June 27, 1961 R. K. REMER 2,989,882

METHOD AND APPARATUS FOR SLITTING PAPER WEBS

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FIG. 1.

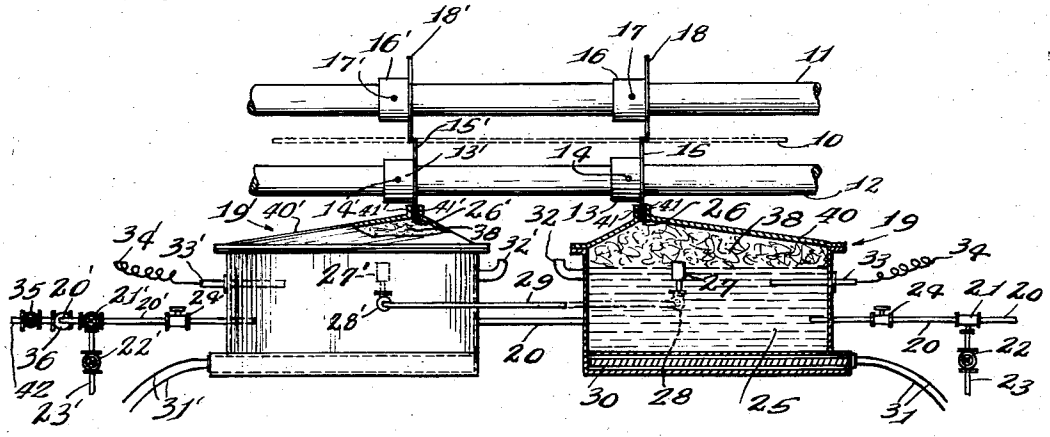
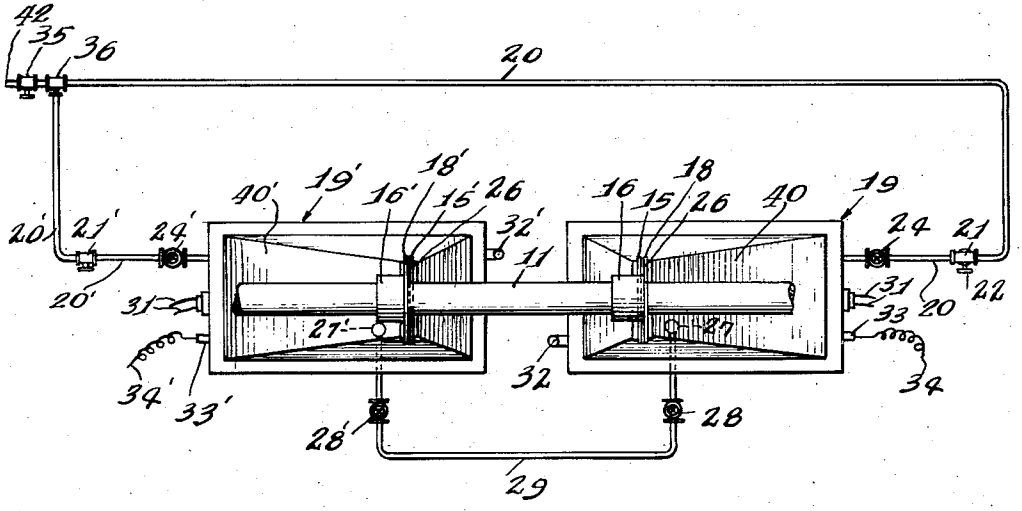


FIG. 2.



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METHOD AND APPARATUS FOR SLITTING PAPER WEBS

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This invention relates to the production of paper such as newsprint in paper mills, and more particularly to the slitting of the web prior to winding it into rolls. In normal methods of slitting a great deal of lint and dust is created which deposits on the web, in the form of fiber, fuzz, or "whiskers." Such extraneous material often gathers into wads forming what are known as "hickies" on the paper sheet. These can seriously mar the printed surface, particularly in the case of offset printing, since the hickies can be transferred to the blanket and in the printing process the imperfection in the printing resulting therefrom will be repeated on sheet after sheet in the same place. This necessitates frequent cleaning or washing up of the blankets, plates and ink rollers, with consequent loss of time and increase in labor.

Some mills use compresed air, a vacuum or a brush to remove the dust and lint from the paper, but due to the high static charge which usually exists on the paper, there is a tendency for dust particles or lint to stick to the surface so that they are not effectively removed by existing methods. I have provided means and a method for reducing or eliminating the static as set forth in my application, Serial No. 612,081, filed September 11, 1956, and this tends to alleviate the problem to some extent. However, the problem could be prevented from arising or greatly minimized if the formation of lint and dust in the slitting of the paper could be prevented, and it is accordingly the purpose of this invention to accomplish this result.

In accordance with the invention, I apply to the knives used for slitting the paper a non-friction lubricating solvent, in vapor form, which is redeposited on the slitted edge of the paper and plasticizes the edge so as to hold the lint, fuzz or whiskers in the sheet rather than allowing them to fly into the air and become trapped between the sheets as they are wound onto the customary web roll.

It is generally understood that paper in its natural state posseses an excess of electrons, and thus is negatively charged. In the usual course of conducting a paper web through a slitting or cutting machine at high speeds, the friction of the paper being drawn over rollers in such a machine creates kinetic electricity in the paper web tending to increase the naturally existing negative charge carried by the paper web. Since dust is naturally attracted to negatively charged bodies, the lint, dust and fuzz formed by slitting the paper web is strongly attracted to the paper web.

The chemicals used to produce the vapor in this paper-slitting process have anti-static properties as will hereinafter more fully appear.

The invention resides primarily in the method whereby the formation of slitter dust or fine fibers which tend to deposit themselves on the web is prevented, but a secondary object of the invention is to provide an apparatus which is particularly well adapted to this purpose.

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

FIG. 1 is an elevational view, partly in section, of my apparatus, showing the manner in which the method of the invention may be carried out; and

FIG. 2 is a top plan view thereof.

As shown in FIG. 1, the web **10** is passed through a slitter comprising shafts **11** and **12** on which two pairs

of slitter knives are carried. The knife **15** of one pair (shown at the right in FIG. 1) is secured to the shaft **12** by means of a hub **13** and set screw **14**. The other knife, identified by the numeral **18**, of this pair is secured to the shaft **11** by means of a hub **16** and set screw **17**. The knives of the other pair are similarly attached to said shafts, such knives and their hubs and set screws being identified by similar numerals with prime markings. The pairs of knives are suitably spaced to obtain the desired width of webs for winding into the customary newsprint rolls for newspaper printing, it being understood that the paper is produced in the mill on wide screens and felts resulting in a web of greater width than that desired for the rolls on which the paper is wound for shipment and for handling in the newsprinting operations.

Beneath the right-hand pair of knives (viewing FIG. 1), I provide a vaporizing chamber, generally identified by the numeral **19**. A second vaporizing chamber is provided beneath the pair of knives **15'**, **18'**, and since this chamber is identical to the chamber **19**, the parts are identified with the same numerals but with prime markings. Therefore, for the most part, one unit only will be described, but it will be understood that the description applies in the same manner to the other unit except where otherwise indicated.

The chambers **19** and **19'** are supported beneath the slitter by any suitable means (not shown).

Water is supplied to the chamber **19** through a pipe **20** having a T-joint **21** therein connecting the same through a valve **22** with a water inlet pipe **23**. A valve **24** is also provided in the pipe **20**.

When the chamber **19** has been filled to desired level, the valve **22** is closed. Cationic chemicals, to be hereinafter described, are added to the water by placing the same in the chamber **19** before or after the water is admitted.

A headspace is provided in the chamber **19** above the liquid level and an opening **26** is provided in a cover **40** for said chamber. Said opening **26** is in the form of a narrow slit with flanges **41** extending upwardly from the cover at the edges of said slit. The knife **15** is disposed in the slit **26**, as shown in FIG. 1 of the drawings.

In order to normally keep the liquid at substantially the same level in the two chambers, standpipes **27** and **27'** are provided in said chambers, respectively, and are supported by an interconnecting pipe **29** in which valves **28** and **28'** are provided. Also upwardly-turned overflow pipes **32** and **32'** are provided in the chambers **19** and **19'**, respectively, at substantially the desired liquid level.

A heating element **30** is provided in the bottom of the chamber **19** and is connected with a suitable source of electrical energy by wires **31**.

A conductor member **33** extends through the wall of the chamber **19** into the solution **25** and has a wire conductor **34** leading therefrom through which any static charges formed within said chamber will be dissipated.

Provision is made for admitting steam to the chambers **19** and **19'** through the pipes **20** and **20'** after the water valves **22** and **22'** have been closed. A valve **35** in a pipe **42** leading from a source of steam (not shown) is provided for controlling the admission of the steam.

An extended part of the pipe **20** is connected with the pipe **20'** by means of a T joint **36** so that the steam may be admitted to both chambers from the pipe **42** through the valve **35**.

The heating of the solution **25** in the vaporizing chambers causes the formation of vapor **38** in the upper part of the chambers and the knives **15** and **15'**, which rotate in this vapor in the slits **26** and **26'**, become thoroughly coated with the vapor and/or its condensate, which is transmitted to the paper as the knives cut therethrough

and to the co-acting knives **18** and **18'**. By virtue of the vapor being positively charged and the paper negatively charged, the vapor and/or its condensate is easily deposited upon the edge of the paper, where it plasticizes the paper and prevents the formation of lint, dust and fuzz.

While a number of positively charged or cationic chemicals will serve to provide a proper solution for the vaporizing chambers, the following may be given as examples: quaternary fatty amines such as Armac C; quaternary ammonium compounds such a cetyl pyridinium chloride; and Sapamine WL which is an aliphatic tertiary ammonium acetate compound. It should be noted that Armac C is a trade name by which the manufacturer, Armour Chemical Division, identifies the acetic acid salts of its fatty amines, which salts may be represented by the formula:

$$\left[RNH_3\right]^+\left[\begin{matrix}O\\ \|\\ CH_3C{-}O\end{matrix}\right]^-$$

in which R represents an alkyl group, derived from fatty acids, containing 8 to 18 carbon atoms. Polyethylene glycols such as Carbowax 1000, 2000, 4000 or 6000 may desirably be used as plasticizers in the solution.

A proper solution for use in the practice of my method may consist of water containing from 1% to 20%, by volume, of a cationic chemical, such as one of those mentioned above.

The heating of the solution and the admission of the steam to the chambers **19** and **19'** create the vapor indicated at **38** and **38'**, through which the knives **15** and **15'**, respectively, rotate.

Since certain changes can be made both in the procedures and the apparatus above described without departing from the spirit or scope of the invention, it is intended that the disclosures herein shall be interpreted as illustrative and not in a limiting sense.

I claim:

1. A method for slitting paper comprising applying to said paper as it is cut an organic cationic chemical fluid so as to prevent the formation of loose fibers, lint or fuzz.

2. A method for slitting paper comprising vaporizing a solution containing an organic vaporizable cationic chemical and applying the resulting fluid thus formed to the paper as it is cut to prevent the formation of loose fibers, lint or fuzz.

3. A method for slitting paper comprising vaporizing a solution containing an organic vaporizable chemical and coating the blades used to slit said paper with the resulting fluid so that such fluid is transferred from said blades to the paper as it is cut, thus preventing the formation of loose fibers, lint or fuzz.

4. A method of slitting paper comprising vaporizing a solution containing an organic vaporizable cationic chemical and coating the blades used to slit the paper with the resulting fluid so as to prevent said blades from creating static electricity as the paper is slit.

5. A method for slitting paper without forming lint or dust, comprising vaporizing a solution containing an organic vaporizable cationic chemical and applying the resulting fluid to the paper as it is cut.

6. A method for slitting paper without forming lint or dust, comprising vaporizing a solution consisting of water containing from 1% to 20% by volume of a vaporizable organic cationic chemical and applying the resulting fluid to the paper as it is cut.

7. A method of slitting newsprint which comprises passing a web thereof to be slit between cutter blades and continuously applying to such blades a vapor of an organic vaporizable cationic solution.

8. A method of slitting newsprint which comprises passing a web thereof to be slit between cutter blades as at least one thereof is rotated in a vapor bath produced by heating an organic vaporizable cationic solution.

9. A method of slitting newsprint which comprises passing a web thereof to be slit between cutter blades as at least one thereof is rotated in a vapor bath produced by heating and injecting steam into an organic vaporizable cationic solution.

10. A method of slitting paper which comprises passing a web thereof to be slit between cutter blades as at least one thereof is rotated and coating a rotating cutter blade with vapor formed by heating and injecting steam into an organic vaporizable cationic solution.

11. In combination with a paper web slitter having rotating cutter blades, an apparatus for coating the blades of the slitter with vapor from a cationic solution, comprising: a vaporizing chamber for containing said solution, a heating unit arranged to heat the solution in said chamber, said vaporizing chamber having a narrow opening in the top thereof into which one of said rotating blades of the slitter may extend and pass through the vapor formed in the chamber, whereby a coating adapted to counteract the formation of static will be applied to said blade and by it to the web.

12. In combination with a paper web slitter having rotating cutter blades, an apparatus for coating the blades of the slitter with vapor from a cationic solution, comprising: a vaporizing chamber for containing said solution, means for introducing water into said vaporizing chamber to form the solution, a heating unit arranged to heat the solution in said chamber, said vaporizing chamber having a narrow opening in the top thereof into which one of said rotating blades of the slitter may extend and pass through the vapor formed in the chamber, whereby a coating adapted to counteract the formation of static will be applied to said blade and by it to the web.

13. In combination with a paper web slitter having rotating cutter blades, an apparatus for coating the blades of the slitter with vapor from a cationic solution, comprising: a vaporizing chamber for containing said solution, means for introducing water into said vaporizing chamber to form the solution, a heating unit arranged to heat the solution in said chamber, means for injecting steam into the solution to further heat and vaporize the same, said vaporizing chamber having a narrow opening in the top thereof into which one of said rotating blades of the slitter may extend and pass through the vapor formed in the chamber, whereby a coating adapted to counteract the formation of static will be applied to said blade and by it to the web.

14. A method of slitting paper wherein the slitting blades are caused to be coated with a vapor formed from a heated solution comprising water containing a cationic chemical taken from the group consisting of quaternary fatty amines and quaternary ammonium compounds.

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