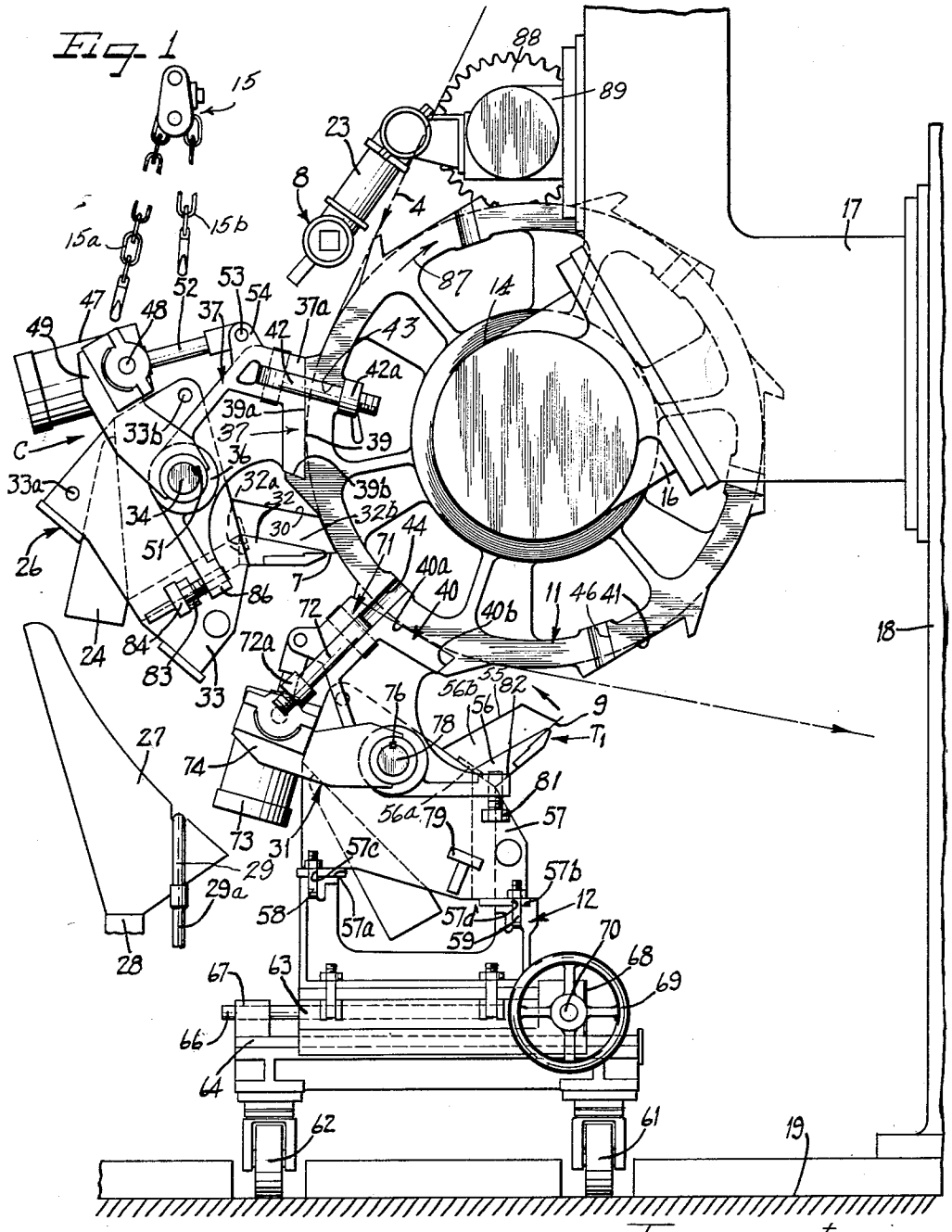
Oct. 6, 1964 E. S. SKINNER 3,152,008

METHOD AND APPARATUS FOR PUDDLE-COATER MOUNTING, INDEXING AND CHANGE OVER

Filed April 30, 1959 4 Sheets-Sheet 1

Fig. 1



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Eugene Sterling Skinner

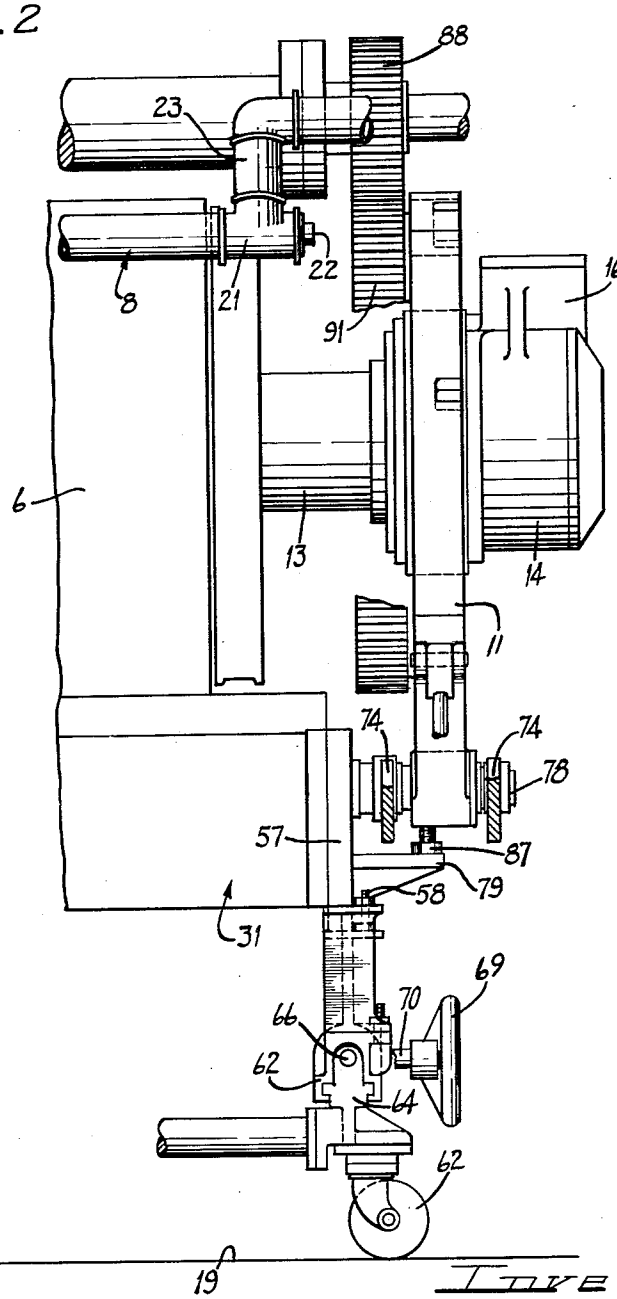
by Hill, Sherman, Meroni, Gross & Simpson Attys

Oct. 6, 1964 E. S. SKINNER 3,152,008

METHOD AND APPARATUS FOR PUDDLE-COATER MOUNTING, INDEXING AND CHANGE OVER

Filed April 30, 1959 4 Sheets-Sheet 2

Fig. 2



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Oct. 6, 1964 E. S. SKINNER 3,152,008

METHOD AND APPARATUS FOR PUDDLE-COATER MOUNTING, INDEXING AND CHANGE OVER

Filed April 30, 1959 4 Sheets-Sheet 3

Fig. 3

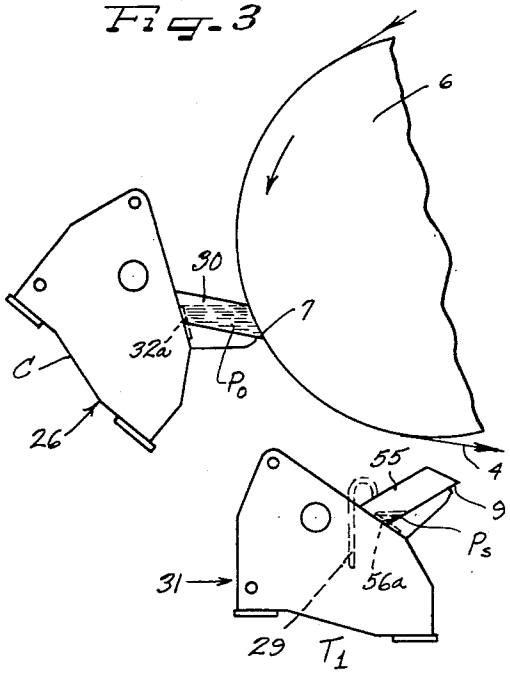


Fig. 4

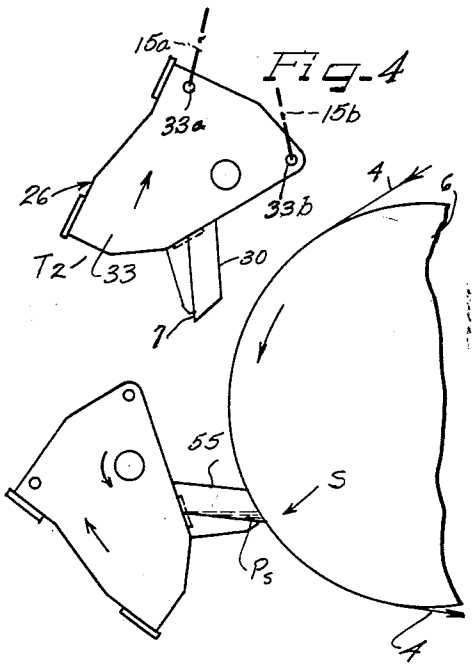
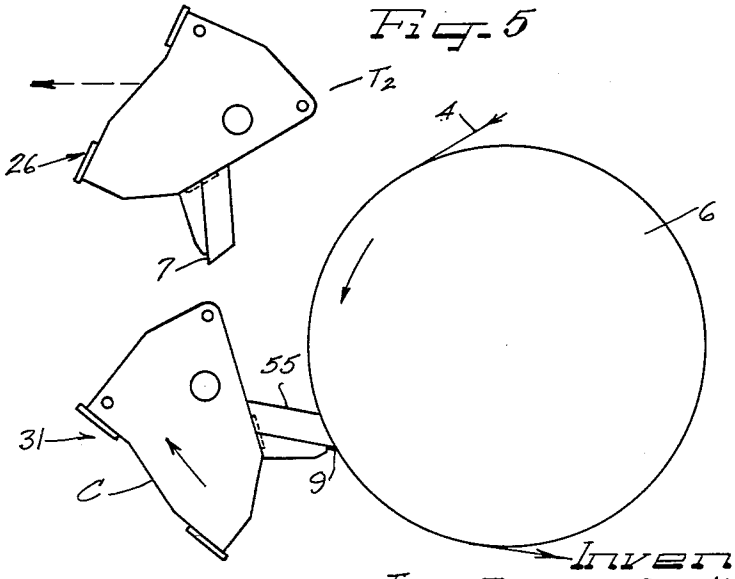


Fig. 5



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Oct. 6, 1964 E. S. SKINNER 3,152,008

METHOD AND APPARATUS FOR PUDDLE-COATER MOUNTING, INDEXING AND CHANGE OVER

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Fig. 6

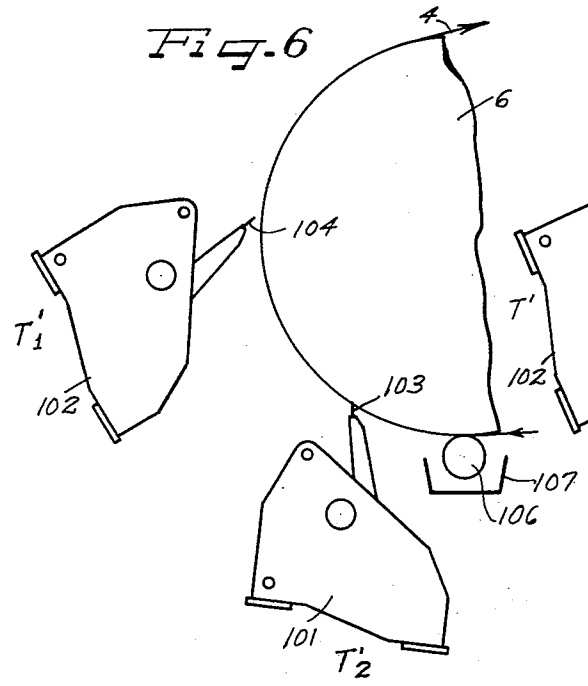


Fig. 7

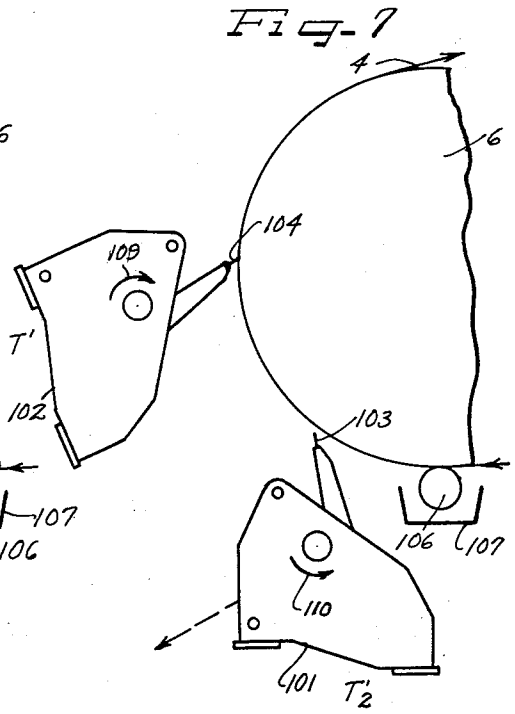
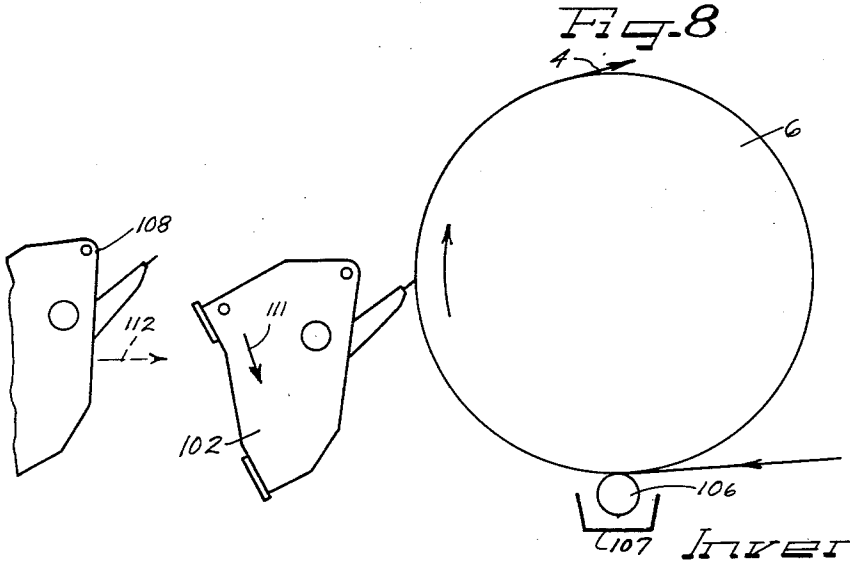


Fig. 8



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Attys

United States Patent Office

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Patented Oct. 6, 1964

3,152,008

METHOD AND APPARATUS FOR PUDDLE-COATER MOUNTING, INDEXING AND CHANGE OVER

Eugene Sterling Skinner, Beloit, Wis., assignor to Beloit Iron Works, Beloit, Wis., a corporation of Wisconsin

Filed Apr. 30, 1959, Ser. No. 810,124
14 Claims. (Cl. 117—111)

The present invention relates to improvements in paper machines, and more specifically relates to an improved mechanism for coating a web of paper using a trailing doctor blade and particularly to a continuous coating mechanism wherein a worn doctor blade is removed and replaced with a fresh blade without stopping the continuous operation of the machine, and without adversely affecting the quality of the paper web.

In the manufacture of certain types of paper, coating is applied to the surface. The features of the present invention contemplate use in combination with a mechanism for applying coating to a continuous web of paper, such as is employed in a paper-making machine. In such a machine, a rotating drum carries an endless web of paper on its surface and a doctor blade extends across the paper surface to smooth and knead coating onto the paper surface with the coating applied at or ahead of the blade, depending upon the arrangement employed. For continuous high-speed operation in a paper machine, the blade is held against the paper with a pressure, or in other words, is loaded to a fixed position relative to the paper surface and the coating is uniformly applied. Non-uniformity in operation and the application of coating may damage the paper or result in an unsatisfactory product. For example, the blade cannot run dry against a web of paper without damaging the web or the blade, or both. Excessive thicknesses or blobs of coating cannot appear on the paper surface after it passes the coater, since these will create wet adhesive spots which create weakened areas of the paper, and also which cause the paper to stick to surfaces, damaging or tearing the paper and making continuous high-speed operation impossible. With continued operation, the blades become worn and require changing. The foregoing problems and other considerations have made it heretofore extremely difficult to change coating blades on a paper coating machine during operation, and have made it normally necessary to stop the operation of the machine while the blade is being changed. Even when the machine is stopped completely, extreme difficulties are encountered in that wet spots will occur in the paper, if the flow of coating is continued, causing the paper to weaken and tear. If the coating on the paper is interrupted for a length of paper, a length of scrap will occur. In any event, stopping or slowing the machine reduces the efficiency of the continuous operation, and increases the cost of manufacture of the paper.

Accordingly, it is an important object of the invention to provide improvements in a mechanism which makes it possible to replace a worn doctor blade in a paper coating machine without adversely affecting the quality of the paper being coated and without creating any unsatisfactory paper areas.

Another object of the invention is to provide an improved mechanism for changing a worn coating blade during a continuous operation of the machine and permitting the machine to continue its normal speed of operation without requiring shut-down or interruption of the machine.

Another object of the invention is to provide an improved blade transferring mechanism which permits transferring a fresh blade to be supported on the machine and loaded to coating applying position before removing a worn blade, from the machine.

Another object of the invention is to provide a machine for applying coating to the surface of a traveling paper web wherein the machine operates continuously, and coating applying blades are exchanged during continuous operation, and wherein improved mechanism is provided for delivering fresh blades to the machine and removing worn blades.

A further object of the invention is to provide an improved machine for applying a layer of coating or for coating a traveling web of paper with a loaded training doctor blade with improved mechanism for supporting the doctor blades, and for transferring the blades between transfer stations while in contact with the paper web.

Another object of the invention is to provide apparatus wherein a fresh coating blade can carry a puddle of coating extending along the width of the blade and to provide means wherein the puddle may be prefilled before bringing the blade into operation for instant full width application of the coating as is required to prevent breakdown of the web.

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

FIGURE 1 is an end elevational view of a paper coating machine embodying the principles of the present invention;

FIGURE 2 is a side elevational view of one end of the paper coating machine of FIGURE 1;

FIGURE 3 is a schematic illustration of the paper coating machine of FIGURE 1, having parts omitted for clarity, and particularly illustrating the manner in which coating is carried by the blades for application to the paper;

FIGURES 4 and 5 are schematic illustrations, similar to FIGURE 3, and when taken in combination with FIGURE 3, show the sequence of positions for a worn blade and a fresh blade;

FIGURE 6 is a schematic illustration of another embodiment of the invention, with parts removed for clarity, and wherein coating is applied by a different means and the cycle of blade changing is reversed; and,

FIGURES 7 and 8 are schematic illustrations, similar to FIGURE 6, and when taken in sequence with FIGURE 6, illustrate the successive positions of a worn blade and a fresh blade at various stages in the cycle of operation and blade changing.

As shown on the drawings:

During normal operation of the machine, as shown by the mechanism of FIGURES 1 and 2, and by the sequence of operation of FIGURES 3–5, a web of paper 4 passes down over the outer cylindrical surface of a rotatably supported drum 6 to be backed thereby. Coating is applied to the surface of the web by a trailing doctor blade 7 (omitted from FIGURE 2). The coating is delivered in liquid form to the web from a coating supply tube 8, to be spread in a thin layer on the surface of the traveling paper web 4.

After a period of operation, the blade 7 becomes worn, and a fresh blade 9 is placed into operation without stopping the operation of the machine, that is, while the paper web 4 continues to travel through the machine. The worn doctor blade 7 and the fresh doctor blade 9 are supported at their ends on wheels which are mounted coaxial with the drum and are indexed so as to carry a doctor blade from a first transfer station shown at T_1 through a starting station S, to a coating station C and to a second transfer station, shown at T_2. Fresh blades are connected to the wheels at the first transfer station T_1. Worn blades are removed at the second trans-

fer station T_2. The wheels have securing mounts on their surfaces for connecting the doctor blades, as will be explained, and rotate in the same direction for a full 360° in indexing movements with a fresh coating blade being added each time a worn blade is removed. The fresh blades are brought into position to be attached to the wheel 11 by a first transfer means, in the form of a carriage 12, which moves axially beneath the coating drum. The worn blades are removed by a second transfer means, shown as a crane or hoist 15.

Referring to the above elements and their associated elements in greater detail, the drum 6 is elongated and cylindrical in shape, and is carried in a horizontal position on a shaft 13, FIGURE 2. The shaft is supported in a bearing 14, which is carried on a bracket 16, FIGURE 1. The bracket is suitably mounted on a cantilever bracket 17, secured to a frame 18. The frame is suitably supported on a floor 19.

It will, of course, be understood that the backing drum 6 extends horizontally for a substantial length which is sufficient to carry the desired width of the paper web. The support shaft 13 projects from the other end of the drum (not shown), and is carried in similar bearings which need not be shown, nor described in detail. Since the ends of the drum and the elements located at the two ends are substantially identical, only one end is illustrated in FIGURES 1, 2 and 3 through 5.

The supply of coating is delivered through the pipe 8, to the outer surface of the traveling web 4, and distributed through downwardly facing openings in the pipe. The pipe is connected at its end to a T-connector 21 with a clean-out plug 22, and a supply pipe 23 connects to the T and is adapted to be connected to a supply line through which coating is forced by a supply pump, not shown. It will be understood, of course, that liquid coating may be supplied by various means.

In the present arrangement, the excess coating runs back on the blade 7, over an adjustable dam 32*a*, and the overflow is discharged downwardly through an overflow fitting 24, which is supported on a blade assembly 26 on which the blade 7 is carried. The overflow drips down into a catch basin 27 mounted on a support 28.

The excess material flows down through the hollow support 28 to be returned to a sump from which it may be filtered and again pumped up to the pipe system 8 through the supply header 23.

The blade assembly 26 carries the operating blade 7 and is identical in construction with a blade assembly 31 which carries a fresh blade 9. This fresh blade will be brought into operation in the manner illustrated in FIGURE 3, when the blade 7 becomes worn, and is removed from the machine.

The doctor blade 7 is supported on a holder or a stiff blade back 32 which extends across the machine and provides a stiffening support for the blade 7. The back 32 is attached to end plates with the plate at the near end shown at 33. At the back of the back 32 is the adjustable dam 32*a* and at the ends of the back and blade are end dams 32*b*. The dam 32*a* has suitable means for adjusting it vertically as shown by the arrowed lines in FIGURES 1 and 3, such as adjustable clamps or supports, not shown, and various adjustment means may be employed as will be appreciated by those versed in the art.

The end plate 33 is provided with a pintle pin 34 which is pivotally mounted in a bearing 36 on a connector 37. The connector is adapted for supporting the blade assembly 26 and is detachably mounted on the blade support and transfer wheel 11. The adjustable dam 32*a* and end dams 32*b* form a side facing trough or a laterally facing open container 30 for providing a puddle of coating on bearings, not shown, on the web. The depth of the puddle can be regulated by adjusting the height of the adjustable dam 32*a*, which is provided with adjustment means, not shown.

As shown in FIGURE 2, the transfer wheel 11 is rotatably supported on bearings, not shown, on the bracket 16 for rotation coaxial with the drum 6 which is supported on the shaft 13 rotatable on bearings, not shown, on the bracket 16. The transfer wheel is stationary during normal operation of the coating machine, and is rotationally indexed during blade changing operation to carry a fresh blade from the first transfer station T_1, FIGURE 1, to the coating station C and to carry the worn blade from the coating station C to the second transfer station T_2. A transfer wheel, similar to wheel 11, is mounted at the other end of the drum for carrying the other end of the blade assemblies.

The transfer wheels are each provided with circumferentially spaced blade securing mounts which are adapted for receiving the blade connectors.

As illustrated in FIGURE 1, the transfer wheel 11 has blade securing mounts, such as shown at 39, 40, and 41, with the mounts being evenly spaced and arranged around the periphery of the wheel 11. Each of the blade securing mounts, as shown by the mount 39, has a flat radially outwardly facing surface 39*a*, and a surface 39*b*, which forms an angle with a radial plane of the wheel 11. The surfaces meet at an angle to form a notch for supporting a base 37*a* of the connector 37 for the blade assembly 26.

The second transfer station T_2, is slightly above the coating station C which is substantially horizontally opposite the rotational axis of the drum, and in the transfer position T_2 the surface 39*b* of the blade securing mount faces upwardly to provide a vertical support for the connector 37. This vertical support helps hold the blade assembly when the connecting swing bolt 42 is released, and the worn blade is removed from the machine. The support prevents the assembly from accidentally slipping downwardly with a possibility of the blade gouging into the paper web and damaging the web or the surface of the drum.

Each connector 37 is provided with a swing bolt, such as 42, which is pivotally connected to the connector and is provided with a nut 42*a* to secure the connector to the wheel 11. For this purpose, the wheel is provided with axially facing slots, such as 43, 44 and 45 for each of the blade securing mounts 39, 40 and 41, respectively.

The blade 7, with its back 32 is connected to the end plate 33, and supported on the pintle pin 34 and is swung to loaded position by a pressure cylinder 47, which may be hydraulically or pneumatically operated. The cylinder is pivotally mounted on trunnions 48 on an arm 49, which is connetced to the pintle pin 34 and is secured thereto by a key 51, so as to rotate the pintle pin and load the blade 7. The cylinder 47 carries the piston to which is connected a piston rod 52. The piston rod is secured by a pivot pin 53 to lugs 54 on the connector 37. Thus, when pressurized fluid is admitted to the cylinder 47, the piston is backed by the connector 37 and pivots the pintle pin 34 to load the blade 7 against the web on the drum. Admission of the pressurized fluid to the other end of the cylinder 47 will pivot the blade away from the drum, as illustrated by the position of the blade 9.

The blade assembly 31 is of substantially identical construction with the blade assembly 26, and the blade 9 has a holder or back 56 connected to end plate 57. At the rear of the back is an adjustable dam 56*a* and at the ends are end dams 56*b* to form a side facing trough or laterally facing open container 55.

The end plate 57 has supporting surfaces 57*a* and 57*b* which support the blade assembly on a first transfer means which is the carriage 12. The blade assembly 31 is connected to the carriage by swing bolts 58 and 59 which swing up into slots 57*c* and 57*d* in the end plate, and serve to clamp the blade assembly 31 onto the carriage in order that it may be safely moved, and may be

adjusted in position with movement of the positioning mechanism of the carriage.

The carriage 12 is supported on wheels, such as shown at 61 and 62, which are illustrated in the form of swivelled castors. The castors are provided primarily for moving the carriage from a service area to bring a fresh blade into position for attachment to the wheel 11. The carriage is moved axially relative to the drum into position beneath the wheel in the first transfer station T_1. The carriage 12 is provided with a lateral slide 63, which is mounted on the carriage bed 64 for moving the blade assembly laterally into position for attachment to the wheel. As illustrated in FIGURES 1 and 2, the slide 63 has a gib connected to the bed 64. A lateral shaft 66 is mounted in upstanding bearings 67 and 68 at its ends, and is threaded at a central location to the slide 63, so that rotation of the shaft 66 adjusts the lateral position of the slide. A hand wheel 69 is secured to a shaft 70, which connects to a bevel gear in mesh with another bevel gear connected to the threaded shaft 66. Thus, rotation of the hand wheel will adjust the lateral position of the slide 63 which supports the blade assembly 31. The blade securing mount 40 is provided with surfaces 40*a* and 40*b*, shaped in the same relationship as surfaces 39*a* and 39*b*, to receive a connector 71 for the blade assembly 31. The connector can be slid axially into position on a carriage 12, and then moved laterally into the pocket formed by the surfaces 40*a* and 40*b* for attachment of a swing bolt 72 on the mount 40. The swing bolt swings upwardly into the slot 44, and the nut 72*a* is tightened for mounting the blade assembly.

The blade assembly 31 is provided with a cylinder 73 pivotally mounted on an arm 74 which is keyed by a key 76 to the pintle shaft 78. The pintle shaft 78 is secured to the end plate 57, and admission of pressurized fluid into one end of the cylinder 73 will pivot the pintle shaft 78 to swing the end plate 57 toward a blade loading position. The blade 9 will be carried with the end plate 57 and will move toward the web until a stop bracket 79 strikes an adjustable stop bolt 81. The stop bolt is threaded into an arm 82 on the connector 71, and adjustment of the bolt determines the loaded position of the blade 9 against the paper web.

A similar stop bolt 83 is engaged by a stop bracket 84 on a plate 33 to determine the loading of the blade 7. The stop bolt 83 is adjustably threaded into an arm 86 on the connector 37.

When the swing bolt 72 is in place in the slot 44 in the wheel 11, and the nut 72*a* tightened, the blade assembly 31 is supported on the wheel. At that time, the swing bolts 58 and 59 can be released to release the blade assembly 31 from the carriage 12, and the carriage rolled out of the way back to a service area.

For a convenient operating method, a fresh blade assembly 31 may be mounted on the wheel 11 and held in position during normal operation of the machine, with the carriage out of the way. In this condition of the machine, the apparatus will appear, as pictured in FIGURE 3.

When the blade 7 becomes worn, the position of the blades 7 and 9 are changed from the position shown in FIGURES 1 and 3 to the position shown in FIGURE 4. Before this is done a puddle of coating is formed for the blade 9.

The tube 29 is connected by a flexible hose 29*a* to the supply header 23 and is used to fill side facing the trough 55 formed by the blade, blade holder and dam to start the process initially. By filling the trough for its full width, coating can be applied to the full width of the web at the same instant. If this is not done the great difference in friction between the wet and dry surfaces of the web will often tear the web, particularly if it is a light weight web. When not being so used tube 29 is allowed to flow coating into the catch basin 27 to prevent hardening of the coating in the tube.

The actual starting of the coating operation is preferably done at a position intermediate those shown at T_1 and T_2. As actual experience with a particular coater will indicate the desirable amount of coating to be supplied in the trough previously mentioned to facilitate this starting the adjustable dam may be suitably positioned as indicated at 32*a* and 56*a*. As soon as stable operation is achieved with the new blade the coating is supplied from the pipe 8.

As illustrated in FIGURES 3, 4 and 5, viewed in connection with FIGURE 1, the wheel 11 is first indexed clockwise (being rotatable on its supporting bearings) against the direction of rotation of the drum 6, to bring the blade assembly 31 from the station T_1, in FIGURE 3, to a starting position S, in FIGURE 4. At position T_1, a starting puddle P_s is in the trough 55. This puddle runs to the edge of the blade 9 at the starting position S_1 and the blade is then tilted and loaded against the paper web 4, by operation of the cylinder 73.

The cylinder 73 is pressurized to swing the blade 9 up into loaded position against the web 4. The blade 7 is immediately swung down to the release position shown by changing the pressurizing of the cylinder 47. As soon as the blade 7 is drawn from the surface of the paper web, the operating puddle P_o of coating held in the trough 30 between the blade 7 and the paper web, will travel down with the web to be caught by the side facing trough 55 of the blade 9. The coating applied by the pipe 8 will then immediately be utilized by the blade 9.

For removing the worn blade 7, as shown in FIGURE 4, its assembly 26 is lifted out of the transfer position T_2 by the hoist 15. For this purpose, the chains 15*a* and 15*b* depending downwardly from the hoist have hooks at their lower ends which are hooked into eyelets 32*a* and 32*b* formed by openings in the end plate 33. The swing bolt 42 (FIGURE 1) is released by loosening the nut 42*a* and swung out of the slot 43. This permits the blade assembly 26 to be lifted upwardly out of the transfer position.

Once the transfer position T_2 is clear, the wheel 11 is indexed in the direction indicated by the arrow 87 to bring the blade assembly 31 up into the position C (as shown in FIGURE 5) which was formerly occupied by the blade assembly 26. This clears the position T_1 for bringing another fresh blade into position to be hung on the transfer wheel 11 to be used when the blade 9 becomes worn.

The transfer wheel 11 may be indexed forwardly by numerous arrangements, and is shown as driven by a pinion gear 88 supported on a bracket 89, which is connected to the projecting support 17. The pinion 88 meshes with a ring gear 91, FIGURE 2, which is secured to the wheel 11. The transfer wheel is thus rotated in indexed increments through a full 360° of rotation with a fresh blade assembly being added to each succeeding mounting station.

It will, of course, be understood that while the preferred arrangement is illustrated, in some instances, it may be desirable to place more than one reserve doctor blade assembly on the wheel, and the wheel is capable of carrying a plurality of blades in reserve, and the arrangement of the support brackets for the elements of the machine will, of course, have to be adapted so as not to interfere with the reserve of blade assemblies which are carried on the wheel.

As a summary of operation, the doctor blade 7 is carried during operation in the coating station C held in loaded operating position against the paper web 4, FIGURES 1 and 3. A fresh blade assembly 31 is brought axially into position beneath the drum, on the carriage 12 to position T_1. The fresh blade assembly 31 is moved laterally to the right, as illustrated in FIGURE 1, against surfaces 40*a* and 40*b* of the blade securing mount 40. The swing bolt 72 is swung up into the slot 44, and the nut 72*a* tightened. The swing bolts 58 and 59 are

dropped and the carriage moved away. The fresh blade 9 is then rotated on the wheel 11 to the starting position S and pivoted into loaded position by operation of the cylinder 73, and the worn blade 7 which has been moved up into station T_2, is swung to the position of FIGURE 4 away from the paper web. The crane 15 is then connected to the worn blade assembly 26, and when the swing bolt 42 is released, the worn blade assembly 26 is carried out of the transfer station T_2. The transfer wheel 11 is then indexed to move the blade 9 up into the coating position C with the blade 9 being held in coating engagement with the web while it is being swung arcuately upwardly on the wheel, as shown in FIGURE 5.

An arrangement of FIGURES 6, 7 and 8 of the device is adapted to operate as a "dry blade" coater. The direction of travel of the web 4 on the drum 6 is reversed. Substantially the same supporting transfer mechanism as provided in FIGURE 1 is utilized and the rotation of the end wheel 11 is also reversed. In this arrangement, the fresh blade is brought in at a station T'_1 and a worn blade is removed from the station T'_2 which is below station T'_1. In this arrangement there are no separate starting or coating stations and the transfer station T'_1 is also the starting station and the transfer station T'_2 is also the coating station.

As illustrated in FIGURE 6, a worn blade assembly 101 having a coating blade 103 is located in a coating station which corresponds with the station T'_2. A fresh blade assembly 102 having a blade 104 is supported on the wheel in readiness for application to the web 4 when the worn blade assembly 101 is to be removed.

In FIGURE 7, the blade assembly 102 is pivoted in a clockwise direction, as indicated by the arrow 109, to load the blade 104 against the traveling paper web. At substantially the same time, but timed so that there will not be a space along the paper web which has not been engaged by one of the blades 103 or 104, the lower blade assembly 101 is pivoted to move the blade 103 out of contact with the paper web, as indicated by the arrow 110.

Coating is applied to the surface of the traveling web by suitable means, positioned in advance of the doctor blades 103 and 104, and shown in the form of a coating applying roll 106 supplied with coating such as by container 107.

When the worn blade 103 is moved out of contact with the traveling web, the blade assembly is connected to the carriage 12 of FIGURE 1. The blade assembly is then rolled out from under the drum 6.

The wheel 11 is next indexed to bring the fresh blade assembly 102 down from the position T'_1 to the coating position T'_2. This movement is shown in FIGURE 8, as indicated by the full line arrow 111, and a fresh blade assembly 103 is moved into position, as shown by the broken line arrow 112, such as on a crane, and the fresh blade assembly is secured to the wheel. The mechanism will then be in readiness for another change when the blade 104 becomes worn.

It will thus be seen that the mechanism is well adapted to use with different coating arrangements and is operative for rapid changes of the very heavy and large doctor blade assemblies during operation, without having to stop the coating process or adversely affecting the quality of the paper which is coated.

Thus, it will be seen that I have provided an improved mechanism for applying a coating to a traveling web of paper, which meets the objectives and advantages hereinbefore set forth. The mechanism is simple in construction, and is adapted for rapid and uncomplicated use. Further, operation of the mechanism is certain, insuring that the web will not be damaged, and that uniform application of the coating will continue during the blade changing operation. Furthermore, a fresh blade is always held in readiness so that in the event that any damage occurs to the worn blade which would require immediate changing, this changing can be done.

I have, in the drawings and specification, presented a detailed disclosure of the preferred embodiments of my invention, and it is to be understood that I do not intend to limit the invention to the specific forms disclosed, but intend to cover all modifications, changes and alternative constructions and methods falling within the scope of the principles taught by my invention.

I claim as my invention:

1. A mechanism for applying coating for coating a traveling paper web or the like comprising in combination a rotatable cylindrical drum for providing a backing support for a traveling web, means for supporting a plurality of doctor blade and doctor blade support assemblies at the periphery of said drum and for moving the doctor blade assemblies in an arcuate path along said drum, means for detachably connecting individual doctor blade assemblies to said supporting means, each of said doctor blade assemblies including a blade, a rigid blade holder connected to the blade and extending the length thereof for holding the blade in engagement with a paper web on the drum, end dams at the end of the holder for containing a puddle of coating on the holder and blade, and an adjustable rear dam positioned at the back of said holder and facing the drum and being vertically adjustable so that coating may flow over the upper edge of the rear dam to determine the depth of a puddle of coating carried on said blade in said holder.

2. In a mechanism for applying a coating to the surface of a web having a cylindrical drum with an outer surface for providing a supporting backing for the web, means for supporting said drum for rotation about its axis, means for directly delivering coating material to the surface of the web on the drum, doctor blade and doctor blade support assemblies for smoothing such material, the combination comprising a pair of blade support and transfer wheels mounted coaxially at the ends of said drum, a plurality of circumferentially spaced attaching means on each of said wheels for detachably securing the doctor blade assemblies to the wheels for the doctor blades to extend axially along the surface of the drum in order to engage the paper web, a transfer carriage for delivering a fresh blade assembly to a first transfer position on the wheels including a mobile support for the carriage for moving the carriage from a service area to said first station, means for releasably securing the fresh doctor blade assembly on said carriage, an adjustment means for said securing means on said carriage for adjusting the securing means and blade assemblies relative to the carriage and relative to the wheels, and means for removing a worn one of said doctor blade assemblies from the wheel at a second transfer position after it becomes worn.

3. In a mechanism for applying coating to a traveling web including doctor blade and doctor blade support assemblies, a cylindrical drum with an outer surface for providing a supporting backing for a traveling web of paper, means for supporting said drum for rotation about its axis, the combination comprising a pair of blade support and transfer wheels mounted coaxially at the ends of said drum, a plurality of circumferentially spaced attaching means on each of said wheels for detachably securing the doctor blade assemblies to the wheels to extend axially along the surface of the drum in order to individually engage the paper web with one of the blades, means connected to drive the wheels in indexing movements through a full revolution to move said engaging blade along the surface of the drum in an arc concentric to the surface from a first transfer location to a second transfer station, a first transfer means for adjustably supporting a fresh doctor blade assembly for attachment to said wheels at said first transfer location, means supporting said transfer means for movement in an axial direction along the drum and into said first transfer location, and second transfer means movable from a second transfer location to remove a worn one of said doctor blade as-

semblies from the wheels after it becomes worn so that the wheels can be rotated in indexing movements for changing blade assemblies while the web is being continually coated.

4. In a mechanism for applying coating to coat a traveling web of paper and the like having a rotatable drum for supporting and backing a traveling web of paper to be coated, doctor blade and doctor blade support assemblies, said drum having positions in sequence along the periphery of the drum arranged in a direction opposite to the direction of travel of the web including a first transfer station, a starting station, a coating station, and a second transfer station, the combination comprising, first means for supporting a first doctor blade assembly at said coating station during a coating operation, second means for supporting a second fresh doctor blade assembly at said first transfer station during said coating operation, third means for moving said first supporting means so that said first assembly is moved from said coating station to said second transfer station while maintaining the blade of the first assembly in coating engagement with the paper web, said third means also moving said second supporting means so that said second assembly is moved from said first transfer station to said starting station, means for moving the blade of said second assembly into coating engagement with the paper web at said starting station, means for moving the blade of the first blade assembly out of coating engagement with the paper web at said second transfer station, means moving a third doctor blade assembly into said first transfer station, and means for moving said first assembly out of said second transfer station away from said drum.

5. In a mechanism for applying coating for continuously coating a traveling web of paper or the like having doctor blade and doctor blade support assemblies, a cylindrical drum with an outer surface for providing a supporting backing for a traveling web of paper and having positions along the drum including a first transfer station at the periphery of the drum horizontally opposite the axis of rotation thereof, a second transfer station spaced downwardly from the first transfer station, said web moving in a direction from said second to said first transfer station, the combination comprising indexing wheels positioned at the ends of said drum for supporting doctor blade assemblies in coating engagement with the web supported by the drum, circumferentially spaced connecting means on said transfer wheels for releasably supporting the blade assemblies on the wheels, means for removing a worn blade assembly released from said wheels from said second transfer station, means for supplying a fresh blade assembly to be attached to said wheels at said first transfer station, and drive means for indexing said wheels to carry the fresh blade assembly arcuately along the surface of the drum with its blade in coating engagement with a web on the drum from said first transfer station to said second transfer station.

6. In a blade transfer apparatus, a mechanism for applying a coating to the surface of a traveling paper web having a cylindrical drum with an outer surface for providing a supporting backing for a traveling web of paper, means for supporting said drum for rotation about its axis, said drum having first and second transfer positions at different circumferential locations relative to the axis of the drum, doctor blade and doctor blade support assemblies for spreading and applying coating to the surface of said web, and means for supplying coating to the web, the combination comprising a pair of blade assembly supporting transfer wheels mounted coaxially at the ends of said drum, a plurality of circumferentially spaced attaching means on each of said wheels for detachably securing doctor blade assemblies to the wheels for the blade to extend axially along the surface of the drum in order to engage the paper web, means for tilting a doctor blade assembly on said wheels at said first position to an operative position against the web carried on the drum surface, drive means connected to drive the wheels in indexing movements through a full revolution to move the blade assembly along the surface of the drum in an arc concentric to the surface from said first transfer position to said second transfer position, first transfer means movable into said first transfer position for supplying a fresh blade assembly to said wheels, and second transfer means movable away from said second transfer position to remove a worn one of said doctor blade assemblies from the wheels after it becomes worn, said drive means rotatably indexing said wheels and changing the position of the blade assemblies while the web is being continuously coated.

7. In a mechanism for applying a coating to the surface of a traveling paper web having a cylindrical drum with an outer surface for providing a supporting backing for a traveling web of paper, said drum having positions along the drum surface including first and second transfer stations at different circumferential locations relative to the axis of the drum, means for supporting said drum for rotation about its axis, means for supplying coating for being smoothed, a doctor blade and doctor blade support assemblies, the combination comprising a pair of blade assembly supporting transfer wheels mounted coaxially at the ends of said drum, a plurality of circumferentially spaced attaching means on each of said wheels for detachably securing doctor blade assemblies to the wheels for the blade to extend axially along the surface of the drum in order to engage the paper web, drive means to rotate the wheels in arcuate increments to move the doctor blade assemblies between said first and second transfer stations, first transfer means movable to said first transfer station for supplying a fresh blade assembly to said wheels, and second transfer means movable from said second transfer station to remove a worn one of said doctor blade assemblies after a fresh blade assembly has been attached to the wheels at said first transfer station.

8. In a mechanism for applying coating to a traveling web with a doctor blade on a blade assembly, having a cylindrical drum with an outer surface for providing a supporting backing for a traveling web of paper, doctor blade and doctor blade support assemblies, and means for supplying coating to the blade to be smoothed on the web by the blade, the combination comprising a pair of blade assembly support and transfer wheels mounted coaxially at the ends of said drum, a plurality of blade assembly mounting seats on the periphery of each of said transfer wheels for positioning the ends of the doctor blade assemblies, said seats having a support surface facing upwardly in a second transfer position for aiding in the support of a worn one of said doctor blade assemblies as it is being removed from said wheels, first transfer means for delivering a fresh doctor blade assembly to a first transfer position, and second transfer means for lifting a worn one of said doctor blade assemblies upwardly out of the second transfer position.

9. A mechanism for applying a coating to the surface of a traveling paper web comprising a rotatable drum having a cylindrical outer surface for backing a traveling web of paper, means for supporting said drum for rotation about its axis, a doctor blade assembly including a coating-applying blade and having a rigid blade back for supporting the blade, journals at the ends of the blade assembly supported in blade assembly bearings for supporting the blade while it is pivoted to engaged coating position against a web on the drum, means for supplying coating to be applied to the web by the blade, a pair of blade support and transfer wheels mounted coaxially at the ends of said drum, blade assembly connectors attached to each of said blade bearings, at least three circumferentially spaced blade assembly securing mounts on said wheels adapted to receive said blade assembly connectors, means for driving said transfer wheels in in-

dexing rotation to move the blade assembly securing mounts concentrically relative to the drum surface, and loading means operatively positioned between the blade assembly bearings and the blade assembly for tiltably loading the blade against the web on the drum so that fresh blade assemblies can be attached to said wheels for loading against the web when a worn blade is removed.

10. A mechanism for applying coating to coat a traveling web of paper or the like comprising in combination a rotatable cylindrical drum for providing a support for a traveling paper web, means for supporting coating applying doctor blades in a position to coat the web on the drum, means for detachably connecting the individual doctor blades to said support means, means for moving said support means along an arcuate path to carry the doctor blades relatively along the surface of said drum from a first station to a second station, means for loading one of the doctor blades against the drum at said first station for coating operation and holding the blade in coating contact with the web during movement from the first station to the second station, a first coating supply means for providing a starting puddle of coating to the blade at said first station, and a second coating supply means for supplying an operating puddle of coating to the blade at said second station.

11. The method of continuously coating a traveling web of paper or the like supported on a rotating drum while changing blades which comprises applying a first, coating-pool confining doctor blade to the surface of the web supported on the drum at a coating station with the blade positioned horizontaly opposite the drum on the down-running side; forming a puddle of coating on the upper surface of a fresh second doctor blade positioned beneath the coating drum, moving the fresh doctor blade upwardly and into contact with the surface of the paper web while tilting the blade forwardly to cause the puddle to run over the contact edge of the blade for immediate application of coating and removing the worn first blade from the surface of the drum.

12. The method of continuously coating a traveling web of paper or the like supported on a rotating drum while changing blades which comprises applying a pool of coating material to the surface of said traveling web, confining the pool by a first doctor blade applied to the surface of the web supported on the drum at a coating station with the blade positioned horizontally opposite the drum on the down-running side, forming a puddle of coating material on the upper surface of a fresh second doctor blade positioned beneath the coating drum, moving the fresh doctor blade upwardly and into contact with the surface of the paper web while tilting the blade forwardly to cause the puddle to run over the contact edge of the blade for immediate application of coating, and tilting the worn first blade downwardly toward the fresh second blade to permit the puddle of coating held thereby to flow downwardly into the starting puddle of the fresh second blade.

13. In a mechanism for applying coating to a traveling web with a doctor blade having a rotatable drum with a cylindrical outer surface for backing a traveling web of paper, the combination comprising blade supporting and transfer means for carrying a doctor blade assembly from a first to a second transfer station along an arc concentric with said surface of the drum, means for delivering fresh blade assemblies to the transfer means, means for removing worn blade assemblies from the transfer means, and connectors on the assemblies for detachably securing the ends of doctor blade assemblies to the transfer means including a seat on the transfer means and a member for the doctor blade assembly fitting said seat, and one of said transfer means and said blade assembly including a slot and the other including a releasable swing bolt to be received by said slot and tightened to hold said seat and fitting element together.

14. In a mechanism for applying a coating to the surface of a traveling paper web the combination comprising a support surface for backing a traveling web, means for carrying said support surface in movement in an arcuate path about an axis, means for delivering coating to be smoothed on the web by a doctor blade on a doctor blade assembly, a pair of rotatable blade-carrying wheels mounted for rotation about said support surface axis, drive means connected to drive the wheels in 360° of rotation in indexing steps to move the doctor blade arcuately in continued contact with the web from a loading position to an unloading position, a plurality of circumferentially spaced blade-securing mounts on said wheels for supporting fresh blade assemblies with blades to be loaded against the web and to be moved into said unloading station, and loading means carried with said blades operative to hold the blades in coating engagement with the web during movement of the blades from said loading to said unloading position.

References Cited in the file of this patent

UNITED STATES PATENTS

1,417,931	Molm	May 20, 1922
1,747,104	Case	Feb. 11, 1930
2,064,776	Wilkinson et al.	Dec. 15, 1936
2,070,667	Lougee	Feb. 16, 1937
2,423,555	Ender	July 8, 1947
2,534,320	Taylor	Dec. 19, 1950
2,541,591	Lemmon	Feb. 13, 1951
2,556,262	Faeber	June 12, 1951
2,698,453	Garrow	Jan. 4, 1955
2,799,920	Hansen	July 23, 1957
2,827,690	Brown	Mar. 25, 1958
2,947,248	Fuchs	Aug. 2, 1960
2,968,279	Peterson	Jan. 17, 1961