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Jaffa

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[54] **SCREEN PRINTING LINT REMOVING APPARATUS AND METHOD**

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[52] **U.S. Cl.** ..... **101/425;** 15/104 A; 118/72; 156/389

[51] **Int. Cl.** **B41f 35/00**

[58] **Field of Search** ..... 101/417, 425; 156/344, 156/584, 389; 15/3, 4, 100, 97 R, 221, 256.51, 102, 104 A; 118/72

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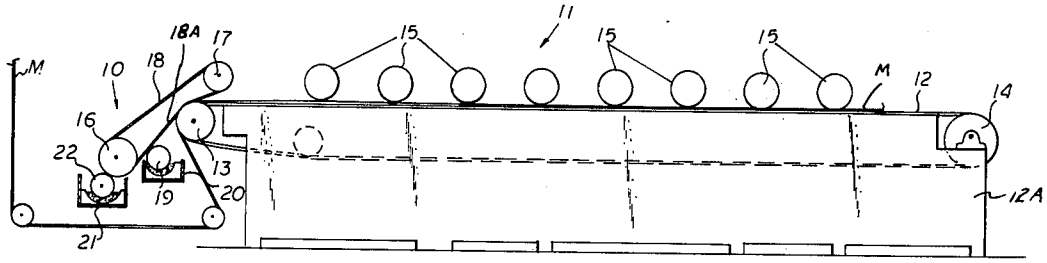
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Primary Examiner—Clyde J. Coughenour

[57] **ABSTRACT**

This disclosure is directed to a method and apparatus for assuring the removal of lint from a piece of material prior to effecting the screen printing of the material. This is attained by moving an endless surface over the material to be printed in advance of printing which has been treated or coated with a substance to which lint is attracted and thereafter cleaning or washing the endless surface to remove the lint and/or any residual coating substance. In operation the endless surface may be moved continuously with the surface being alternately coated and washed to provide for continuous rapid and automatic lint removal which is rendered readily compatible to the operating printing speeds of an associated screen printing operation.

9 Claims, 4 Drawing Figures



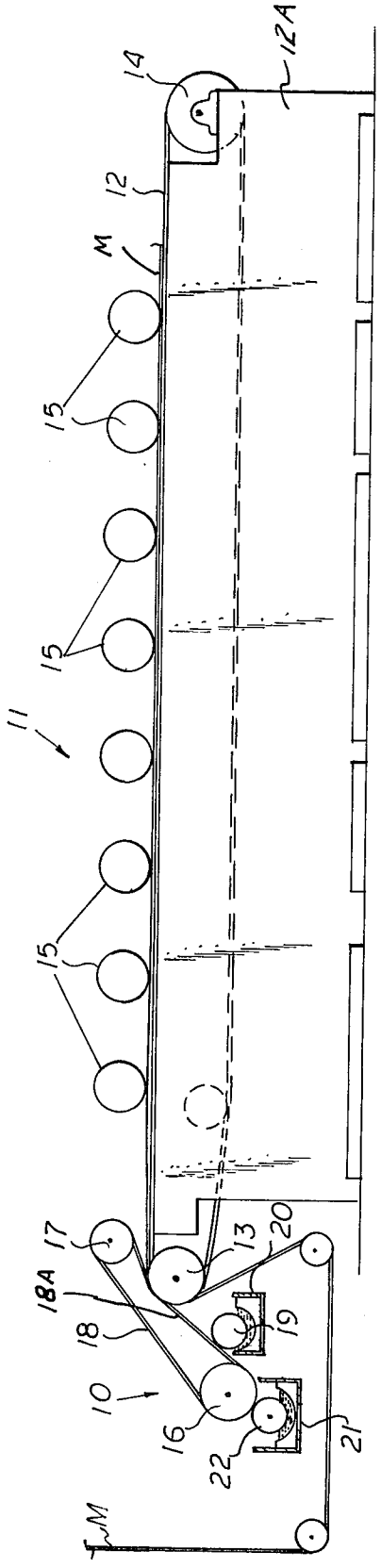


FIG. 1

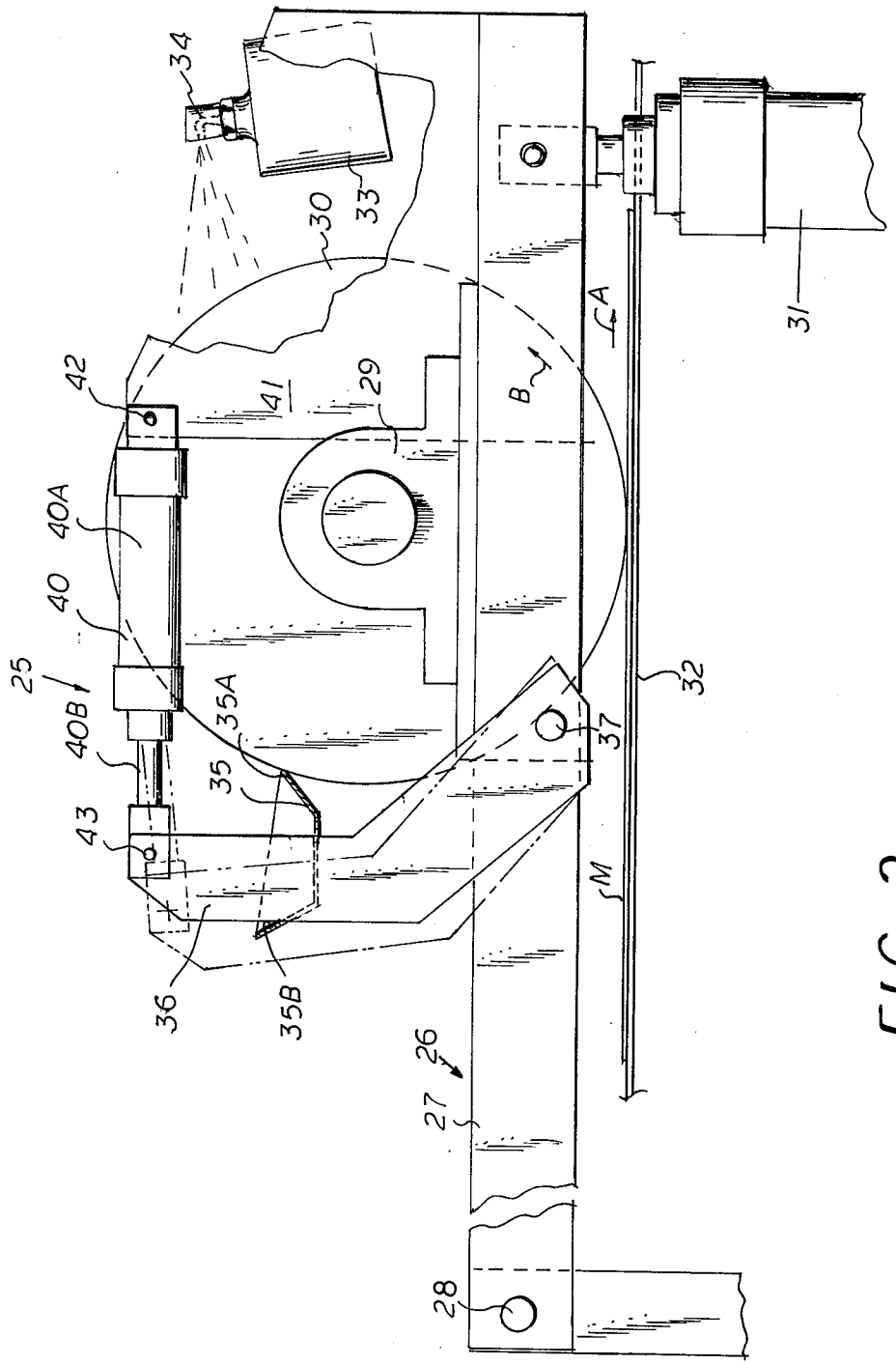

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FIG. 2

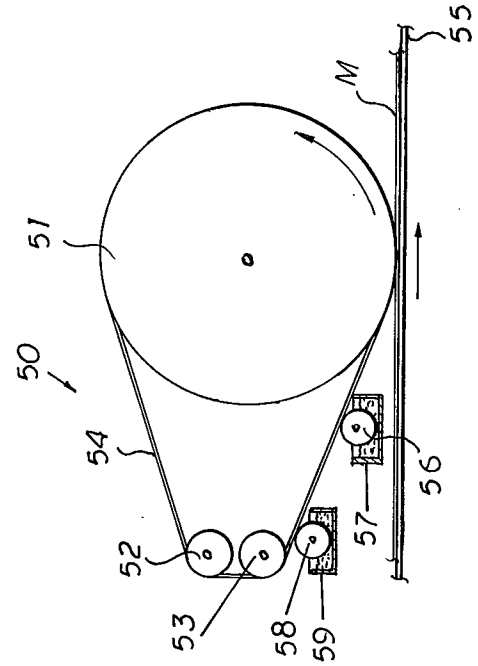


FIG. 4

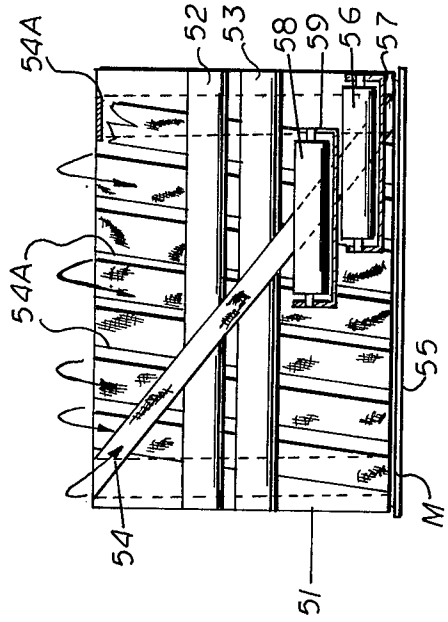


FIG. 3

SCREEN PRINTING LINT REMOVING APPARATUS AND METHOD

PROBLEM AND PRIOR ART

A basic problem confronted in the screen printing art, particularly in the rotary screen printing of material, is the removal of lint from the surface of the material to be printed. The problem is particularly aggravated on high speed screen printing machines, e.g. in rotary screen printing machines. This is because in high speed printing operations, the linting of the material can damage many yards of goods in a relatively short period of time. This is attributed to the fact that the lint, if not satisfactorily removed, will adhere to the rotary printing screen and in doing so will block or seal the screen openings through which color is forced. When this occurs portions of the designs will not be printed, thereby resulting in defective design prints. When this occurs the printed material is either wasted or disposed of at a substantially reduced price as "seconds" or "imperfect"goods. The presently known lint removal systems are not totally effective to obviate this problem since they, for the most part, employ either brushes or vacuums operating on the surface of the material in an effor to remove the lint. It has been observed that while brushes or vacuums are effective to remove the larger pieces of lint, they have a tendency to create or produce microscopic lint pieces by virtue of the frictional action produced thereby on the surface of the material. Other efforts have utilized two sided adhesive tapes wrapped about a roller which is disposed against the surface of the material to remove the lint therefrom. However, the disadvantage in the use of pressure sensitive tape was that the useful life of the tape was very short, and for this reason the screen printing operation had to be repeatedly interrupted to effect a change of tape. In high speed operation the constant need for attending to the removal of lint covered tape to insure lint free printing completely negated the advantage of high speed printing. Consequently the desired optimum high speed production was nullified by the use of such tape lint removal systems.

OBJECTS

An object of this invention is to provide a lint removal apparatus and method which is continuous and positive in operation and which is rendered readily compatible for use with high speed screen printing machines.

Another object is to provide a method and apparatus for effecting the removal of lint from a sheet of material prior to screen printing by alternately gumming and washing an endless surface disposed in engagement with the material to be printed and moving relative thereto.

Another object is to provide a method and apparatus for removing lint which is relatively simple in construction, inexpensive to fabricate and positive in operation.

BRIEF SUMMARY OF THE INVENTION

The foregoing objects and other features and advantages are attained by a method and apparatus in which an endless surface or belt is disposed contiguous to the feed end of a screen printing apparatus to engage with and move relative to the material to be printed. The

endless surface is coated with a suitable adhesive or material to which lint is attracted whereby the relative movement between the endless surface and the material causes the lint to be adhered to the endless surface. In one form of the invention, the coating is applied by spraying. In other form the coating is applied by an applicating roller disposed in rolling engagement with the endless surface. The lint adhered to the endless surface is periodically removed either by a scraper blade or by washing.

In one form of the invention the endless surface comprises an endless belt which has a surface portion thereof disposed in contact with the material to be printed. In this form of the invention the coating of the belt with an adhesive material and the removal of the lint and residual adhesive is attained by successively passing the belt over a gumming application roller and a washing roller.

In another form of the invention the endless belt comprises a relatively narrow width belt which is helically wound about a roller disposed transversely to the material to be printed with the gumming and washing of the belt being attained by a gumming or application roller operating on one portion of the belt for coating the belt with adhesive, and a washing roller operating on the other portion of the belt for removing the lint and/or residual adhesive.

In still another form of the invention the endless surface comprises a drum movably mounted for movement between an operative and inoperative position. The surface of the drum is coated with an adhesive material by spraying. The removal of the lint is effected by an adjustable scraper which is also formed with a shape to define a collector or receptacle for receiving the removed lint and/or residual adhesive.

FEATURES

A feature of this invention resides in the provision of a method and apparatus in which an endless surface coated with a suitable adhesive is disposed in moving engagement with a material to be printed to remove the lint therefrom prior to printing and which surface is subsequently cleaned of the adhered lint and/or residual adhesive.

Another feature of the invention resides in the provision of an endless surface which is successively coated with an adhesive material to attract lint thereto and subsequently washed to provide a continuously operating lint removing arrangement.

Another feature resides in the provision of a continuously operating lint remover formed as an endless belt, the surface of which is successively gummed to attract the lint contacted thereby and successively washed to remove the lint attracted thereto.

Another feature resides in the provision of an endless drum disposed in rolling engagement with the material to be printed on which a coating of adhesive is sprayed onto the surface of the roller to pick up the lint which is subsequently removed by scraping. Other features and advantages will become readily apparent when considered in view of the drawings and description in which:

FIG. 1 is a side elevation view illustrating the lint removing device in accordance with this invention, as applied to a screen printing machine.

FIG. 2 is a side elevation view of a modified form of the invention.

FIG. 3 is a detailed perspective view of still another modified form of the invention.

FIG. 4 is a side elevation view of the modified form of the invention of FIG. 3.

Referring to the drawings there is shown in FIG. 1 a lint removing device or system **10** as applied to a screen printing machine **11.** The screen printing machine **11** which is schematically illustrated comprises essentially of a supporting frame **12A** having an endless printing blanket or belt **12** for supporting the material M to be printed suitably threaded over the end rollers **13** and **14.** The arrangement is such that a continuous strip of material or web M to be printed is readily fed onto the printing blanket **12** whereby the material is conveyed past a series of rotary screen printers **15.**

In screen printing continuous sheets of material, as for example, fabric, the assumulation of any lint on the surface of the material M would adversely affect the printing of the design on the fabric as hereinbefore noted. To avoid or minimize the linting problem there is provided lint removing system or device **10** which can be readily utilized in conjunction with the screen printing machine to effect continuous removal of the lint from the surface of the material M prior to the material being printed without affecting the operating speed of the screen printing machine **11.**

As best seen in FIG. **1** the lint removing device **10** comprises a pair of spaced apart rollers **16, 17** which are suitably supported on a frame of the screen printing machine **11,** at the infeed end of the machine **11.** An endless belt **18** is threaded over rollers **16** and **17.** It will be understood that the belt may be formed of any suitable material, as for example, leather, rubber or a suitable composition. The arrangement is such that an intermediate portion of one of the flights **18A** of the endless belt is disposed in contacting engagement with the material M being fed onto the printing blanket **12** of the screen printing machine **11.** It will be understood that the belt **18** of the lint remover may be driven either by friction and/or through a motor drive (not shown) which is operatively connected to drive at least one of the end rolls **16** or **17.** The arrangement is such that the endless belt **18** of the lint remover **10** will move in timed relationship to the material M being fed to the respective screen printing stations **15.** It will be understood that the width of the endless belt **18** of the lint removal system **10** is substantially equal in width to the printing bed or blanket **12** of the machine.

A means is provided for applying a coating of a suitable adhesive or other substance capable of attracting lint thereto to a surface portion of belt **18** engaging the material M. In the illustrated embodiment of FIG. **1** the coating of adhesive is applied to the surface of belt **18** by means of an applicating roller **19** having a knurled surface, which is rotatably journalled in a trough or receptacle **20** adapted to contain a supply of the adhesive or gumming material. The applicating roller **19** for coating the belt with suitable adhesive is disposed in rolling engagement with the surface of the belt **18** immediately in advance of that area in which the belt engages the material. Accordingly, as seen in FIG. **1** the movement of the lint removing belt **18** about its respective end rollers **16** and **17** is such that the under surface of the belt is coated with a suitable adhesive prior to moving into engagement with the material M being printed so that any lint on the surface of the material to be printed will be adhered to the gummed surface of the lint removing belt **18.**

To effect the removal of the lint from the belt **18** subsequent to moving in contact with the material, a means is provided for the washing of the lint from the belt **18.** As shown, a receptacle or trough **21** adapted to contain a washing solvent is disposed adjacent the belt **18.** An applicating or washing roller **22** is rotatably journalled in the trough and is disposed in rolling engagement with the belt in advance of the gumming roller **19.** Accordingly, the arrangement is such that as the lint removal belt is moved relative to the washing roller **22,** the washing solution contained in the trough **21** is brought in contact with the belt **18** to effect the cleansing or washing of the lint and residual adhesive from the lint removing belt. It will be understood that the washing solution in trough **21** comprises a suitable solvent for effecting the washing of residual coating and lint from belt **18.** In operation the lint removing belt **18** is alternately coated with an adhesive material for effecting the removal of the lint as the lint removing belt passes in engagement with the material M to be printed and washed to effect a continuous lint removal operation which is rendered readily compatible to the speed of the screen printing apparatus **11.**

FIG. **2** illustrates another embodiment of the invention. In this form of the invention the lint removing apparatus or system **25** comprises a supporting frame **26** which includes opposed side arms **27,** one end of which is pivotally connected about a pivot **28** to a frame sturcture of a screen printing machine. Supported on the opposed side arms **27** of the supporting frame **26** are suitable bearing blocks **29** for rotatably supporting therebetween a drum **30.** It will be understood that the drum **30** is supported adjacent the infeed end of a screen printing apparatus of the type hereinbefore described. That is, the drum **30** is located upstreamwise of the respective printing screens (not shown).

A piston and cylinder assembly **31** which may be either pneumatically or hydraulically operated is connected to the side arms **27** of the support frame **26** which when activated will tend to lift the support frame **26** and associated drum **30** between operative and inoperative positions. In the operative position the drum is disposed into rolling engagement with the material M to be printed, the material M in turn being supported on the printing belt **32** of the machine.

Suitably supported on the support frame **26** is a manifold **33** which extends parallel to the axis of the drum **30** and spaced slightly therefrom. A plurality of nozzles **34 are spaced along the length of the manifold 33 with** the respective nozzles **34** being directed to spray either an adhesive or a solvent onto the drum for either effecting the coating of the peripheral surface of the drum with a suitable adhesive for attracting thereto any lint or for directing a suitable solvent thereto for effecting the cleaning or washing of the drum at periodic intervals. This is attained by every other nozzle being used to spray an adhesive with the nozzles in between adapted for spraying a solvent.

This may be readily attained by providing a manifold **33** with two distinct side by side chambers, one being connected to a supply of suitable adhesive, and the other being connected to a supply of suitable washing solvent. Accordingly, the alternate nozzles are respectively disposed in communication with the respective chambers so that either an adhesive or a solvent may

be sprayed onto the surface of the drum; by controlling the nozzles accordingly.

Disposed adjacent to the drum is a scraper **35** which is movably mounted for movement toward and away from the drum **30.** As shown a pair of opposed upright arms **36** is pivotally connected to the side bars **27** of the support frame **26** about pivot **37.** Connected between the spaced apart upright side arms **36** is a scraper means **35.** The scraper means **35** includes an edge portion **35A** adapted to be disposed contiguous to the peripheral surface of the drum **30** so that in operation the scraping edge **35A** causes the lint adhering to the coated surface of the drum **30** to be scraped free therefrom. As shown, the scraper means **35** includes a body portion **35B** shaped to define a receptacle for receiving the lint and residual adhesive scraped from the surface of the drum by edge **35A.**

To effect the operation of the scraper means **35,** a means is provided for shifting or pivoting the side arms **36** toward and away from the drum. In the illustrated embodiment the actuating means comprises a piston and cylinder assembly **40,** the cylinder **40A** of which is suitably secured to a portion **41** of the frame support **26** about pivot **42.** The extended piston rod **40B** of assembly **40** in turn is pivotally connected to the upper end of the side arms **36** about pivot **43.** The arrangement is such that actuation of the piston and cylinder assembly **40** will effect a displacement of the associated piston rod **40B** between an operative and inoperative position as indicated in FIG. **2.** With the piston and cylinder assembly **31** disposed in the retracted position, the drum is lowered into rolling engagement with the material M to be printed.

In operation, the manifold and associated nozzles through which the adhesive is sprayed are operated to spray the peripheral surface of the drum **30** with a suitable adhesive as the drum rotates. With the drum spray coated with adhesive, and lowered into rolling engagement with the material M, the coating portion of the drum **30** will attract thereto any particles of lint or the material and thereby lift the lint off the material M. As the drum becomes covered with lint and the surface of the drum beings to loose its tackiness, the lint and residual adhesive may be removed by the scraper **35** disposed on the opposite side of the drum. The operation of the scraper is such that when the activating piston and cylinder is energized, the scraper edge **35A** is brought to bear against the periphery of the drum to remove the lint therefrom. The removed lint is thus collected in the trough shaped body portion **35B** of the scraper means **35.** The removal of the lint and residual adhesive is further facilitated by spraying a solvent through the solvent nozzles as the scraper edge **35A** engages the drum **30.** The arrangement is such that by continuous rotation of the lint removing drum **30** and the alternate spraying of the drum with adhesive and scraping of the lint off the surface upon the accumution thereof, a system is provided for continuously removing lint in a virtually uninterrupted printing operation at the optimum printing speed of the screen printing machine.

FIG. 3 illustrates another modified form of the invention. In this form of the invention, the lint removal sytem **50** comprises a transverse roller **51** which is suitably journalled for rotation adjacent the infeed end of a screen printing apparatus as hereinbefore described. An upper and lower guide bar or roller **52** and **53** respectively is suitably journalled on the machine frame at a distance space from the transverse roller **51.** An endless belt **54** having a width which is substantially less than that of the transverse roller **51** is threaded about the transverse roller **51** and the associated guide bars **52, 53.** The arrangement is such that a portion of the endless belt **54** is helically wound about the transverse roller **51** as illustrated. With the endless belt helically wound about the roller **51,** as indicated, the arrangement is such that the surface of the helically wound portion of the belt is disposed into rolling engagement with the material M to be printed supported on the printing blanket **55.**

Operating on the narrow width portion of the belt **54,** as indicated, is an applicating roller **56** for applying a suitable adhesive to the surface of the belt **54** adapted to engage the material M. As previously described, the applicating roller **56** is suitably journalled within a trough or receptacle **57** adapted for containing a supply of adhesive or gumming material. The arrangement is such that upon movement of the belt **54** the rolling engagement with the applicator roller **56,** a coating or layer of adhesive material is transfered from the applicating roller **56** to the surface of the belt **54.** As the transverse roller **51** is rotated, the successive convolutions **54A** of the endless belt **54** moved transversely of the roller **51** to effectively transverse the width of the material M and picks up any lint which may be on the material M. As the belt leaves the transverse roller **51,** it is directed or guided over guide rollers **52, 53** for reintroduction or rewinding about roller **51.** As the narrow belt **54** leaves roller **51** and before being rewound thereon, the belt **54** is subjected to a washing to remove the collected lint and residual adhesive. This is attained by a washing roller **58** rotatably disposed in a trough **59** which is adapted to contain a suitable washing solution or solvent. The washing solvent is transfered to the surface of the belt by the rolling engagement of belt **54** with the washing roller **58.** On passing through the washing station the belt moves in rolling engagement with the adhesive applicating roller **56** whereby the belt is again coated with a layer of adhesive.

From the foregoing it will be apparent that the method of removing lint from a web of material M to be screen printed comprises essentially of disposing an endless member **18, 30** or **54** into engagement with a surface of the sheet of material M to be printed whereupon the surface of the respective endless member to be disposed in contact with the web of material is coated with a suitable adhesive or material capable of attracting lint thereto. By effecting movement of the coated endless member **18, 30** or **54** relative to the material M to be printed, any lint on the surface of the material is attracted to the coated surface of the endless member. Thereafter the lint adhered to the coated surface of the respective endless members **18, 30** or **54** is subsequently removed by either scraping and/or by washing the lint covered endless member with a suitable solvent. The endless surface is coated with an adhesive either by an applicating roll disposed in rolling engagement therewith to transfer the adhesive directly thereto, or by spraying the adhesive in atomized or liquid form onto the surface of the endless member. The lint removing method and apparatus described effectively and continuously removes lint as a sheet of material is screen printed in a manner which will not in any way impede or interfere with the operating speeds of

the screen printing apparatus. A positive and rapid method and apparatus is thus rendered possible for effecting the continuous removal of objectionable lint from the material to be printed in a screen printing operation at the optimum operational speeds.

While the invention has been described with respect to several embodiments thereof it will be readily appreciated and understood that variations and modifications may be made without departing from the spirit or scope of the invention.

What is claimed is:

1. In combination, a screen printing maching having a printing screen and a lint removing system for said screen printing machine,

said system including an endless means disposed in rolling engagement with a material to be printed on a screen printing machine in advance of a printing screen,

said endless means including spaced apart end rollers disposed adjacent the material inlet end of a screen printing machine, and

an endless belt threaded over said end rollers,

said endless belt having an intermediate portion disposed in engagement with the material to be printed, an adhesive coating means for applying a continuous coating of adhesive to the surface of said enless belt

said coating means including a trough for containing a suppy of adhesive,

an adhesive applicating roller rotatably journalled in said trough and adapted to be at least partially submerged in the adhesive when said trough contains a supply of adhesive,

said adhesive application roller being disposed in rolling engagement with the surface of said belt,

said endless belt engaging the material for effecting the removal of any lint thereon after engagement with said adhesive applicating roller,

means for continuously removing the adhesive and lint adhered thereto from said belt,

said latter means including a trough disposed downstream wise of said coating means adapted to contain a washing liquid,

and a washing roller rotatably journalled in said downstream trough for engaging the surface of said belt to effectively continuously clean said surface.

2. The invention as defined in claim **1** wherein said belt means has a width at least substantially equal to the width of the material being printed.

3. The invention as defined in claim **1** wherein said endless belt is helically wound about said rollers.

4. The invention as defined in claim **3** wherein said transverse roller is formed with a helical groove for accommodating the endless belt helically wound thereabout.

5. A lint removal system for use in a screen printing machine comprising:

a roller rotatably journalled adjacent the feed end of a screen printing machine, said roller extending transversely of the feed end,

a guide roller spaced from said transverse roller,

an endless belt having a width substantially less than the width of said transverse roller,

said endless belt being looped over said guide roller and transverse roller whereby said belt is helically wound about said transverse roller,

said helically wound portion of said belt being disposed in rolling engagement with the material to be printed,

means for applying a coating material to said belt capable of attracting thereto any lint on the material disposed in contact therewith, and

means for effecting the removal of any lint attracted thereto.

6. A method of removing lint from a sheet of material to be screen printed comprising the steps of:

disposing an endless member in engagement with the surface of a sheet of material to be printed,

coating the surface of the endless member with a layer of material capable of attracting lint thereto,

moving the coated surface of the endless member relative to the material to be printed and in contact therewith so that any lint attracted thereto is removed from said material,

and effecting the removal of the lint and coating from said endless member as said endless member is moving relative to said material after contact with said material.

7. The invention as defined in claim **6** wherein the removal of the lint is effected by scraping the lint surface of said endless member as it moves relative to said material.

8. The invention as defined in claim **7** and including the step of applying a solvent to the surface of said endless member to enhance the scraping of the lint therefrom.

9. The invention as defined in claim **6** wherein the lint is removed by washing the lint and coating from the surface of said endless member.

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