Sept. 7, 1965 S. L. KINGSTON 3,204,271

GARMENT BRUSHING MACHINE

Filed June 10, 1963 2 Sheets-Sheet 1

Fig. 1

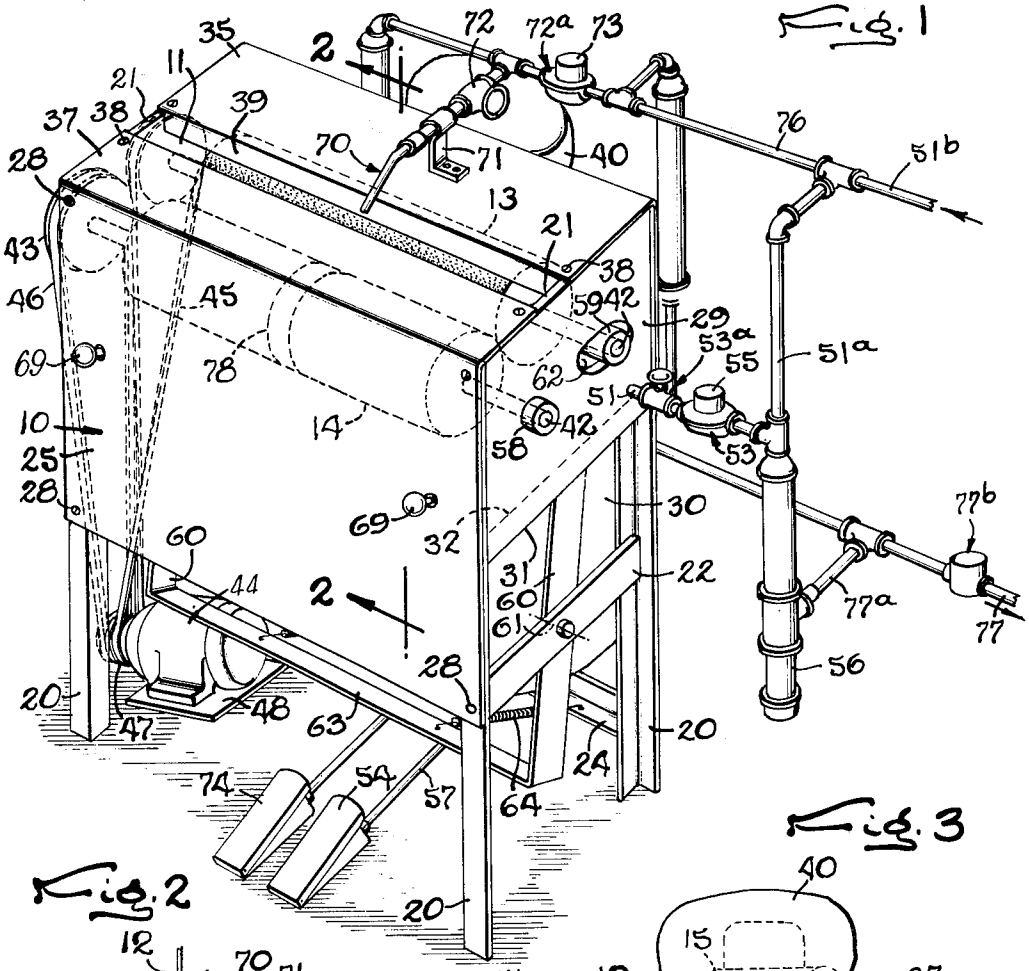


Fig. 2

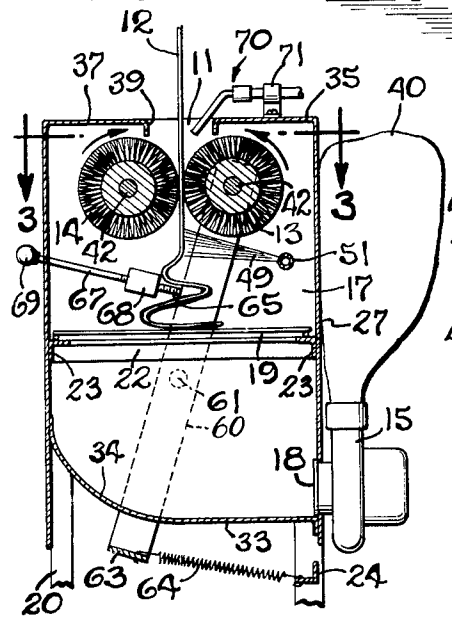
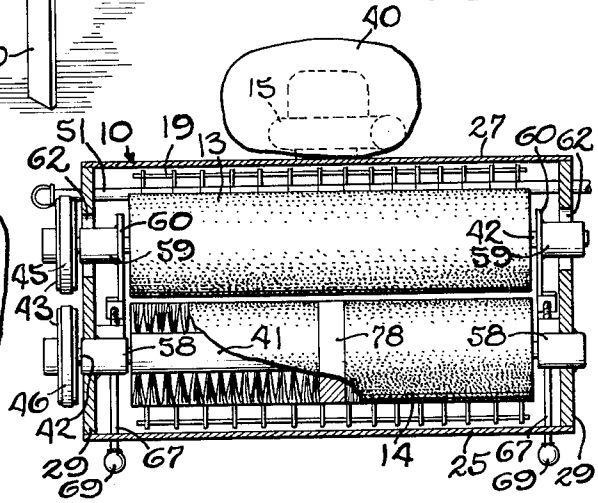


Fig. 3



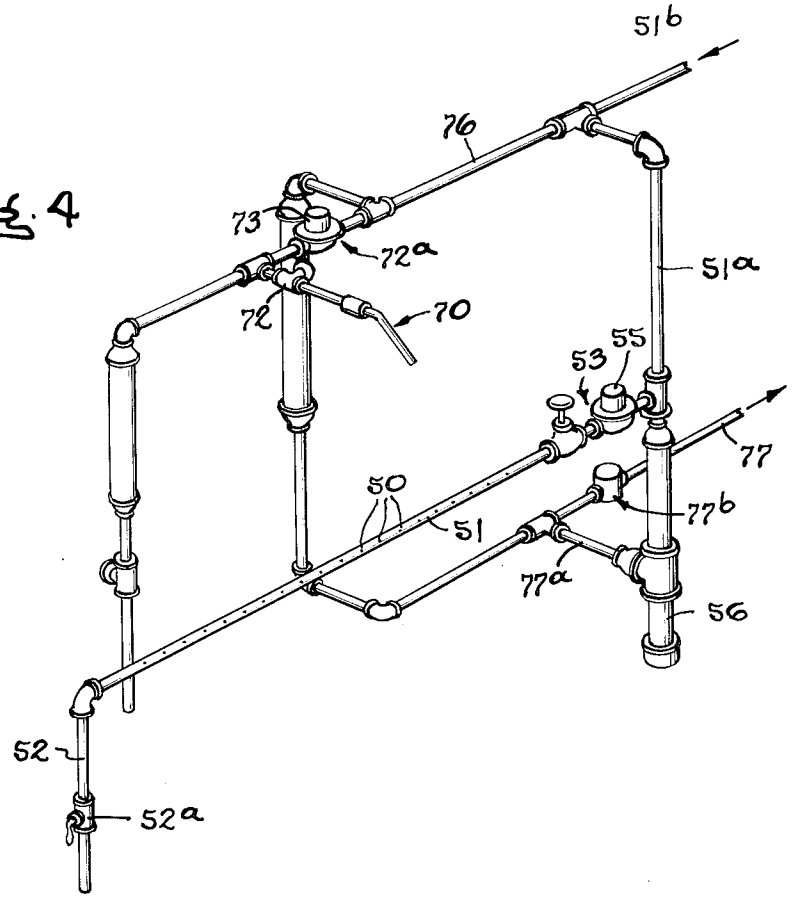
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Fig. 4



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3,204,271

GARMENT BRUSHING MACHINE

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5 Claims. (Cl. 15—1.5)

This invention relates to a garment brushing machine of the type including a casing having a top wall with an opening therein through which garments can be lowered into the interior of the casing and between two side-by-side brushes rotating in opposite directions to draw a garment downwardly between them and brush the opposite sides of the garment.

Machines of this general type have been used heretofore to remove dust and dirt from relatively sturdy articles such as trouser cuffs and tanned hides and skins where it is permissible to subject the article to relatively heavy brushing pressure or to brush an article for a prolonged period of time. Despite the fact that such machines have been known for many years, however, dry cleaning establishments and others concerned with the commercial removal of lint from more delicate articles such as knitted sweaters, silk dresses, and evening clothes have found it necessary to rely on hand brushing or other equally time-consuming operations to remove lint without damage to the garment and to card the garment, that is, to brush out knots and curls and raise the nap of the material. It has been said that lint removal now is the primary problem facing the dry cleaning industry.

The problem of commercial lint removal by dry cleaners is complicated by the fact that the dry cleaning process produces static electricity in garments thereby causing lint to be attracted and adhere to the garments. Further, the static charge is increased when garments are brushed. While it is known that the formation of static electricity may be prevented by wetting the brushes, such treatment has not been practicable with brushes of the common types having bristles that become soft and easily deformed when wet, or with materials that shrink or otherwise are damaged by wetting as is the case with most of the garments handled by a dry cleaner.

Accordingly, the general object of the present invention is to provide a novel machine for effectively removing lint and accumulated foreign particles even from very delicate garments and carding the same quickly and without danger of damage to the garments.

Another object is to enhance the appearance and texture of garments by removing accumulated lint and foreign particles that dull the colors of the garments.

A further object is to remove water soluble soils remaining on the garments after the usual dry cleaning operation in a quick and easy manner as an incident to the lint removing operation.

Other objects and advantages of the invention will become apparent from the following detailed description taken in connection with the accompanying drawings, in which

FIGURE 1 is a fragmentary perspective view of a garment brushing machine embodying the novel features of the present invention.

FIG. 2 is a fragmentary sectional view taken along the line 2—2 of FIG. 1.

FIG. 3 is a fragmentary sectional view taken along the line 3—3 of FIG. 2 with parts broken away and shown in section.

FIG. 4 is a schematic perspective view of the piping of the machine.

As shown in the drawings for purposes of illustration, the invention is embodied in a garment brushing machine including a hollow casing **10** having a top wall formed with an opening **11** through which the garment **12** (FIG. 2) to be brushed can be lowered between two

side-by-side brushes **13** and **14** in the casing rotated in opposite directions to draw the lower end portion of the garment downwardly between brushes and then brush the opposite sides of the garment as the latter is pulled upwardly between the brushes. The spacing of the brushes is adjustable to apply the desired brushing pressure to the garment, and a vacuum pump **15** communicates with the chamber **17** below the brushes through an outlet **18** to collect and dispose of particles removed from the garments by the brushes. A horizontal grating **19** disposed between the brushes and the outlet prevents garments from being sucked into the vacuum pump.

The casing **10** is formed by a plurality of sheet metal plates mounted on a frame including four upright angle bar legs **20**, horizontal crossbars **21** (FIG. 1) spanning and secured to the tops of the front and rear legs on each side, parallel crossbars **22** spanning the front and rear legs intermediate the ends thereof, and two angle bars **23** (FIG. 2) spanning the two front legs and the two rear legs just below the grating **19**. The grating rests on the tops of these angle bars. Another angle bar **24** is fastened across the lower end portions of the rear legs.

The front and rear walls **25** and **27** of the casing are formed by two upright rectangular plates screwed at **28** to the legs of the frame, and each of the side walls comprises two vertical plates **29** and **30**. The upper plate **29** is fastened to the top angle bar **21** and to the outer edges of the associated front and rear legs with its lower edge **31** (FIG. 1) adjacent the level of the grating. The lower plate **30** is offset inwardly from the upper plate and overlaps the bottom of the latter as indicated by the broken line **32** in FIG. 1, this plate being fastened to the inner side of the assocated front and rear legs and extending downwardly below the crossbar **22**.

To form the bottom of the casing **10**, a curved plate **33** (FIG. 2) is secured to the front wall plate **25** below the grating **19** and curves downwardly and rearwardly at **34** toward the rear wall **27**, the rear portion of the bottom plate preferably being horizontal and being fastened as by welding to the rear wall. The vacuum outlet **18** is formed in the rear wall just above the bottom wall of the chamber. The casing is completed by two elongated rectangular guard plates **35** and **37** spanning the top crossbars **21** and fastened thereto by screws **38** (FIG. 1). The outer edges of the guard plates abut against the upper edges of the front and rear plates **25** and **27**, and the inner edges of the plates are spaced apart to define the opening **11** which takes the form of a slot extending across the full length of the casing and centered over the chamber **17**. The adjacent edge portions **39** of the guard plates are bent downwardly to eliminate sharp edges that could damage clothing.

With this arrangement the chamber **17** is substantially enclosed by the casing **10**. Thus, as air is evacuated from the chamber by the volume pump **15**, outside air is sucked into the chamber through the slot **11**. The vacuum pump may be of any suitable construction and herein discharges air from the chamber into a filter bag **40**.

In this instance, the brushes **13** and **14** also extend across the full length of the casing **10** with the space between the brushes generally centered beneath the slot **11**. The brushes are of a well known and readily available construction including cylindrical wooden bodies **41** with resilient bristles which may be composed of Manila fiber fast on the bodies and projecting radially outwardly, preferably in closely spaced relation to form a substantially cylindrical periphery on each brush comprising the exposed ends of the bristles. Trunnions **42** for mounting the brushes rotatably on the support formed by the casing

and the frame are fast on the ends of the brush bodies and coaxial therewith.

To rotate the brushes, the trunnions **42** on the left-hand side of the casing project through the side wall **29** and two pulleys **43** are mounted on the projecting end portions of the trunnions and rotated by an electric motor **44** through V-belts **45** and **46** trained around the pulleys and around drive pulleys **47** fast on the motor shaft, one of the belts being twisted whereby the brushes are rotated in opposite directions as indicated by the arrows in FIG. 2. The motor is supported below the casing **10** on a base plate **48**.

A garment **12** to be brushed is lowered through the slot **11** and between the brushes **13** and **14** and is pulled downwardly by the brushes into the chamber **17**. Then, as the garment is pulled upwardly, particles loosened by the brushes are drawn into the vacuum pump **15** along with the air flowing inwardly through the slot and between the brushes and through the bristles thereof to the pump.

As previously stated, machines of this general type are known and have been used for brushing dust from hides or removing dirt from the cuffs of trousers where heavy or prolonged brushing pressure may be used without damage to the article being brushed. The prior art machines are not suited, however, for use in lint removal or carding of a large portion of the garments received for dry cleaning because of the delicate nature of the material and the static electricity developed in the garments during the dry cleaning process. Accordingly, commercial lint removal and carding in dry cleaning establishments heretofore has been accomplished by laborious, time-consuming, and therefore expensive hand brushing. In especially difficult cases, it sometimes has been necessary to remove lint by pressing a strip of adhesive material against the garment.

In accordance with the primary aspect of the present invention, a jet **49** of dry steam is directed against the portion of the garment **12** within the chamber **17** below the brushes **13** and **14** to humidify the garment and thereby dissipate static electricity in the garment before the latter is pulled upwardly between the brushes, and excess steam immediately is drawn out of the chamber by the vacuum pump **15** thereby to avoid wetting of either the garment or the brushes. After the static electricity is dissipated, light brushing pressure is sufficient to remove lint and other particles on the garment quickly and without harm to the garment.

In the present instance, the dry steam is directed toward the portion of the garment immediately below the brushes by a plurality of nozzles **50** formed by holes spaced longitudinally at intervals of one and one-half to two inches along a pipe **51** extending generally horizontally through the chamber **17** along the rear wall **27** of the casing **10** and disposed somewhat below the level of the brushes. The nozzle holes are drilled horizontally through the front side of the pipe to direct steam forwardly in a plurality of generally horizontal jets **49** that merge below the brushes and form a curtain of steam that impinges against the entire width of the garment. The total area of the holes is such that the entire length of the spray pipe is pressurized and steam issues from all the holes in substantially identical jets.

On one side of the casing **10**, the right-hand side as viewed in FIG. 4, the spray pipe **51** communicates with an upright pipe section **51a** connected to a supply pipe **51b** communicating with the usual central steam source (not shown) of the dry cleaning establishment which supplies steam under pressure ordinarily on the order of 85 to 90 p.s.i. To remove water droplets and sediment from the steam before it enters the spray pipe, a well **56** is provided below the joint between the spray pipe and the vertical pipe section **51a** so that droplets settle into the well. Further, the spray pipe is inclined at a slight angle downwardly to the left (FIG. 4) so that any water that collects in the pipe as a result of condensation drains through the pipe into a depending pipe section **52** formed with a restricted bleed opening spaced below its upper end. The size of the bleed opening is controlled by a pet cock **52a**. Thus, water drains out of the spray pipe through the pipe **52** and the bleed opening, and the latter permits disposal of the water while maintaining the steam pressure within the spray pipe.

A suitable selectively operable valve **53** is interposed between the nozzles **50** and the steam source to control the release of steam into the spray pipe **51** and thence into the chamber **17**. Herein, this valve is of the solenoid-operated type controlled by a foot pedal **54** which, when depressed, energizes the solenoid **55** to open the valve and admit steam into the pipe. The foot pedal is mounted on a flexible cable **57** which permits placement of the foot pedal wherever desired. A manually adjustable rate valve **53a** controls the amount of steam admitted into the spray pipe when the valve **53** is open.

In operation, with the vacuum pump **15** and the brush motor **44** operating, the foot pedal **54** is depressed as a garment is lowered between the brushes **13** and **14** as shown in FIG. 12, and steam issues through the nozzles **50** in jets **49** directed toward the portion of the garment below the brushes thereby to humidify the garment and dissipate static electricity in the garment. While the lower sides of the brushes are exposed to the steam deflected by the garment, the constant flow of air through the slot **11** and around and through the brushes immediately carries this steam toward and into the vacuum pump to prevent wetting of the brushes and prolonged exposure of the garment to the steam. The length of time the foot pedal should be depressed varies with the nature of the material and the amount of lint thereon, and is best determined by experience with the machine.

Similarly, the brushing time varies with the nature and condition of the material. With some garments, one pass between the brushes could be sufficient, but with most garments it is desirable to work the garment up and down between the brushes several times. Of course, the clothing may be folded initially and refolded and reversed until all surfaces have been brushed, steam being applied each time a new surface is lowered between the brushes. I have discovered that treatment with this machine not only removes obvious lint but also greatly enhances the appearance of practically all materials by brightening the colors thereof. The color change is attributed to removal of accumulated foreign matter that clings to or is imbedded in the material and has been unaffected by the hand brushing heretofore relied upon for lint removal and carding. Moreover, the knots and curls formed by external tangles in the yarn of the material are quickly and easily brushed out. It is believed that the slight moistening of the fabric not only dissipates static electricity but also softens the yarn, making it more pliable and easily brushed out with a minimum of breakage of fibers.

The results achieved with this machine have been exceptional. For example, hand brushing of a sweater previously required as much as ten to fifteen minutes whereas such brushing now is completed in a matter of seconds with results superior to those achieved by hand brushing. So little time is required that all dry cleaned clothing may be treated.

One of the brushes **13, 14** is mounted to yield relative to the other when bulky articles or parts of articles pass between the brushes thereby to prevent the application of excessive brushing pressure that could damage the article. For this purpose, the trunnions **42** of the brush **14** are journaled in bushings **58** fast as by welding in the side walls **29** of the casing **10**, and the trunnions of the brush **13** are journaled in bushings **59** fast in the upper end portions of elongated parallel arms **60** pivoted on the frame to swing the brush **13** toward and away from the other brush about an axis **61** spaced below the brushes and paralleling the brush axes.

Herein, the arms **60** are disposed adjacent the opposite sides of the machine and are pivoted intermediate their ends on the horizontal crossbars **22** with the upper end portions of the arms projecting into the chamber **17** through the elongated slots formed between the offset side wall plates **29** and **30**. To accommodate swinging of the brush **13**, the trunnions **42** thereof project through arcuate slots **62** in the plate **29**.

The lower ends of the arms **60** are connected together by a crosspiece **63** and a pair of tension springs **64** are stretched between the lower angle bar **24** and the crosspiece to urge the arms counterclockwise (FIG. 2) about the axis **61** and swing the brush **13** toward the brush **14**. To limit such swinging and hold the brushes in properly spaced relation for light brushing engagement with a garment, adjustable stops **65** comprising the ends of bolts **67** threaded through nuts **68** fast on the frame are positioned in the path of swinging of the arms to abut against the latter and normally hold the movable brush in a position determined by the adjustment of the stops. The bolts project through the front wall **25** of the casing **10** with knobs **69** fast on the outer ends to facilitate turning of the bolts relative to the nuts to adjust the normal spacing of the brushes.

If a garment that is substantially thicker than the selected width of the space between the brushes should be lowered between the brushes, the movable brush yields away from the fixed brush as permitted by the springs **64** to avoid the application of excessive pressure to the garment. The same is true when a shoulder pad or the like passes between the brushes.

The invention also contemplates the provision of novel means for quickly and easily removing water soluble soils not removed in the normal cleaning operation. For this purpose, a selectively operable spotting gun **70** is mounted on the top wall of the casing **10** in an out-of-the-way position but in position to direct a jet of steam toward spots on the garment discovered by the operator during de-linting. After a spot has been treated with a jet of steam long enough to dampen the soiled area of the garment, the operator simply lowers the soiled portion in between the brushes to be cleaned thereby.

Herein, the spotting gun **70** comprises a nozzle clamped in a bracket **71** screwed to and upstanding from the rear guard plate **35** adjacent the middle of the casing with the discharge end of the nozzle inclined downwardly and forwardly to direct a concentrated jet of steam toward a central portion of the exposed surface of the fixed brush **14**. Steam is supplied to the nozzle through a manually adjustable rate valve **72** (FIGS. 1 and 4), a second valve **72a** opened and closed by a solenoid **73** controlled by a second foot pedal **74** on a flexible cable **75**, and a pipe **76** communicating with the supply pipe **51b**. Steam is returned to the source through a return line indicated generally at **77**. A branch line **77a** between the well **56** and the return line returns overflowing water to the source. A temperature-operated steam trap **77b** maintains steam pressure in the system.

When a spot is discovered, the operator simply positions the spotted area in front of the nozzle, depresses the pedal momentarily to apply steam to the spot, and then lowers the garment until the spotted area is pulled between the brushes. It will be seen that the brushes not only remove the soil after the steam treatment but also cooperate in holding the garment taut and in position before the nozzle as steam is applied to the spotted area. It should be understood that only a limited area of the garment is dampened for spot-cleaning thereby avoiding any problem of shrinkage. Moreover, the immediate brushing of the area not only removes the soil but also feather-edges the damp spot to distribute the moisture and avoid so-called "rimming" of the garment, that is, the forming of obvious water spots on the material.

In view of the fact that wetting weakens the bristles of most brushes and repeated exposure of the bristles to a concentrated jet of steam can deform the bristles of the exposed area, it is desirable to protect the exposed area with a ring **78** of material not susceptible to deformation by the steam jet. This ring may be composed of any suitable relatively firm material and is fastened to the body **41** of the brush **13** in longitudinal alignment with the nozzle **70**, the ring having approximately the same outside diameter as the periphery of the brush. Thus, the ring prevents the formation of a groove in the brush and provides a firm backing for the soiled portion of the garment as the latter is sprayed for spot cleaning.

From the foregoing, it will be apparent that the machine described herein is capable of removing lint and brushing out knots and curls in a quick and easy operation even on very delicate garments such as knitted sweaters without danger of damage to the garments. As a result of treatment by the machine, the garments are substantailly lint free and, further, the color of the material is brightened and renewed.

I claim as my invention:

1. A garment brushing machine including, in combination, a support including a hollow casing having an upper wall with an elongated slot-like opening therein through which garments can be lowered, a pair of cylindrical brushes disposed within said casing below said opening and journaled on said support for rotation about parallel horizontal axes with the peripheral surfaces of said brushes closely adjacent each other to engage the opposite sides of a garment lowered between them, means for rotating said brushes in opposite directions to draw a garment downwardly between them, a series of nozzles spaced longitudinally of said brushes within said casing and positioned below said brushes to direct jets of steam against the portion of the garment below the brushes thereby to humidify the garment and dissipate static electricity therein, selectively operable means for delivering steam to said nozzles, means for applying vacuum to the interior of said casing below said brushes to carry away the steam along with particles of lint freed from the garment by the brushes, and a grating interposed between said brushes and said vacuum means for preventing said garment from being sucked into said vacuum means.

2. A garment brushing machine including, in combination, a support including a hollow casing having an elongated opening in its upper end through which garments can be lowered, a pair of brushes in generally horizontal side by side relation below said opening parallel to the longer axis thereof and journaled on said support for rotation with the peripheries of said brushes spaced to engage the opposite sides of a garment lowered through said opening, means for rotating said brushes in opposite directions to draw a garment downwardly between them and into said casing, a nozzle positioned to direct a jet of steam against at least a portion of the garment below said brushes, foot operated means for delivering steam to said nozzle and thence against the garment to humidify the garment and dissipate static electricity therein, and means for creating a flow of air downwardly between and past said brushes thereby to carry away the steam along with particles of lint and the like freed from the garment by the brushes.

3. A garment brushing machine as defined in claim **1** in which said nozzles comprise generally horizontally facing holes spaced longitudinally along a pipe disposed beneath and generally parallel to one of said brushes to direct said jets laterally across the interior of said casing beneath the brushes.

4. A garment brushing machine including, in combination, a support including a hollow casing having an elongated opening in its upper end through which garments can be lowered, a pair of brushes disposed below said opening generally parallel to the longer axis thereof and journaled on said support for rotation with the peripheries of the brushes spaced to engage the opposite sides of a garment lowered through said opening, means for rotating said brushes in opposite directions to draw a garment

downwardly between them and into said opening, a nozzle positioned to direct a jet of steam against at least a portion of the garment below said brushes, selectively operable control means for delivering steam to said nozzle and thence against the garment to humidify the garment and dissipate static electricity therein, and means for creating a flow of air downwardly between and past said brushes thereby to carry away the steam along with particles of lint and the like freed from the garment by the brushes, a further nozzle mounted on said support above one of said brushes in position to direct a concentrated jet of steam toward the upper portion of a garment while the lower portion of the garment is between the brushes, and selectively operable means for supplying steam under pressure to said nozzle whereby a selected soiled area of the garment is spot cleaned as an incident to lint removal by positioning said area in the path of said jet, applying a jet of steam to the area, and subsequently lowering the area between said brushes.

5. In a garment brushing machine, the combination of, a support, a pair of brushes journaled on said support for rotation about spaced axes with the peripheral surfaces of the brushes closely adjacent each other to engage the opposite sides of a garment lowered between the brushes, means for rotating said brushes in opposite directions to draw the lower end portion of the garment downwardly between them, a nozzle mounted on said support above one of said brushes in position to direct a concentrated jet of steam toward an upper portion of

the other brush and thus against a selected area of the upper portion of a garment while the lower portion of the garment is between the brushes, selectively operable means for supplying steam under pressure to said nozzle whereby said selected area is spot cleaned by positioning said area in the path of said jet, applying a jet of steam to the area, and subsequently lowering the area between said brushes, and a ring of relatively firm material encircling the portion of said other brush in the path of said jet thereby to form a backing for the garment during steam treatment thereof and prevent deformation of said other brush by said jet.

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