Dec. 18, 1962 J. VISCARDI 3,069,285

COLOR SPRAYING OF FLOCKED AREAS

Filed Nov. 9, 1959 3 Sheets-Sheet 1

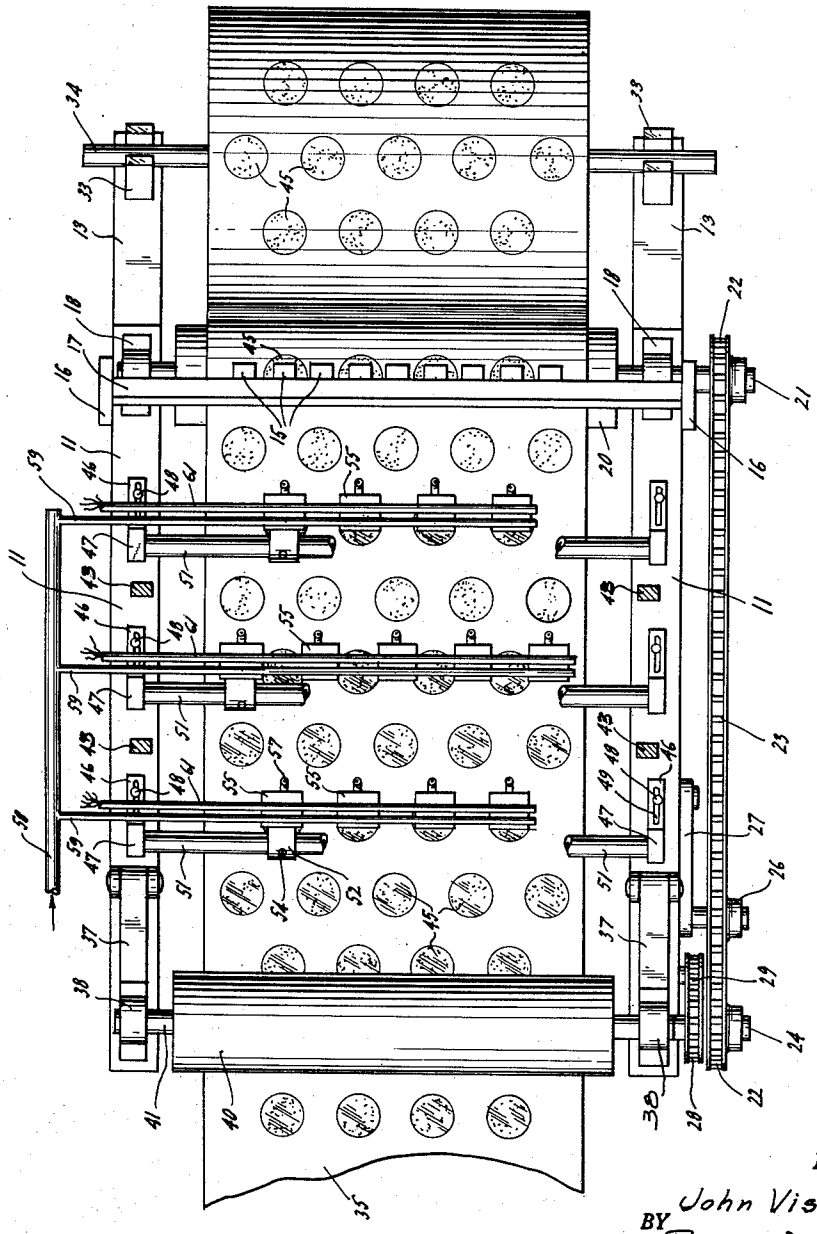


FIG. 1.

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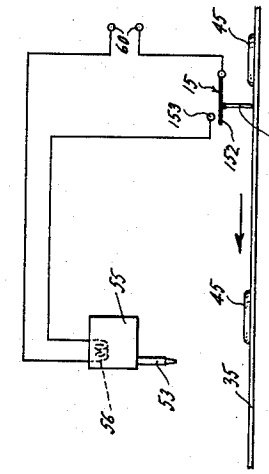


FIG. 3.

FIG. 2.

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FIG. 4.

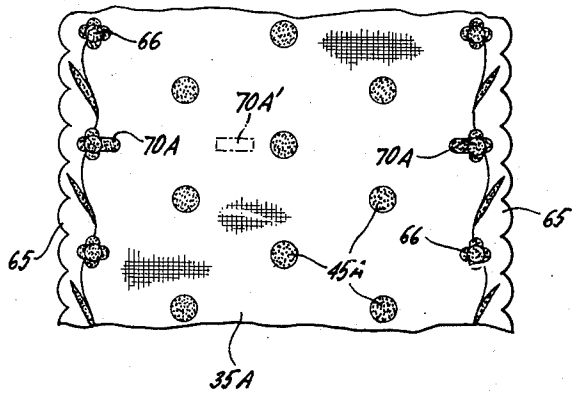


FIG. 5.

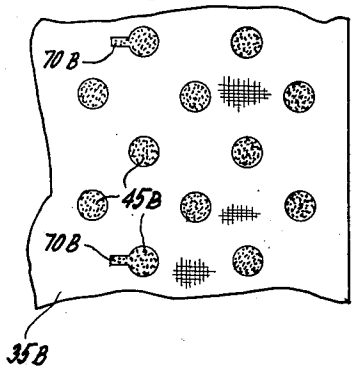


FIG. 6.

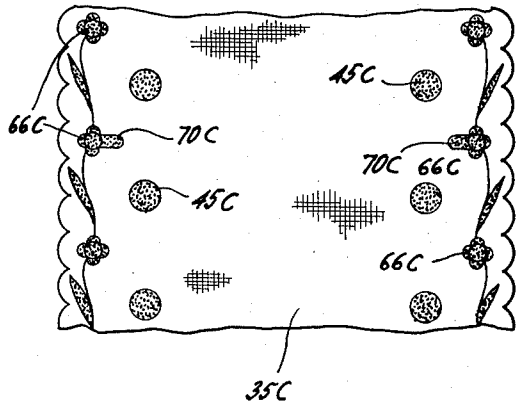
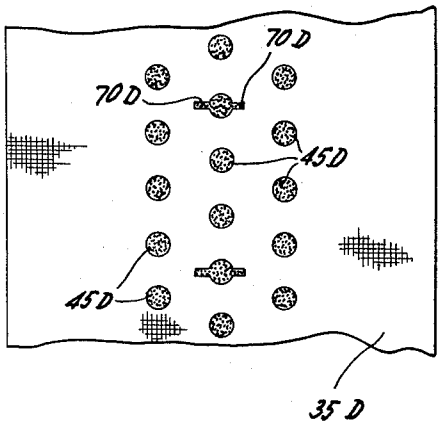


FIG. 7.



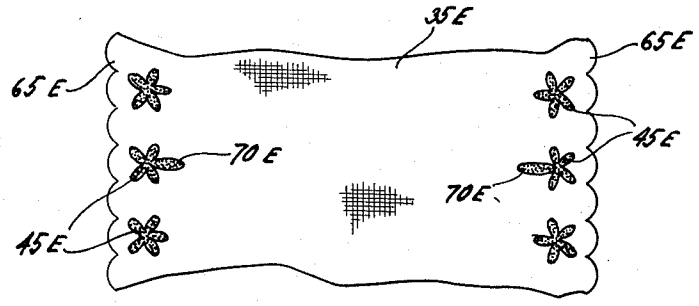


FIG. 8

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3,069,285

COLOR SPRAYING OF FLOCKED AREAS

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10 Claims. (Cl. 117—37)

This invention relates to the coloring of flocked or other raised areas of fabrics and, more particularly, to a simplified and flexible method of and apparatus for applying color only to such flocked or raised areas without applying the color to the main body of the fabric where the fabric has a repeated pattern.

In the flocking of fabric, finely divided particles of fragmentary material, generally in fiber form and of relatively short length, are deposited or distributed in fixed relation upon a base fabric in a pre-determined pattern. Usually the fixation is accomplished by pre-printing the patterned portions of the fabric with a suitable adhesive so that, when the flock material is deposited on the fabric, it will adhere only to the adhesive coated portions of the fabric to be patterned. The deposits of the flocking material on the fabric, in adhering relation to the latter, provide a raised or embossed effect for the fabric.

In certain instances, it is desirable that the flocked portions of the fabric have a different color from the main portion of the fabric. Previously, such coloring of the flocked portions has been difficult and expensive to effect, usually requiring the use of rollers engraved in the same pattern as the flocked portions of the fabric so that only the flocked portions will be color printed. This naturally requires that a different engraved roller be employed for coloring each different pattern of flocking. In addition, great care must be taken to prevent stretching, skewing, or other distortion of the fabric during printing in an attempt to secure proper registry of the flocked areas with the corresponding engraved portions of the printing roll or rolls.

In accordance with the present invention, advantage is taken of the fact that the flocked pattern generally is repeated at pre-determined intervals. Proceeding upon this basis, it is possible, where the flock pattern is repeated at pre-determined intervals, to apply color to the flocked areas only in a novel, inexpensive and flexible manner, not requiring the use of engraved printing rollers or the like.

More specifically, the flocked fabric is caused to travel over a pre-determined path and, above this path, there are located a plurality of reservoirs of liquid coloring material in accordance with the number of different colors desired. These reservoirs are selectively and interchangeably connectible to spraying heads controlled by electric valve means and effective, when the valve means are operated, to have compressed air supplied thereto to spray color from a selected reservoir into the fabric directly beneath the spray head. These spray heads are arranged at a pre-determined zone along the path of travel of the flocked material and, at a distance upstream therefrom equal to the length, or to a multiple of the length, of the repeated flocked pattern, a plurality of electric switches are arranged in another zone. Each of these switches has a very sensitive feeler arranged to ride along the fabric as it is drawn or otherwise moved to a position beneath the spray heads.

In accordance with one embodiment of the invention, when one of these feelers contact a raised or embossed flocked portion of the fabric, it closes its respective switch to energize the electric valve of a correspondingly located spray head which is at a distance from such feeler equal to the length of the repeated pattern, or to a multiple of such length. Consequently, a spray of a particular color is thereby directed upon a flocked portion then passing

directly beneath the particular spray head. The spray heads may be arranged in two or more transverse rows across the path of travel of the material, so that a particular spray head in any selected row may be energized at will by an associated feeler switch longitudinally aligned with such head along the path of travel of the material. Thereby, different colors may be applied to different portions of the flocked pattern.

In some patterns used in flocked fabric, one or more flocked areas of one repeat of the pattern, normally substantially centered on one line extending longitudinally of the fabric, will laterally overlap the adjacent longitudinally extending line or lines on which one or more other flocked areas of such repeat are normally centered. In such case, the microswitch finger or feeler normally centered on such adjacent line for tripping by flocked areas centered therealong will be falsely tripped by such laterally overlapping flocked areas, thus resulting in incorrect spraying of the flocked areas.

Accordingly, in a preferred embodiment of the invention, "keys" are worked into the flocked design adjacent either or both borders of the fabric, or adjacent the center or other parts of the fabric, and these keys are so positioned that only these keys will be contacted by the fingers of the micro-switches and not the flocked areas of the pattern. The keys are provided at the beginning of each repeat of the fabric, and the spraying devices controlled by the thus-tripped micro-switches are so arranged that when a key is contacted, all the flocked areas of a preceding repeat of the fabric are sprayed simultaneously. Thus, the several spraying devices are initially arranged to correspond in number and location, with all of the flocked areas of a single repeat of the pattern. Thus, when any key trips a micro-switch at the beginning of a pattern repeat, all of the spraying devices then oriented over the flocked areas of a preceding repeat are activated at once, so that all the flocked areas in a given section of the fabric are sprayed at once.

To provide for any possible misalignment, twisting, or warping of the fabric in its passage over the rolls and under the same spraying devices, two or more normally laterally aligned keys may be provided at the beginning of each pattern repeat, as at both edges of the fabric and also in the center. In the case of keys so provided at both edges of the fabric, each key would control spraying of the flocked areas of substantially one-half the width of the fabric and, in the case of keys located at both edges and also at the center, each key would control spraying of the flocked areas of substantially one-third the width of the fabric.

A further situation arises in the case of certain fabrics in which the flocked areas are concentrated near the edges of the fabric, with the center being unflocked, and in cases where the flocking is concentrated along the center of the fabric with the edges being unflocked. In the first of these cases, the keys are provided only at the edges of the fabric and, in the second of these cases, the keys are provided only at the center area of the fabric.

The keys may take any desired form, such as laterally extended flocked areas, or extensions of patterns, such as flowers and leaves, so as to appear to be actually part of the pattern but nevertheless projecting laterally beyond adjacent flocked areas so as to serve as projections into the path of the feelers of the micro-switches.

For an understanding of the principles of the invention, reference is made to the following description of a typical embodiment thereof as illustrated in the accompanying drawings. In the drawings:

FIG. 1 is a top plan view of an apparatus embodying the invention;

FIG. 2 is a side elevation view of the apparatus;

FIG. 3 is a somewhat schematic partial side elevation view illustrating the underlying principle of operation of the invention; and

FIGS. 4 through 8 are plan views of flocked fabric having keys incorporated in the flocking in selected manners at the beginning of each repeat of the fabric for the purpose of triggering the spraying devices to color spray all the flocked areas of a preceding repeat of the pattern.

Referring to the drawings, the apparatus is mounted on a frame generally indicated at **10** and including elevated and parallel side members **11** supported on columns **12**, the frame having extensions **13** at the end of each side and supported upon shorter columns **14**. Uprights **16** at one end of each side rail **11** support a cross bar **17**, shown as an angle, on which are adjustably mounted a plurality of switches **15**, such as micro-switches, adapted for adjustment along cross member **17**.

Beneath cross bar **17**, each rail **11** has a bearing **18** rotatably supporting the shaft **21** of a roller **20**. At its opposite end, each rail **11** has bearings rotatably supporting the shaft **24** of a roller **25**. Shafts **21** and **24** have secured thereto sprockets **22** which are interconnected by an endless chain **23**. An idler roller **26** mounted on a bracket **27** pivoted to one rail **11** serves to maintain chain **23** taut. A second sprocket **28** on shaft **25** is connected by a chain **29** to a sprocket **31** on the output shaft **32** of a gear motor **30**. It will thus be noted that rollers **20** and **25** are rotated in synchronism with each other, the importance of which will be pointed out more fully hereinafter.

The extension side rails **13** support outwardly opening bearings **33** which receive a shaft **34** on which the material **35** is wound. Thus, a fresh roll of material, wound on a shaft **34**, may be readily mounted in the brackets **33**. The material wound on shaft **34** is led over the rollers **20** and **25** so as to extend substantially horizontally therebetween, and a support surface may be provided beneath the material between the rollers, if desired.

Just in advance of roller **25**, upstanding arms **36** on side rails **11** have pivoted thereto substantially horizontal arms **37** carrying, at their outer free ends, bearings **38** rotatably receiving the shaft **41** of a roller **40**. Roller **40** engages the material **35** and maintains it firmly against roller **25** for drawing of the material **35** from its supply wound on shaft **34**. Due to the synchronously driven rollers **20** and **25**, and the roller **40**, material **35** is fed without stretching underneath switches **15** and the spray heads.

Material **35** is formed with a regular pattern of flocked or embossed portions **45** which project from the surface of the material. In the particular example shown, the flocking **45** is arranged in alternate rows of four and five flocked areas respectively. Of course, any other repeated pattern can be sprayed with the apparatus of the invention.

An elevated platform **42** supported on stilts **43** secured to side rails **11** is arranged substantially above the material **35** and intermediate the rolls **20** and **25**. This platform supports tanks or reservoirs **50***a*, **50***b*, and **50***c*, containing the color solutions to be sprayed onto the flocked areas **45**. All three reservoirs may contain the same color, or the color in each of the reservoirs may differ from that in the other reservoirs in accordance with the particular color spraying operation to be performed.

L-shaped brackets **44** comprising feet **46** and uprights **47** are mounted on each rail **11** by means of bolts **48** extending through slots **49** in feet **46**. Thereby, the brackets may be adjusted over a substantial range longitudinally of the rails **11**. The upper ends of each laterally opposite pair of brackets **44** are interconnected by tubular cross members **51**, and these cross members **51** have slidably and rotatably mounted thereon brackets **52** supporting the spray devices **55**. The brackets **52** are adjustable both longitudinally of the tubular cross members **51** and angularly with respect thereto so that the spray delivered by nozzle **53** of each spray device can be properly directed accurately upon a flocked area **45**. Brackets **52** are maintained in longitudinally and angularly adjusted position by means of set screws **54** threaded therein and engageable with tubular cross members **51**.

Each of the spray devices **55** is provided with an electric or solenoid operated control valve, such valve being schematically indicated by the winding **56** of FIG. 3. Any one of the spray devices **55** may be connected to any one of the reservoirs **50** by means of a flexible conduit **57** so that any particular spray device **55** may have any one of the three available colors supplied thereto. As schematically illustrated, solely by way of example, the left-hand row of spray devices **50** is connected to reservoir **50***c*, the intermediate row to reservoir **50***b*, and the right-hand or leading row to reservoir **50***a*.

The brackets **44** are adjusted longitudinally of rails **11** so that the spacing of the brackets is equal to the distance between successive rows of flocking **45**. The spray devices **55** are adjusted along support **51** so that each spray is longitudinally aligned with flocked areas in a particular row of the pattern. For example, the leading row of spray devices **55** includes four of the spray devices each aligned with one of the areas **45** in a row of four of the pattern, and the intermediate row of the spray devices includes five of these devices each aligned with one of the area **45** in a row of five areas of the pattern. If the pattern were repeated after each third row, the trailing row of spray devices **55** would be aligned longitudinally with the flocked areas of the third row of each pattern. Also, the leading row of spray devices is adjusted so as to have a distance from switches **15** equal to the distance between two successive rows of four flocking areas.

The spray devices **55** are supplied with compressed air from a main **58** by individual connections **59** which may be flexible to provide for the necessary adjustment of the spray devices **55**. Also, each spray device is electrically connected to the associated switches **15** by wires contained in conduits **61** connected to the several spray devices.

Referring to FIG. 3, each switch **15** includes a feeler **151** connected to a contact arm **152** which is normally disengaged from a contact **153**. Switch **15** is connected in series between a source of electric potential, connected to terminals **60**, and the winding **56** of a control valve of a spray device **55**. With the parts adjusted as described, when feeler **151** is engaged by a raised or flocked area **45**, arm **152** engages contact **153** to close a circuit energizing the winding **56**. This opens the valve of the associated sprayer **55** so that a spray of coloring material is directed upon the flocked area **45** of the pattern preceding the one then being engaged by the feeler **151** of the switches **15**. As soon as feeler **151** rides off a flocked area, the circuit is broken so that the control valve is closed.

Referring to FIG. 1, it will be noted that a row of four flocked areas is passing beneath the switches **15**. This correspondingly activates the spray devices **55** in the leading row thereof to spray the row of four flocked areas then passing beneath these spray devices. When a row of five flocked areas engages the switches **15**, the intermediate row of spray devices is energized to spray the row of five flocked areas then aligned beneath the nozzles of the intermediate row of spray devices. Thus, and where the pattern is a repeated pattern, as a trailing pattern passes beneath the feelers **151** of switches **15**, a preceding pattern is automatically and precisely sprayed with the desired color or colors.

The unsprayed flocked patterns are indicated in FIG. 1 by circles which have dots therein, whereas the sprayed flocked areas are indicated by circles having the dots plus

shading. With the described arrangement, spraying of any desired color upon the flocked areas of a repeated pattern is effected automatically, simply, and economically and without the use of engraved rollers or the like. It is merely necessary to adjust the spray devices **55** laterally of their support rods **51**, and to adjust the brackets **44** longitudinally of the rails **11** to correspond with the modulus of the pattern. Also, any spray device **55** can be connected to any reservoir **50** so that the color selection may be changed from row to row or even between flocked areas **45** in any given row.

As stated previously, there are many cases wherein, due either to the irregularity of the repeated pattern or due to the fact that certain flocked areas will laterally overlap, to a substantial extent, other flocked areas, false indications may be given by the feelers of the micro-switches. To avoid this possibility, and at the same time to obtain a more accurate and faster application of color to the flocked areas of the pattern, the preferred embodiments of the fabric shown in FIGS. 4 through 8 is used. In these preferred embodiments of the invention, "keys" are provided, preferably as part of the flocking pattern, at the beginning of each repeat to trigger one, two, or three micro-switches to simultaneously spray all the flocked areas of a preceding repeat of the pattern.

Referring first to FIG. 4, the fabric **35A** is illustrated as having thereon flocked areas **45A** arranged in repeated patterns. The opposite longitudinal edges of the fabric, which may be scalloped, have flocking extending therealong, as indicated at **65**, and inwardly of these edges an edge pattern, likewise flocked, may be provided in the nature of floral ornamentation, as indicated at **66**. In this particular embodiment of the invention, keys **70A** are provided at the start of each repeat of the pattern, these keys being flocked areas projecting toward the center of the fabric from one of the flowers of the pattern **66**. The keys may be provided at only one edge of fabric **35A**, but preferably are provided at both edges thereof as indicated. This takes care of any possible skewing or biasing of the fabric in its passage over the rolls **20** and **25** of FIG. 2. Also, and if desired, an additional key **70A'**, shown in dotted outline in FIG. 4, may be provided at the center of the fabric in lateral alignment with the two keys **70A** at the side edges thereof.

With this arrangement, the switches **15** are so arranged that the feelers **151** of these switches are aligned only with the keys **70A** and **70A'**. Thus, if a key is provided at only one edge of the fabric, only one switch **15** and its associated feeler **151** are used. On the other hand, if the keys are provided at both edges of the fabric, two switches **15** are used, and if an additional key **70A'** is provided at the center of the fabric, three switches **15** are used. If only one switch is used, this switch is wired to control all the spray devices **55** arranged in a number and in a pattern such that all of the flocked areas **45A** in a single repeat of the pattern will be aligned with the spray devices when a subsequent repeat has its keys **70A** passing beneath the feeler **151** of a switch **15**. In the event two keys are used, one at each edge of the fabric, each switch controls the spraying devices **55** arranged over one-half of the width of the fabric. If a third key **70A'** is used at the center of the fabric, each one of the three switches controls the spraying devices for substantially one-third the width of the fabric. This assures proper and accurate spraying of the flocked areas **45A** of the pattern irrespective of any possible skewing or misalignment of the fabric in passing beneath the switches and the spraying heads.

FIG. 5 shows an alternative arrangement in which central flocked areas **45B** on a fabric **35B** are provided with extensions forming keys **70B** at the start of each repeat of the flocked pattern. In this case, only one substantially centrally located switch **15** and feeler **151** is provided, with the feeler positioned laterally so as to intercept the keys **70B**. This single switch simultaneously triggers all of the spray devices corresponding in number and location to the number of flocked areas **45B**, and their location, in a single repeat of the pattern.

In certain patterns, the flocked areas are concentrated adjacent the side edges of the fabric and the center is left unflocked. Thus, and as shown in FIG. 6, fabric **35C** is provided with flocked areas **45C** adjacent each side edge of the fabric. In this particular instance, the flocked pattern **66B** adjacent each edge of the farbic is provided with extensions forming keys **70C** at the start of each repeat of the pattern. Two switches are used in this instance, each controlling spray devices **55** conjointly arranged in number and location so as to spray a complete repeat of the pattern at each activation .

FIG. 7 illustrates the opposite case in which the flocked areas **45D** are concentrated at the center of the fabric, and the areas adjacent the edges of the fabric are left unflocked except possibly for an edge flocking. In this instance, a pair of keys **70D** are arranged to project laterally from flocked areas **45D** on the center line of the fabric and at the beginning of each repeat of the pattern. Either one or two switches may be used and, if two switches are used, each switch controls the spray devices **55** for one-half the width of the flocked areas.

Referring to FIG. 8, a preferred way of providing the keys **70E** is by forming these keys as relatively inconspicuous parts of the flocked pattern. In this instance, the flocked pattern is indicated as leaf or petal arrangements **45E**, with one leaf of each pattern **45E**, at the start of the repeat of a pattern, being made longer than the others and projecting toward the center of the fabric. These extensions **70E** project beyond the lateral extent of the leaf pattern **45E** at the beginning of a repeat of the fabric and thus serve to trigger two switches **15** each of which will spray one-half the width of the flocked area of the pattern in each repeat.

While a specific embodiment of the invention has been shown and described in detail to illustrate the application of the invention principles, it will be understood that the invention may be embodied otherwise without departing from such principles.

What is claimed is:

1. A method of coloring raised integral areas of a fabric arranged in a pre-determined pattern repeated longitudinally of the fabric, said method comprising the steps of moving the fabric longitudinally along a path; directly contacting the fabric at a first pre-determined point along such path to detect a raised integral fabric area of a repeat of the pattern passing such first point; and responsive to detection of a raised fabric area of one repeat of the pattern at such first point, spraying at least one raised area in a preceding repeat of the pattern at a second point along such path which is spaced longitudinally from the first point by an integral multiple of the length of the repeated pattern at least equal to one length thereof.

2. A method as claimed in claim 1 in which said raised fabric areas are correspondingly located in each repeat and are aligned longitudinally of such path.

3. A method as claimed in claim 1 in which the integral raised fabric areas include plural raised fabric areas spaced transversely of the fabric in each repeat thereof; and such correspondingly located raised fabric areas are aligned longitudinally of such path.

4. Apparatus for coloring raised integral areas of a a fabric arranged in a pre-determined pattern repeated longitudinally of the fabric, said apparatus comprising, in combination, means for moving the fabric longitudinally along a path; detecting means arranged at a predetermined point along such path and operable by direct sensing contact with such raised integral areas of the fabric; a color spraying means arranged at a second pre-determined point along such path spaced longitudinally from the first point by an integral multiple of the length of the repeated pattern at least equal to one length

thereof; control means for the respective color spraying means operatively connected to said detecting means in such manner that upon detection of a raised fabric area at one repeat of the pattern at such first point, at least one color spraying means is activated to spray color on a raised area in a preceding repeat of the pattern at such second point.

5. Apparatus as claimed in claim 4 in which said control means comprise electrically operated valves for the spraying means; and said detecting means comprises normally open switches having sensitive feelers each effective to close the associated switch when the feeler is engaged with a raised integral area of the fabric to operate at least one valve connected to such associated switch to activate the spray means associated with the valve.

6. Apparatus as claimed in claim 4 including a plurality of spray devices arranged in a row transversely of such path at such second point; plural reservoirs for spraying color material; and means selectively operable to interconnect any one of said spraying devices to any one of said reservoirs.

7. Apparatus as claimed in claim 4 in which there are a row of spraying devices extending transversely of the path of the fabric at such second point; and means for adjusting said row longitudinally of the path of travel in accordance with the length of the repeated pattern whereby to adapt the apparatus for patterns of varying length.

8. Apparatus as claimed in claim 7 in which there are plural rows of spraying devices each spaced longitudinally from each other by the length of the repeated pattern.

9. Apparatus as claimed in claim 4 in which said means for moving the fabric along a path comprises a pair of longitudinally spaced drive rollers; means interconnecting said rollers for synchronous rotation; and a roller engaging the fabric passing over the downstream roller to maintain the fabric firmly engaged with the downstream roller.

10. Apparatus as claimed in claim 9 including plural reservoirs for sprayable coloring material; feed lines selectively connecting any one of said spraying means to any one of said reservoirs; a source of compressed air; and electric valve means operable to connect said source of compressed air to a spraying nozzle associated with the controlled spraying means, responsive to operation of a detecting means.

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