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O. SHEPPARD

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LINT CLEANING APPARATUS

Filed Oct. 30, 1940

3 Sheets-Sheet 1

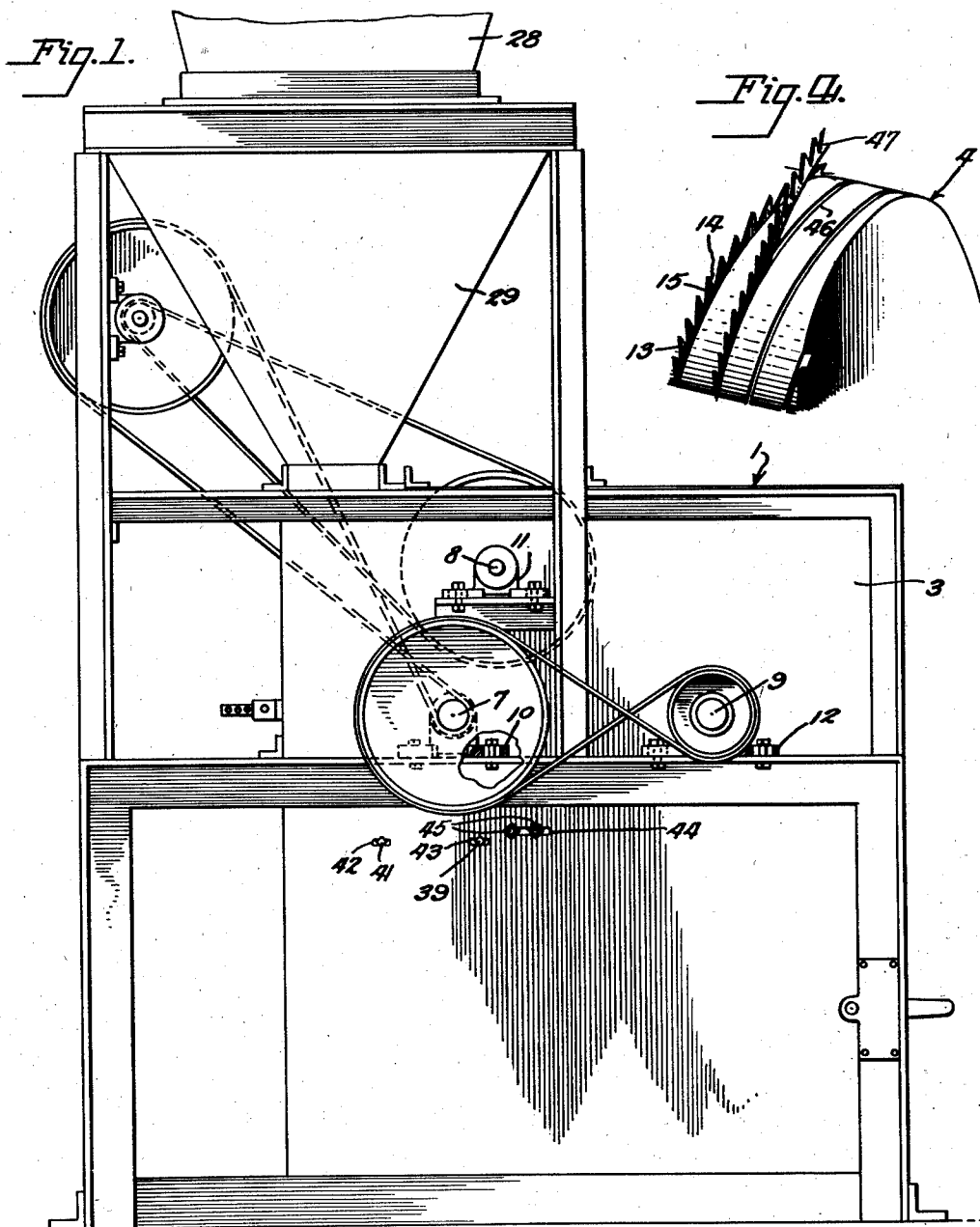
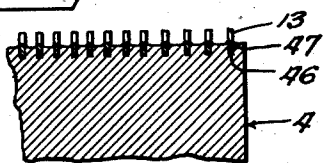


Fig. 5.



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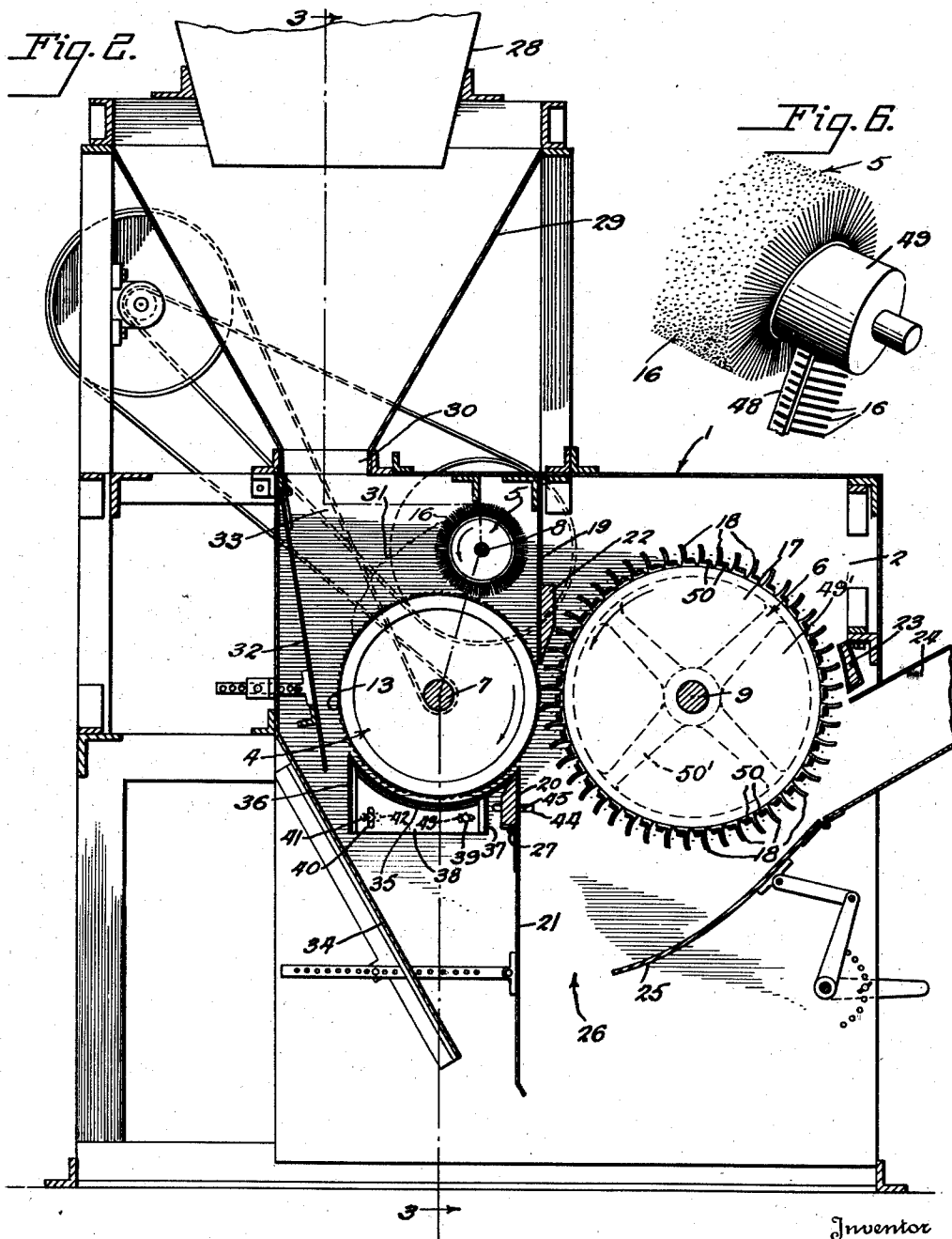
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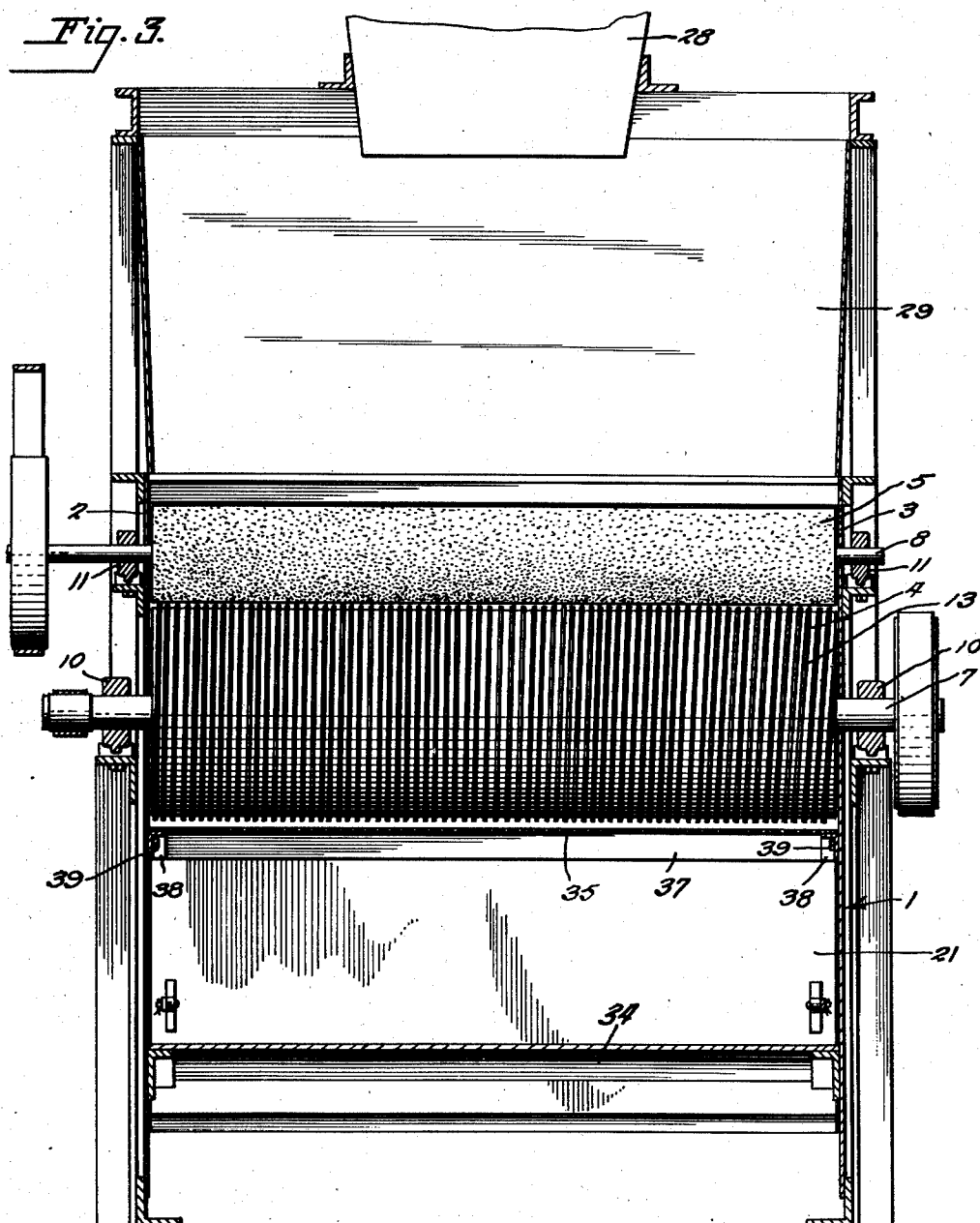
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3 Sheets-Sheet 3



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UNITED STATES PATENT OFFICE

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LINT CLEANING APPARATUS

Orlando Sheppard, Atlanta, Ga.

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7 Claims. (Cl. 19—67)

This method relates to the method of cleaning lint and apparatus for carrying out this method. The invention has for its object the treatment of lint after it comes from a delinter.

One of the more specific objects of the invention is to collect the lint continuously upon a conveying roll, passing it continuously through a restricted thin film-forming space between the collecting roll and a brushing roll, the relative interaction of said rolls serving to arrange the lint in orderly manner, thereby disengaging it from trash particles with which it may be entangled, drawing the lint and trashy matter from the conveying roll into the pockets of a centrifugal vacuum fan operating in close proximity to said conveying roll, throwing the lint and detached trashy particles centrifugally from said fan into an eduction current of air flowing at an abrupt angle to the trajectory of said lint and trashy particles, the cleaned lint passing out of the machine in said current, and the trash particles being caught against a mote board and removed gravitationally from the apparatus.

Another object of the invention is the provision of lint cleaning apparatus comprising a brushing roll and a cylindrical centrifugal fan having longitudinal pockets, said brushing roll and fan being mounted on parallel axes, and a lint collecting and conveying roll also mounted on an axis parallel to the axes of said brushing roll and fan, having its surface in close proximity to the periphery of the brushing roll and that of the fan, whereby lint collecting on said conveying roll is dragged in a thin film between said conveying roll and brushing roll, being subject to the brushing effect of the latter whereby trash particles entangled in the lint are disengaged therefrom, the lint being then carried in a thin film to the region of adjacency of said conveying roll and fan whereby both the lint and the detached foreign particles are drawn into said fan and centrifugally thrown out therefrom into a classifying air current in which the lint and foreign matter are separated.

Other objects of the invention concern details in the method as well as in the apparatus and as will appear as the following description of a preferred and practical embodiment thereof proceeds.

In the drawings which accompany and form a part of the following specification, and throughout which the same characters of reference have been employed to designate identical parts:

Figure 1 is a side elevation of lint cleaning apparatus embodying the principles of the present

invention and illustrating principally the driving connections between the several parts;

Figure 2 is a vertical side sectional view;

Figure 3 is a vertical section taken along the staggered line 3—3 of Figure 2;

Figure 4 is a perspective view showing a detail in the construction of the collecting and conveying roll;

Figure 5 is a detail view in longitudinal section through the collecting and conveying roll; and

Figure 6 is a perspective view illustrating a mode of constructing the brush roll.

Before advertng to a detailed description of the apparatus, it may be stated that the lint which it is contemplated to treat is the product of any delinting machine and which comes from the machine in partially cleaned state, but containing enough dust, pepper, and other trashy particles to make it unfit for certain industrial purposes, and to substantially lower its grade and commercial value.

By the present invention, such lint is completely cleaned so that it has the highest market value and is adapted for industries in which only the most refined lint can be employed.

The lint cleaning apparatus comprises, in general, a casing 1 having the opposite vertical and parallel side walls 2 and 3. This casing is preferably of sheet metal construction, supported by angular iron frames, although the nature of the casing construction is optional and is not an essential part of the invention.

Three rotating members are employed in the line cleaning apparatus, the roll 4, which by virtue of its dual function may be referred to as the collecting and conveying roll; the brushing roll 5; and the centrifugal vacuum fan 6.

These rotating members are mounted upon the respective shafts 7, 8 and 9, the ends of which are supported in the respective bearings 10, 11 and 12 at the opposite sides of the casing, said bearings being horizontally adjustable, as shown, so that the distance between the brushing roll and fan relatively to the rolling and conveying roll may be adjustably varied.

The collecting and conveying roll is provided with a spiral series of saw teeth 13, see Figure 4, the helices being arranged about one-eighth of an inch apart, each having an abrupt shoulder 14 and a sloping shoulder 15, said teeth being arranged with their abrupt shoulders facing the direction of rotation of the collecting and conveying roll. The surface of the brushing roll comprises a mass of radial wire bristles 16. The brushing roll is arranged so that the ends of the

wire bristles have a small clearance of perhaps one-thirty-second of an inch from the ends of the saw teeth 13.

The centrifugal fan comprises a drum 17 having longitudinal radial spaced blades 18 extending therefrom and arranged in close proximity to the periphery of the collecting and conveying roll.

The collecting and conveying roll 4 and the brushing roll 5 rotate in opposite directions, while the centrifugal fan 6 rotates in the same direction as does the brushing roll. The optimum relative rates of rotation of these several members is 500 R. P. M. for the collecting and conveying roll, 10 R. P. M. for the brushing roll, and 1200 R. P. M. for the centrifugal fan.

The casing is divided substantially vertically into a chamber containing the rolls and the chamber containing the fan by the division boards 19 and 20, the lower part of the latter board being the adjustable wind deflector 21. The division of the casing into these two chambers is necessitated by the fact that the fan chamber involves pneumatic operation and air conditions in said chamber must be controlled. With this end in view, the upper part of said chamber in which the upper portion of the fan revolves is substantially cut off from the lower part of said chamber by the air cut-off boards 22 and 23 so that, due to the action of the fan, more or less of a vacuum exists in this portion of the chamber. The presence of this vacuum causes the fan pockets between the blades 13 to approach the collecting and conveying roll in vacuum condition, enabling them to draw off and receive both the lint and the foreign particles carried by the collecting and conveying roll. The portion of the fan chamber below the cut-off boards 22 and 23 is in communication with the lint discharge conduit 24 through which the cleaned lint is blown by the action of the fan 6. An adjustable mote board 25 forms the lower wall of the lint discharge conduit, beneath the fan, an eduction current of air being drawn into the space 26 at the lower end of the mote board, then suffering an abrupt direction change as it passes between the mote board and fan and out by way of the lint discharge conduit. The space 26 can be varied in size by adjustably swinging the wind deflector 21 about its pivotal connection 27. This controls the velocity of the eduction current as well as the angle of its direction change after it enters through the space 26.

In the apparatus, as shown, the lint comes from the delinter to the lint cleaning apparatus by way of the cyclone 28, in which as much as possible of the dust has been removed. The lint is discharged from the cyclone 28 into a feed hopper 29, which opens into the casing 1 through an inlet slot 30, the latter preferably extending the full width of the casing. The lint, together with such trash or foreign matter with which it may be engaged or entangled, falls gravitationally upon the collecting and conveying roll 4, and is carried around against the brushing roll 16. Here the lint may form a mass 31 in the angle between the collecting and conveying roll and the brushing roll, which mass is continuously depleted by the dragging action of the saw teeth against its lower surface, and which is continuously replenished by fresh lint coming in from the cyclone. The close proximity of the brushing roll to the surface of the collecting and conveying roll permits the passage of only a thin film or layer of lint beyond the brushing roll, and the relative speed differential between the two rolls is such that the lint is subject to brushing action

by the wire bristles of the brushing roll by which action the lint fibers are arranged in an orderly manner and any foreign particles with which they may be engaged or entangled are freed or loosened therefrom. After the lint and foreign particles have passed beyond the brushing roll, they are therefore in loosened condition and ready to be separated.

If the brushing roll were stationary the lint mass 31 would become compacted in the angle between the two rolls, and the lint would be drawn beneath the brushing roll in a condensed mass in which the foreign particles would be embedded. The action of the slow rotation of the brushing roll is to draw out the mass of lint 31 in a direction beneath the rolls, preventing condensing of the mass and producing an open film or layer between said rolls at the point at which the wire bristles perform their brushing action. This open nature of the mass between said rolls assists in the detachment of the foreign particles from the lint fibers.

The casing 1 is provided with a hinged deflector wall 32 adjacent the collecting and conveying roll 4 and normally spaced therefrom to permit heavy foreign particles which may enter the apparatus to gravitate to the lower part of the casing without being entrained in the lint carried on the surface of the collecting and conveying roll. This deflector wall is made adjustable so as to vary the width of the space between itself and the collecting and conveying roll, to the end that the current of incoming air set up by the rotation of the collecting and conveying roll may be controlled and undue turbulence in the lint feeding chamber 33 prevented so that the lint will quietly settle on the collecting and conveying roll uniformly from end to end.

The lower end wall 34 of the casing is inclined so as to discharge whatever foreign matter may descend upon it, into a common pile with the foreign matter discharged from the mote board.

The collecting and conveying roll 4 is underlain by a perforated screen 35, the function of which is to prevent lint which may be carried around upon the collecting and conveying roll from dropping off and being wasted with the trash, while at the same time permitting such trash as may drop from the lower part of the roll to pass through their perforations and be discharged at the lower end of the inclined end wall 34. The screen 35 is made rigid by means of the longitudinal flanges 36 and 37 and the end flanges 38, and it is swingably adjustable about the pivot 39 so that it can be lowered or raised at the left hand side. This lowering or raising is made possible by the vertical slots 40 in the end plate 8 through which passes the supporting pin 41. The screen is also made laterally adjustable by means of the horizontal slots 42 and 43, so that the distance between said screen and the surface of the collecting and conveying roll at the right hand end of the screen may be varied. The lower division board 20 is also laterally adjustable by means of the slots 44 in the ends of the casing, through which slots extend the ends of U-bolts 45 mounted in the ends of the division board and having lateral play in said slots.

With reference to the construction of the surface of the collecting and conveying roll 4, this is already known in the art and comprises a shallow spiral slot 46 turned in the surface of the roll in which a continuous toothed ribbon 47 is seated, and the material of the roll peened or spun against said ribbon, holding it in place.

The construction of the brushing roll is also

known in the art, comprising a strip of bolting 48, in which the wire bristles 16 are mounted, said strip being wound about and secured to a mandrel 49 forming the core of the roll.

The blade elements 18 of the centrifugal fan 6 are formed angular, the base of the blades being slightly curved to fit the periphery of the drum headers 49' and the intermediate spiders 50', said base portion constituting the peripheral surface of the drum. The blade elements are secured by cap screws 50 or the like. The radial portions 18 of the blade elements are formed with a slight curve, as shown, which creates a much greater pull of the fan than if left straight.

In the operation of the apparatus, the lint dragged from the under surface of the lint mass 31 by the teeth of the collecting and conveying roll and spread out into a loose layer between the collecting and conveying roll and the brushing roll by the slow rotation of the latter is brushed into an orderly arrangement by said brushing roll, and the trash particles loosened, after which the thin layer of lint together with the loosened foreign particles is brought into the vacuum zone of the fan 6, the thinness of the layer carried by the collecting and conveying roll ensuring maximum efficiency in the separation of the lint from the foreign particles by the fan, and by the eduction current which cooperates with the fan. The lint and loosened foreign particles are drawn off into the vacuum fan pockets and as the fan rotates further they are thrown out into the eduction current flowing into the space 26 and discharging through the lint discharge conduit 24. A trajectory is imparted both to the lint and the foreign particles which throws them into the eduction current, but the lint being light and buoyant, is carried out in the eduction air current, while the foreign particles being heavier or more compact, are drawn through the eduction current against the mote board and separately discharged.

While I have in the above disclosed what I believe to be a preferred and practical embodiment of the invention, it will be understood to those skilled in the art that the specific details of construction and arrangement of parts as described and illustrated, are by way of example and not to be construed as limiting the scope of the invention defined in the appended claims.

What I claim is:

1. Lint cleaning machine comprising a casing having a partition defining on one side a lint-receiving chamber to which lint is fed, and on the other side a fan chamber, said partition having an opening extending thereacross at an intermediate height, a cylindrical roll of uniform diameter in said receiving chamber substantially occluding said opening, the upper part of said roll being rotatable towards the upper edge of said opening, said roll being densely clothed with teeth having lint catching portions facing in its direction of rotation and passing the upper edge of said opening with small clearance, the cylindrical surface of said roll between said teeth extending substantially to the base of said teeth, a centrifugal drum-type fan in said fan chamber having radial blades, defining chambers between them, said fan rotating in the opposite direction to said roll with its blade edges in close proximity to said teeth in that region of said roll exposed at said opening, a lint discharge suction conduit communicating with said fan chamber on the side of said fan opposite said opening, and so located with respect to said blade chambers

as to evacuate them, the sides of said fan chamber enclosing the upper arc of said fan from said suction conduit to said opening in substantially air-tight manner, for maintaining in said blade chambers the vacuum induced by said suction conduit whereby said fan in the region of said roll will suck lint and trash from said roll teeth into said blade chambers, the lower part of said fan chamber adjacent said opening being provided with an atmospheric air inlet from which said suction conduit draws a cross current of air tangent to the lower arc of said fan, into which current lint and trash are drawn centrifugally by said fan and separately classified.

2. Lint cleaning machine as claimed in claim 1, including means for feeding dirty lint to the inlet of said lint chamber in a vehicle of air, and an adjustable deflector within said casing for directing the stream of dirty-lint laden air upon said toothed roll.

3. Lint cleaning machine as claimed in claim 1, including a perforated screen beneath said toothed roll and in close proximity thereto, permitting gravitational fall therethrough of detached trash, but retaining the lint layer upon said toothed roll, said screen being slidably and pivotably adjustable with respect to said toothed roll.

4. Lint cleaning machine comprising a casing having a partition defining on one side a lint-receiving chamber to which lint is fed, and on the other side a fan chamber, said partition having an opening extending thereacross at an intermediate height, a roll in said receiving chamber substantially occluding said opening, the upper part of said roll being rotatable towards the upper edge of said opening, said roll being densely clothed with teeth having lint catching portions facing in its direction of rotation and passing the upper edge of said opening with small clearance, a centrifugal drum-type fan in said fan chamber having radial blades, defining chambers between them, said fan rotating in the opposite direction to said roll with its blade edges in close proximity to said teeth in that region of said roll exposed at said opening, a lint discharge suction conduit communicating with said fan chamber on the side of said fan opposite said opening, and so located with respect to said blade chambers as to evacuate them, the sides of said fan chamber enclosing the upper arc of said fan from said suction conduit to said opening in substantially air-tight manner, for maintaining in said blade chambers the vacuum induced by said suction conduit whereby said fan in the region of said roll will suck lint and trash from said roll teeth into said blade chambers, the lower part of said fan chamber adjacent said opening being provided with an atmospheric air inlet from which said suction conduit draws a cross current of air tangent to the lower arc of said fan, into which current lint and trash are drawn centrifugally by said fan and separately classified, said casing including a dirty lint inlet above said toothed roll, and a brush roll between said inlet and said opening, tangential to said toothed roll having the lower part rotating in the same direction as the adjacent part of said toothed roll for brushing the lint layer passing between said rolls, thereby loosening the trash from the lint.

5. Lint cleaning machine comprising a casing having a partition defining on one side a lint-receiving chamber to which lint is fed, and on the other side a fan chamber, said partition having an opening extending thereacross at an in-

intermediate height, a roll in said receiving chamber substantially occluding said opening, the upper part of said roll being rotatable towards the upper edge of said opening, said roll being densely clothed with teeth having lint catching portions facing in its direction of rotation and passing the upper edge of said opening with small clearance, a centrifugal drum-type fan in said fan chamber having radial blades, defining chambers between them, said fan rotating in the opposite direction to said roll with its blade edges in close proximity to said teeth in that region of said roll exposed at said opening, a lint discharge suction conduit communicating with said fan chamber on the side of said fan opposite said opening, and so located with respect to said blade chambers as to evacuate them, the sides of said fan chamber enclosing the upper arc of said fan from said suction conduit to said opening in substantially air-tight manner, for maintaining in said blade chambers the vacuum induced by said suction conduit whereby said fan in the region of said roll will suck lint and trash from said roll teeth into said blade chambers, the lower part of said fan chamber adjacent said opening being provided with an atmospheric air inlet from which said suction conduit draws a cross current of air tangent to the lower arc of said fan, into which current lint and trash are drawn centrifugally by said fan and separately classified, said casing including a dirty lint inlet above said toothed roll and a brush roll between said inlet and said opening, tangent to said toothed roll, having the lower part rotating in the same direction as said toothed roll for brushing the lint layer passing between said rolls thereby loosening the trash from the lint, said brush roll rotating at a slower speed than said toothed roll, and distributing the lint between said rolls.

6. Lint cleaning machine comprising a casing having a partition defining on one side a lint-receiving chamber to which lint is fed, and on the other side a fan chamber, said partition having an opening extending thereacross at an intermediate height, a roll of uniform diameter

in said receiving chamber substantially occluding said opening, the upper part of said roll being rotatable toward the upper edge of said opening, said roll being densely clothed with teeth having lint catching portions facing in its direction of rotation and passing the upper edge of said opening with small clearance, the cylindrical surface of said roll between said teeth extending to the base of said teeth defining with said teeth shallow lint-receiving channels, and a vacuum fan in said fan chamber having radial blades defining vacuum chambers between them, said fan rotating in the opposite direction to said roll with its blade edges in close proximity to said teeth in that region of said roll exposed at said opening, and a lint discharge suction conduit communicating with said fan chamber on the side of said fan opposite said opening and so located with respect to said blade chambers as to evacuate them.

7. Lint cleaning machine comprising a casing having a partition defining on one side a lint-receiving chamber to which lint is fed, and on the other side a fan chamber, said partition having an opening extending thereacross at an intermediate height, a roll of uniform diameter in said receiving chamber substantially occluding said opening, the upper part of said roll being rotatable toward the upper edge of said opening, said roll being densely clothed with lint catching teeth and passing the upper edge of said opening with small clearance, the cylindrical surface of said roll between said teeth extending to the base of said teeth defining a space of substantially tooth height between said surface and the upper edge of said opening, a vacuum fan in said fan chamber having radial blades defining vacuum chambers between them, said fan rotating in the opposite direction to said roll with its blade edges in close proximity to said teeth in that region of said roll exposed at said opening, and a lint discharge suction conduit communicating with said fan chamber on the side of said fan opposite said opening and so located with respect to said blade chambers as to evacuate them.

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