April 7, 1964 A. J. SCHMITT 3,128,207

TRAILING BLADE COATER BLADE LOADING MECHANISM

Filed Sept. 7, 1961 2 Sheets-Sheet 1

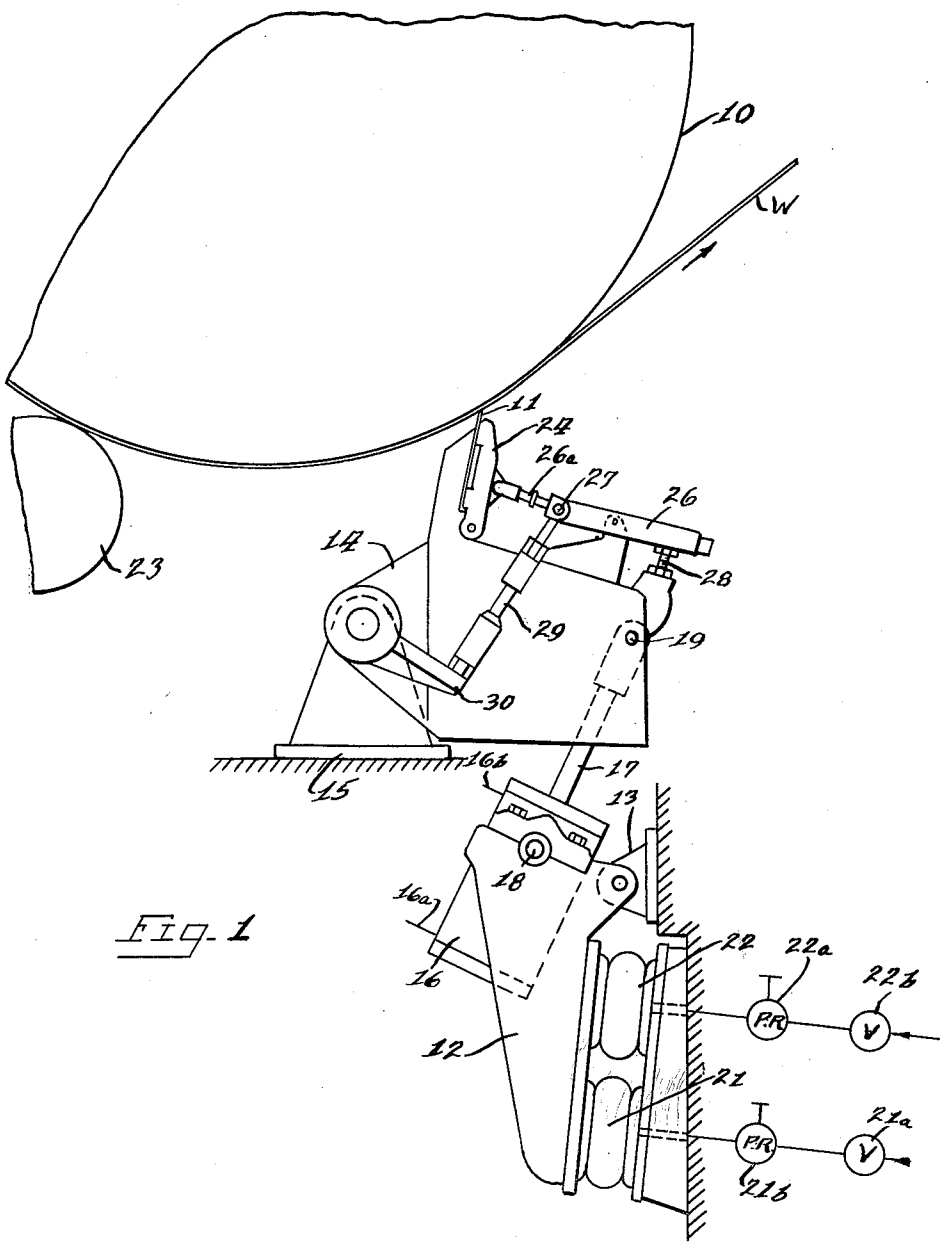


Fig. 1

INVENTOR.
Arnold Joseph Schmitt

BY
Hill, Sherman, Meroni, Gross & Simpson
ATTORNEYS

April 7, 1964 A. J. SCHMITT 3,128,207

TRAILING BLADE COATER BLADE LOADING MECHANISM

Filed Sept. 7, 1961 2 Sheets-Sheet 2

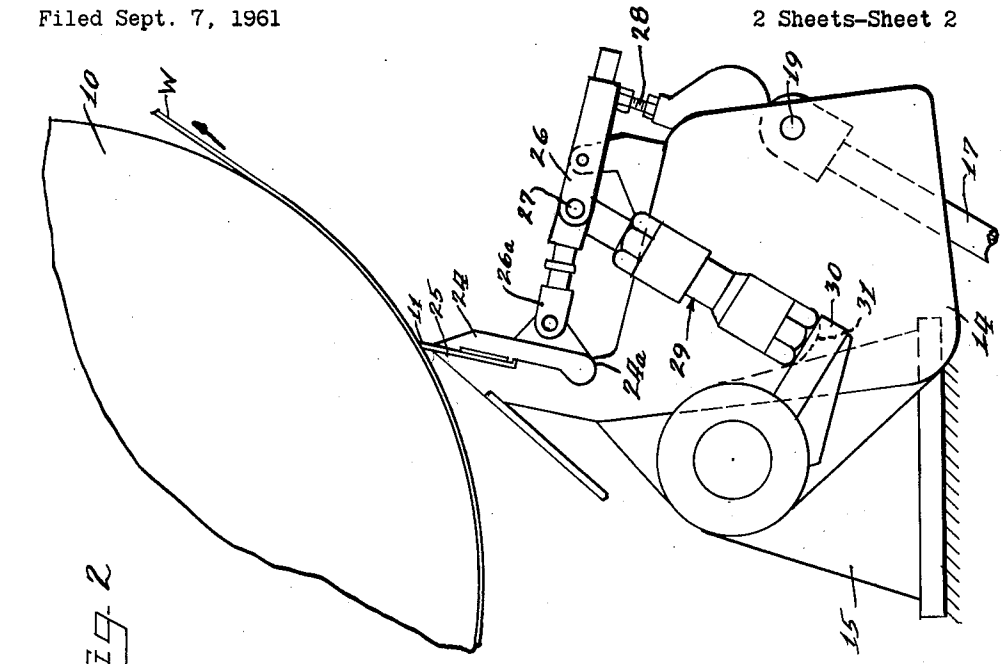


FIG. 2

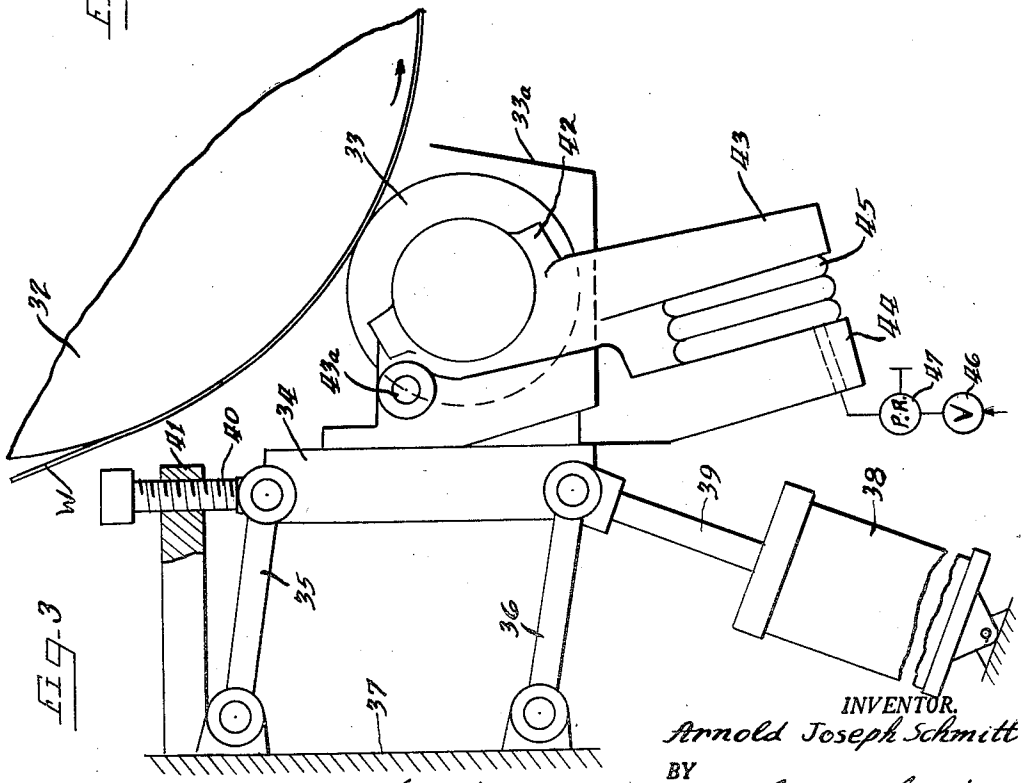


FIG. 3

INVENTOR.
Arnold Joseph Schmitt
BY
Hill, Sherman, Meroni, Gross & Simpson
ATTORNEYS

United States Patent Office 3,128,207 Patented Apr. 7, 1964

3,128,207

TRAILING BLADE COATER BLADE LOADING MECHANISM

Arnold Joseph Schmitt, Beloit, Wis., assignor to Beloit Iron Works, Beloit, Wis., a corporation of Wisconsin

Filed Sept. 7, 1961, Ser. No. 136,636
4 Claims. (Cl. 118—126)

The present invention relates to improvements in mechanism for loading an element with a controlled pressure against a moving web and more particularly to a fluid pressure operated loading mechanism for holding coating elements against a moving web on a coater back up roll.

The invention is used in a trailing blade coating mechanism wherein coating is applied to the surface of a moving paper web carried on a coater back up roll and the coating is smoothed by a doctor blade held in pressure engagement with the web. Accurate control of the pressure of the blade against the web is essential to control the amount of coating applied to the sheet. The blade, in addition to being held accurately against the web at a predetermined controlled pressure, must be moved away from the back up roll during threading, clean up and blade change operations. Due to the mass of the system, sensitive loading becomes difficult, and handling of the mechanism requires equipment sufficient to support the heavy weight as well as controllably and accurately load the blade against the web.

A feature of the present invention is the provision of blade loading mechanism which moves the blade away from the back up roll to a rest position, carries the blade up to the roll to a ready position, moves the blade into contact with the sheet and a very light "kiss" contact starting blade pressure preventing any excess of coating from passing through on the sheet and coating up the after driers, paper rolls and so forth, and loads the blade against the moving paper web with a predetermined controllable sensitive operating force.

Coating may be applied to the moving web ahead of the blade by various means such as by an applicator roll. The applicator roll must also be movable relative to the back up roll to a rest position for threading and clean up, and be movable into coating contact with the web with a controllable application pressure.

A feature of the invention is the provision of a loading mechanism which can be used on an applicator roll of a paper coating machine capable of moving the applicator roll to a rest position away from the back up roll or to a ready position adjacent the back up roll, and to coating contact with the moving paper web with an accurately controlled nip pressure between the rolls.

An object of the present invention is to provide an improved loading mechanism for holding coating elements against a moving paper web with a sensitively controlled loading pressure, and which is capable of moving the elements away from the roll to a rest position. It will be recognized from the description of the mechanism that while certain advantages are obtained in use with paper coating mechanism, and particular advantages are obtained in certain arrangements with different elements of the paper coating mechanism, the features of the invention may also be employed for loading other elements of paper machines, and may be used for example in loading rolls of printing machinery.

A further object of the invention is to provide an improved loading mechanism for a trailing blade coater wherein a first loading device supports the dead weight of the mechanism and a second loading device operates to apply and control the loading pressure of the blade against the moving web.

A still further object of the invention is to provide a

loading mechanism capable of accurately positioning the trailing blade of a coating mechanism against a moving web with a starting blade pressure load at a very light predetermined plate pressure that prevents an excess of coating from passing through the sheet and prevents tearing of the fibers from the sheet and excessive heating of the blade and which also compensates for the static load of the assembly, and is capable of applying an operating blade pressure over a relatively wide range of accurately and sensitively controlled pressures.

One of the problems of operating trailing blade coaters, particularly at high speeds, is involved in loading the blade against the dry sheet initially before the coating is applied to the sheet. The initial dry running tends to tear fibers from the sheet that become lodged under the blade and cause streaks. It also causes the blade to heat up, burn and warp.

One of the objects of the invention is to provide an improved loading mechanism which accurately and sensitively controls starting blade pressures eliminating the problems which heretofore existed.

During running coating operation, there is a definite relationship between the coater weight applied to the sheet and the trailing blade pressure. With increasing blade pressure the coating weights decrease. With sensitive operating blade pressure control, coating weights can be more precisely controlled. Coating pressures have been controlled in various ways such as by providing adjustable mechanical stops.

An object of the present invention is to provide an improved mechanism for sensitively controlling the operating coating blade pressure avoiding difficulties heretofore encountered, and wherein blade pressures can be readily changed from day to day operation or during shifts, or at any time during operation by simple adjustment of air pressure.

Other objects and advantages and features will become more apparent with the teaching of the principles of the invention in connection with the disclosure of the preferred embodiment thereof in the specification, claims and drawings, in which:

FIGURE 1 is a schematic end elevational view showing a trailing blade coater in accordance with the present invention;

FIGURE 2 is a schematic detailed end elevational view of a blade holding mechanism; and

FIGURE 3 is a schematic end elevational view of an applicator roll constructed in accordance with the present invention.

As shown on the drawings:

FIGURES 1 and 2 show a coater back up roll **10** with a paper web W carrier thereon. A doctor blade **11** is shown in operating position against the web smoothing coating applied by suitable means, such as by spraying, rolling or by a bath, and an applicator roll is shown at **23** and its associated mechanism will be described in detail in connection with the illustration of FIGURE 3.

As shown in FIGURES 1 and 2, the mechanism for holding and positioning the doctor blade **11** includes a first pivotal arm **12** pivotally supported on a rigidly mounted bracket **13**, and a second pivotal arm **14** pivotally mounted on a rigidly supported bracket **15**. Between the arms is connected a fluid pressure operated positioning means in the form of a cylinder **16** with a piston therein connected to a piston rod **17**. The piston rod is pivotally connected at **19** to the second or the upper arm **14**, and the piston travels within the cylinder **16** by controlling the flow of air into the cylinder through air lines **16*a*** and **16*b***.

When pressurized air is admitted to the lower line **16*a*** the piston will travel to the top of the cylinder against

a stop, not shown, to bring the blade **11** up to a ready position. In this position the blade **11** will be a small distance on the order of ½" from the web W when pneumatic loading units **21** and **22** are not pressurized.

When the lower end of the cylinder **16** is vented through line **16***a*, the weight of the arm **14** will cause it to drop downwardly to a rest position where the blade is away from the back up roll. In this position operations of threading, clean up and blade changing can be performed.

When the arm **14** and blade **11** are moved up to the ready position, the pneumatic unit **21** is pressurized by opening a valve **21***a* in a line leading to the interior of the unit. The units **21** and **22** are closed pneumatic cells having annular outer flexible walls so that they expand when pressurized. This type of unit is frequently referred to as an "air spring." Air is admitted to the unit **21** at a predetermined pressure which is related to the characteristic of the unit **21** so that the blade **11** is brought just up into contact pressure with the web W, with the pneumatic unit **21** supporting the dead weight of the arms **12** and **14** and the elements supported thereon. This is the starting and operating position of the blade, and the unit **21** applies a force to bring the blade into contact with the web W with a starting pressure. This is a very light predetermined blade pressure that prevents any excess of coating from passing through the coating mechanism on the sheet and thereby prevents any coating up of the after driers, paper rolls, etc.

The starting blade pressure is also light enough to prevent tearing of the fibers from the sheet and to prevent excess of heating of the blade that might damage it prematurely. The pressure for providing this starting force is obtained by a pressure regulator **21***b* in the line leading to the loading unit **21**.

When coating is applied to the web W for regular operation, the unit **22** applies an operating force to load the blade **11** against the web with an operating pressure. Air pressure is supplied to the unit **22** by opening a valve **22***b* in the line leading to the unit, and the pressure in the unit is controlled by a variable pressure regulating valve **22***a*. The operating blade pressure is therefore controlled by varying the air pressure in the loading unit **22** and control is sensitively obtainable over a relatively wide range of air pressures. The sensitivity is possible because the load unit **22** controls only the blade pressure, and load unit **21** has compensated for the dead weight or mass of the system. Valve **21***b* for the unit **21** is normally preset for the weight of the elements, and **22***a* is regulated in accordance with the operating pressure desired. Both units **21** and **22** have small travel and can be more accurate inasmuch as the long travel is provided by the cylinder **16**. As will be appreciated, there are a number of control systems that can be provided with the use of interlocks to properly sequence and automate the loading operations for supplying air pressure to the cylinder **16**, and the loading units **21** and **22**.

FIGURE 2 illustrates a blade clamping device which may be employed, wherein a pivotal blade clamp **24** is supported in a socket **24***a* in the arm **14**. The clamp is urged against the blade **11** to hold it against a seating surface **25** by a toggle linkage including links **26** and **26***a*. Link **26***a* is pivoted to the clamp **24**, and link **26** is pivoted on a bracket on the arm **14**, and the links are pivotally connected to each other at **27**. The clamping position of the toggle linkage is limited by an adjustable stop **28** on the arm **14**, and the toggle linkage is held in its clamping position by an expansible rod **29** which incorporates a micrometer for measuring the length of the rod so as to accurately control the clamping pressure. The micrometer has a rounded base end **31** for being pivotally supported in a seat on a bracket **30** on the arm **14**. For releasing the blade the micrometer rod **27** is contracted and slipped out from underneath the pivotal connection **27**, so that the linkage can pivot downwardly and release the blade **11**.

FIGURE 3 illustrates the applicator roll **33** which carries coating up to the paper web W, receiving coating on its surface in a container **33***a*.

The applicator roll **33** is rotatably mounted and is supported on a roll support **34** which is mounted on a pair of pivotally supported parallel links **35** and **36** which are connected at their base ends to a fixed support **37**. The coating container **33***a* is carried on the roll support **34** to move with the roll **33**. A positioning means in the form of an air cylinder **38** with a piston therein connected to a piston rod **39** moves the support **34** between a rest position, wherein the applicator roll is positioned away from the backing roll **33**, and a ready position, wherein the applicator roll is positioned close to the back up roll. The cylinder **38** is provided with suitable air lines, not shown, and when the base of the cylinder is pressurized, the support **34** swings up on the links **35** and **36** against a stop pin **40** which is adjustably threaded into a fixed bracket **41** for determining the rest position.

The applicator roll **33** is rotatably supported in a bearing **42** on an arm **43** which is pivotally mounted at **43***a* on the support **34**. A loading unit **45** expands to load the applicator roll against the web W on the back up roll **32**.

The loading unit is in the form of a closed expansible chamber having a flexible outer jacket and is of the type of unit which is known as an "air spring." The loading unit is mounted on a bracket **44** on the support **34**, and an air line connects to the interior of a loading unit **45**. A control valve **46** is opened to admit air to the unit **45**, and a controllable pressure regulating valve **47** regulates the pressure supplied to the unit **45**. By varying the air pressure in the unit **45**, the loading pressure of the applicator roll **33** can be accurately controlled.

In operation, air is released from the cylinder **38** to permit the applicator roll to be dropped away from the back up roll to a rest position, which may be as far as 6" to 8" from the back up roll. To bring the applicator roll **33** up to ready position, air is admitted to the cylinder **38** until the support **34** strikes the adjustable stop **40**. At this position there is a gap of ⅛" to ¼" between the rolls **32** and **33**, and thus the cylinder **38** has provided a support for the weight of the mechanism to bring the roll **33** to operating position. The gap is closed by admitting air under pressure to the unit **45** pivoting the arm **43** upwardly and bringing the applicator roll to operating position with an operating pressure dependent upon the regulation of the valve **47**. This permits accurately controlling the nip pressure between the rolls **32** and **33**. A more accurate nip pressure is obtainable inasmuch as the cylinder **38** takes care of the unavoidable dead weight of the mechanism.

It is contemplated that the mechanism may be employed with a sheet break detector which operates when a break is detected in the web W, and disconnects the air supply to the cylinder **38** so that air will be immediately released with a break in the web causing the roll **33** to drop away from the back up roll **32**. The air in the line to the loading unit **45** may be connected to the same source so that this unit will collapse with breakage of the web W. The tray or pan **33***a* is conveniently mounted on the support **34** so that it will drop away with the support and move with the roll **33**. The parallel linkage **35** and **36** will maintain the tray **33***a* in its horizontal position so that the coating therein will not be spilled.

Thus it will be seen that I have provided an improved coating mechanism which meets the objectives and advantages before set forth and which avoids disadvantages heretofore present.

The drawings and specification present a detailed disclosure of the preferred embodiments of the invention, and it is to be understood that the invention is not limited to the specific forms disclosed, but covers all modifica-

tions, changes and alternative constructions and methods falling within the scope of the principles taught by the invention.

I claim as my invention:

1. In a paper coating machine the combination comprising means for applying a layer of coating to a moving paper web, a trailing coating blade for applying the coating to the web surface, a starting fluid pressure means supporting the weight of the blade and moving the blade into touching contact with the web at a light predetermined pressure preventing an excess of coating on the sheet from passing the blade, a control fluid pressure means applying a predetermined variable operating pressure to said blade solely to control operating pressure for obtaining sensitive pressure control, a first pivoted arm connected to said starting and said control fluid pressure means with said starting means and control means connected in parallel, a second pivotal arm connected to said blade, and a positioning fluid pressure means between said arms for transmitting the forces of said first and second pressure means to said blade and for moving the blade from a rest position away from the web to a ready position adjacent the web.

2. In a paper coating machine, the combination comprising, means for applying a layer of coating to a moving paper web, a trailing coating blade for applying coating to the web surface, a first pivotal arm, a second pivotal arm supporting said blade for movement from a rest position away from the web to a coating position in close-running relationship to the web surface, a piston and cylinder connected between said first and second arms for moving said second arm to carry the blade between said rest position and coating position, a first fluid operated means connected to said first arm, and a second fluid operated means connected to said first arm parallel to said first means so that said first and second means both apply a force to said blade through said first and second arms.

3. In a paper coating machine, the combination comprising, means for applying a layer of coating to a moving paper web, a trailing coating blade for applying coating to the web surface, a first pivotal arm, a second pivotal arm supporting said blade for movement from a rest position away from the web to a coating position in close-running relationship to the web surface with said second arm extending substantially horizontally in said coating position, a piston and cylinder connected substantially

horizontally of the pivotal point of said first arm between said first and second arms for moving said second arm to carry the blade between said rest and coating positions, said first arm having a downwardly extending portion, a first fluid operated means connected to said downwardly extending portion, and a second fluid operated means connected to said downwardly extending portion parallel to said first means so that said first and second means both apply a force to said blade through said first and second arms, said first means applying a force substantially equal to the weight of said arms and blade with the piston and cylinder, and said second means applying a variable operating force to control the force between said blade and the surface of the web.

4. In a paper coating machine, the combination comprising, a coating applying member movable between a coating position in close-running relation to a web surface and a rest position, a shiftable carrier including pivotally mounted parallel links and including a bar pivotally connected to said links, an adjustable stop engaged by said carrier in a ready position with said applying member in close-running relation to the web surface, a piston and cylinder connected to said carrier moving the carrier between positions to move the applying member from said rest position to said coating position, a pivotal arm mounted on said bar carrying said applying member, and a fluid pressure operated member between said bar and said arm controlling the operating pressure between the web and said applying member.

References Cited in the file of this patent

UNITED STATES PATENTS

1,031,620	Callan	July 2, 1912
2,534,320	Taylor	Dec. 19, 1950
2,566,811	Stevenson	Sept. 4, 1951
2,568,446	Griffin	Sept. 18, 1951
2,589,966	Rullo	Mar. 18, 1952
2,861,541	Hornbostel	Nov. 25, 1958
3,026,796	Crawford	Mar. 27, 1962

FOREIGN PATENTS

213,765	Australia	Mar. 20, 1958
741,970	Great Britain	Dec. 14, 1955
751,549	Great Britain	June 27, 1956
869,939	Great Britain	June 7, 1961