 is provided to back the friction fabric 96, and is formed circular to be coextensive with the circle of plate 19 and with fabric 96. Flange 98 projects upwardly from plate 19 at its periphery, and is threaded internally for engagement with external threads of collar 99. The collar is rotated downward against friction fabric 96, and presses the fabric and the pad 97 around their coincident peripheral edges.
against the top surface of plate 19. Spacer ring 100 is inserted below collar 99 and against friction fabric 98, the spacer ring being of whatever thickness is needed for gripping the fabric firmly against plate 19.

Rubber is a heat insulator, and for some tests, requiring isolation of heat, the rubber inhibits heat dissipation sufficiently to be disadvantageous. The pad 101 of Fig. 9 may be substituted alternatively for rubber pad 97. Pad 101 is of aluminum, and is a disc of the same size as rubber pad 97. Spiral groove 102 is cut in a face of pad 101 for better frictional engagement. Foreign matter of .015" depth and .015" width having been used satisfactorily.

As a third alternative, friction fabric 95 may be placed in direct engagement with the top surface of plate 19, without any other backing being used, and this has proven generally to be satisfactory.

For many tests, engagement surfaces 60 and 61 of the friction and fabric mounts 12 and 11 respectively are positioned in contact with each other by lowering fabric mount 11 in the manner described, and motor 46 is operated for a predetermined time interval. Tests of one minute have been used. A time interval of five minutes or more is extreme. In any event, a time interval is selected that is an accepted standard, and timer 73 is set to terminate operation of motor 46 when the selected time interval expires.

After the rubbing operation is completed, the rubbed fabric 82 may be removed by placing a piece of carbon paper on the engagement surface 60 of friction mount 12 and operating the machine for a few cycles, 2 to 10 cycles being sufficient. Alternatively, the fabric mount 11 may be removed from the machine, and from the shaft 58 thereof in the manner described, the carbon paper is placed on any suitable flat surface, and fabric 82 rubbed over the carbon surface of the paper in an orbit several times, by the operator holding fabric mount 11 with his hand.

When a test is completed and fabric 82 is inked, it may be removed from fabric mount 11. The area of fabric 82 that was backed by pad 79 is clearly marked, and its pills are readily visible and may be counted. The marked area of fabric 82 may be compared with similarly treated and marked like areas of other pieces of fabrics. The quality of a given fabric may be judged thereby with reference to its use in a garment and particularly with reference to its ability to retain its desirable appearance in normal use.

The scope of the invention is determined by the accompanying claims.

1. In apparatus for testing fabric, a mount for the fabric to be tested, friction material and a mount therefor, a base supporting the several mounts, and a motor for relative movement between the fabric and friction mounts, the fabric mount comprising a predetermined area of raised flat surface in backing engagement with the fabric, and a keeper for holding the fabric spread evenly and in relaxed condition over its backing surface, the friction mount comprising a flat surface which is larger than the fabric-backing surface and comprising the friction material backed by and spread evenly over the flat surface of the friction mount, the base holding the several mounts with flat surfaces in opposed relationship and parallel to each other and comprising an adjustment to position the several flat surfaces in pressure engagement with each other under a predetermined and adjustable magnitude of pressure distributed uniformly over the surfaces of engagement, the motion being operable to move the several fabric and friction mounts relative to each other in the plane of engagement and in an orbit around an axis that is normal to the plane of engagement, the fabric and friction mounts being held against relative rotation on an axis through the fabric-backing surface of the fabric mount.

2. In apparatus as defined in claim 1, the friction mount comprising a rigid flat surface coextensive with its engagement surface, a friction sheet of predetermined frictional quality supported by the rigid surface coextensively, and a clamping mechanism adjustable to hold the friction sheet at its peripheral edges spread evenly over the rigid surface.

3. In apparatus as defined in claim 2, the friction sheet consisting of a woven fabric with balanced surface cover and coincident surface level of balanced weave.

4. In apparatus as defined in claim 3, a set of backing pads of a variety of qualities and positionable interchangeable in the friction mount between the rigid flat surface and the friction sheet, each pad comprising opposite flat surfaces that are parallel and extending coextensively with the coextensive areas of the rigid flat surface and the friction sheet.

5. In apparatus as defined in claim 1, the base holding the fabric mount stationary, a transmission from the motion to the friction mount to actuate the friction mount with reference to the fabric mount in the orbit of relative movement.

6. In apparatus as defined in claim 5, the fabric mount being located above the friction mount with their engagement surfaces disposed horizontally, the motion being located below the friction mount, and the transmission engaging the friction mount from below.

7. In apparatus as defined in claim 1, the fabric mount comprising a rigid block embodying opposite end faces at respective rubbing and supporting ends and embodying sides between the end faces coaxial therewith on an axis normal to the rubbing end face, a pad of resilient material smaller than the area of the rubbing end face and secured thereto concentrically to provide a resilient engagement surface of the fabric mount that is raised above and bounded by a rigid frame consisting of surface of the rubbing end face of the block, the sides comprising an annular groove, a keeper comprising a resilient ring constituting a toroid with circular cross-section and fitting the groove under tension, the block comprising an attaching device positioned at the supporting end and away from the rubbing end beyond the annular groove, the base comprising an attaching device companion to the attaching device of the fabric mount to secure the mount to the apparatus.

8. As an article of manufacture, a fabric mount comprising a rigid block embodying opposite end faces at respective rubbing and supporting ends and embodying sides between the end faces coaxial therewith on an axis normal to the rubbing end face, a pad of resilient material smaller than the area of the rubbing end face and secured thereto concentrically to provide a resilient engagement surface of the fabric mount that is raised above and bounded by a rigid frame consisting of surface of the rubbing end face of the block, the sides comprising an annular groove, a keeper comprising a resilient ring constituting a toroid of circular cross-section and fitting the groove under tension, the block comprising an attaching device positioned at the supporting end and away from the rubbing end beyond the annular groove, the base comprising an attaching device companion to the attaching device of the fabric mount to secure the mount to the apparatus.

9. For use with the fabric mount of claim 8, a tool for securing a fabric sample to the mount comprising a flat ring positionable exteriorly of the peripheral edge of the resilient pad with clearance and fitting into face-to-face engagement with the frame of the pad out of pressure engagement with the pad, a frusto-conical surface coaxial with the ring and extending downwardly to a periphery greater than the block and exterior thereof proximate to the annular groove, the frusto-conical surface extending upwardsly above the resilient pad and to a periphery less than the diameter of the keeper in relaxed condition.

10. The process of testing fabric that comprises securing a sample of the fabric to be tested on a fabric mount spread evenly and in relaxed condition on a flat backing
2,815,668

11. In the process as defined in claim 10, providing a resilient material to constitute the flat backing surface for the fabric.

12. References Cited in the file of this patent

UNITED STATES PATENTS

1,435,314 Vercombe Nov. 14, 1922
2,032,202 Dennis Feb. 25, 1936
2,420,646 Bloom May 20, 1947
2,603,083 Schiefer July 15, 1952
2,721,473 Allen Oct. 25, 1955

FOREIGN PATENTS

873,315 Germany Apr. 13, 1953
1,047,399 France July 22, 1953