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PAPER COATING MECHANISM AND PROCESS OF COATING PAPER

Filed Jan. 2, 1926

2 Sheets-Sheet 1

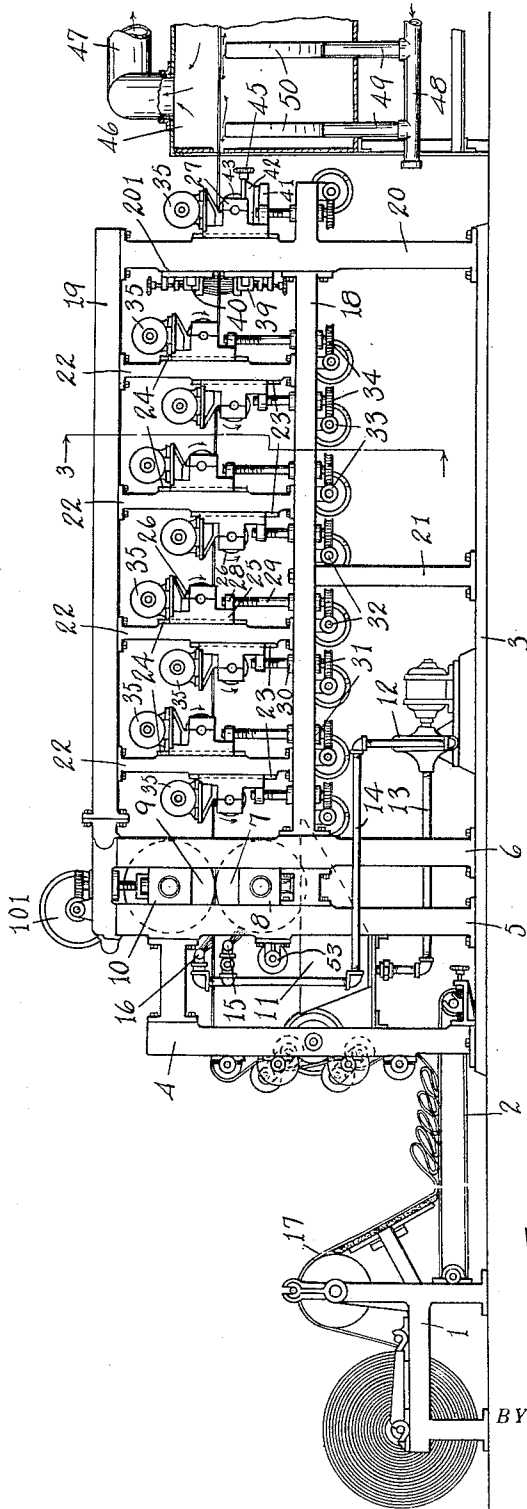


Fig. 1

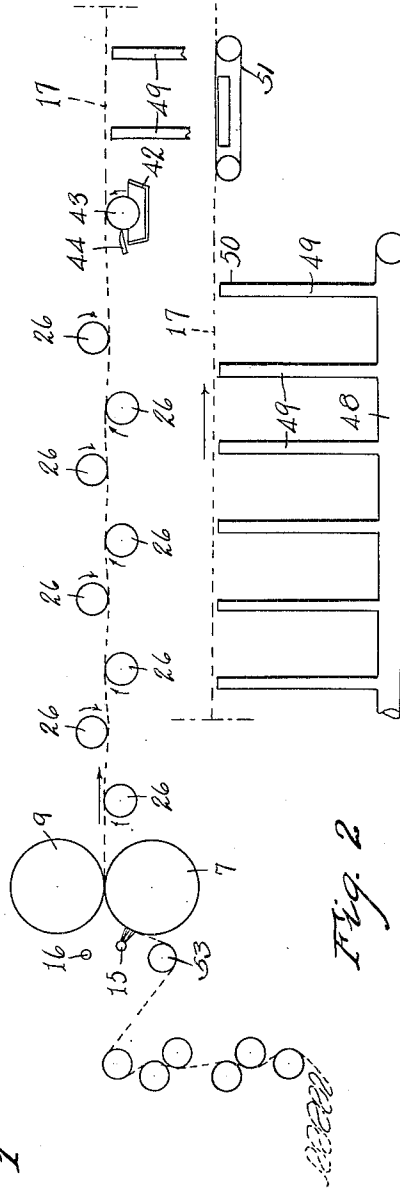


Fig. 2

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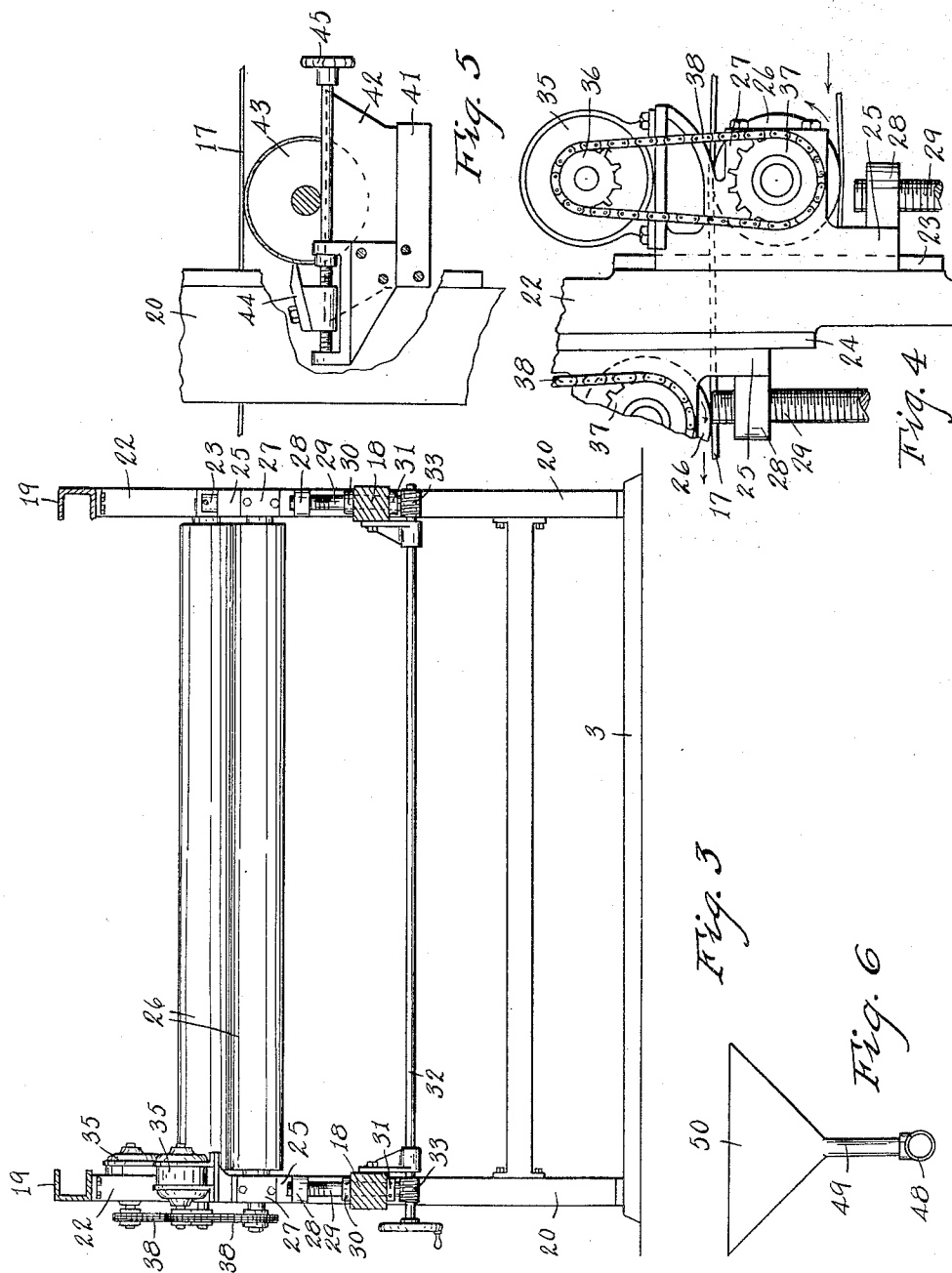
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2 Sheets-Sheet 2



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PAPER-COATING MECHANISM AND PROCESS OF COATING PAPER

Application filed January 2, 1926. Serial No. 78,868.

This invention relates to an improved paper coating mechanism and process of coating paper.

The objects of the invention are:

First, to provide a simple and durable machine of large capacity, high speed, and efficiency.

Second, to provide a simple means for securing an even distribution, even appearance and effective surface finish on a coated sheet.

Third, to provide a machine which is economical as to the coating material, using no excess and conserving all the surplus.

Fourth, to provide an improved process of handling the sheets without undue tension and delivering the same effectively coated to the floater for drying.

Fifth, to provide an improved continuous process of handling and coating a web of paper.

Objects pertaining to details and economies of construction and operation of my invention will definitely appear from the detailed description to follow.

The invention is clearly defined and pointed out in the claims.

A structure which is a preferred embodiment of my invention is clearly illustrated in the accompanying drawing, forming a part of this application, in which:

Fig. 1 is a side elevation view of the machine, portions of the drying box being broken away and shown in section.

Fig. 2 is a similar diagrammatic side elevation view, being in broken section.

Fig. 3 is an enlarged detail transverse sectional view on line 3—3 of Fig. 1.

Fig. 4 is an enlarged detail view from the left hand of Fig. 3 showing details of construction of the finishing rolls and their driving and adjusting means.

Fig. 5 is a similar enlarged end view of the moistener structure made use of when one side only of the sheet is being coated.

Fig. 6 is a side elevation of one of the nozzles.

The parts are identified by the same numerals of reference throughout the several views.

1 is the roll stand from which the paper

web 17 to be coated is delivered to the canvas looper 2. 3 is the base of the main part of the machine carrying the feed roll structure 4 of a usual construction at its front end.

5 and 6 are the main uprights for carrying the coating roll. The driven roll 7 is in an adjustable bearing box 8 between these uprights and the follower roll 9 is carried in the adjustable bearing box 10, the pressure on which is controlled by usual screw means controlled by the handwheel 101.

11 is the cross trough for the coating material. 12 is a centrifugal electrically driven circulation pump taking the coating mixture through pipe 13 from the bottom of the trough 11 and delivering the same through pipe 14 to header nozzles 15 and 16 for coating one or both sides of the sheet or web 17.

18 and 19 are the longitudinal top and bottom beams for the main frame work of the machine carried by the uprights 5 and 6 and the end posts 20 and supporting posts 21 beneath the same at intervals as required. These beams are connected by upright columns 22, 22 which are provided with vertical adjusting ways 23, 24. On these ways are brackets 25 which carry the finishing rolls 26 which are supported in boxes 27 that are adjustable up and down by the screw-threaded lugs 28 receiving the upright supporting screws 29 which are provided with collars 30, 31 and are actuated simultaneously by the shaft 32 having worms 33, 33 at each end meshing with worm gears 34 on the lower ends of the said adjusting screws 29.

The rolls are driven by electric motor 35 provided with sprocket driving pinions 36 which drive sprocket gears 37 on the ends of the rolls by means of sprocket chains 38. These rolls are supported on the guideways on the opposite sides of the uprights 22. The rolls at the left hand side of the upright are shown with the web 17 passing above the roll and those on the right of the standard 22, as seen in Fig. 1, are disposed with the finishing rolls above the sheet. The adjustments enable the proper contact arrangement of the roll to the web 17.

The finishing rolls are driven to rotate against the direction of the travel of the web

17 when both sides are coated. When only the upper side is coated the rolls on the under side are driven in the same direction as the sheet and serve to support and advance the same without undue friction. The rolls 26
5 are made of highly polished non-corrosive material of any kind. This material is preferably of polished steel.

The sheet travels from the finishing rolls to the drier box 46 which has an eduction flue 47 for carrying away the moisture laden air. Air is supplied to the drier box through the header 48 having upwardly projecting connections 49 each terminating in broad fan-shaped nozzles 50 transverse to the web and delivering in close proximity to the under side thereof, as clearly appears in Fig. 2.

By thus supporting the sheet on the air it is not necessary to provide strong tension and the same is very readily delivered through a long dry-box to a tensioning apron 51 seen in Fig. 2. The tensioning apron tensions the sheet through the entire apparatus so that the finishing rolls, acting alternately on opposite sides in spaced relation to each other, act against the tension means 51 and can, therefore, be run at a comparatively high rate of speed and finish the surface by a light friction contact therewith. The speed
30 giving best results is $2\frac{1}{2}$ to 3 times the speed of the web. The contact is as light and more perfect than can be secured with a brush.

In normal brushing practice the brushes vibrate laterally of the moving web, thus displacing the coating fluid and causing it to be distributed evenly, with slight irregularities therein equalized. The result of applying the reversely turning rolls in my machine, is that the rolls pick up the coating from the sheet and redeposit it again thereon. To
40 pick up very thin films of coating, which seems to be necessary to attain the desired effect, the peripheral speed of the rolls must be faster than the paper moving thereunder. If the rolls have a peripheral speed less than that of the paper, the result will be to form transverse ridges thereon.

On the end support 20 I mount a pair of reciprocating cross brushes (of usual coating brush construction) 39 beneath the web and 40 above. These eliminate any slight surplus coating and smooth off any irregularities and pass the sheet perfectly clean onto the driver 46.

55 When the coating is done on both sides no moisture is supplied to the web.

When there is but a single coating on the upper side of the sheet it is necessary to moisten the lower side to insure even drying and consequently a perfectly flat sheet. This I accomplish by providing a unit similar to the other unit with moistening roll 43 in place of a finishing roll. There is a shelf 41 carrying a cross trough 42 for water into which
65 the moistening roll 43 projects. A wooden

doctor 44 adjustable by the usual hand screw 45 regulates the amount of moisture on this roll which is delivered to the under side of the sheet by rolling into contact therewith, the roll running in the direction of the web travel. When the sheet is to be coated on one side only I prefer to lead it first around a roll 53 whereby it is brought into a position to receive coating material from nozzle 15, and is caused to follow the surface of roll 7, which it next contacts for some little distance. This is shown in Figures 1 and 2.

In Fig. 1, I show both sprays 15 and 16 and the coating material in process of application to both sides of the web. The spray 16 is delivered on to the top of the web 17 and the lower spray delivers to the surface of the roll 7 and is passed into contact with the under side of the web by the roll.

In Fig. 2 I show the method of passing the web through the machine when one side, the top side only, is coated. Here the lower spray head 15 is delivering to the top side of the sheet which is being delivered in contact with the lower roll 7. I also here show the moistener roll in operation moistening the under side of the web 17 as it passes to the drier so that it will dry evenly. Of course, where both sides are coated they are equally moist and the drying will be done evenly without injury to the sheet. I have shown my improved coating and finishing machine in its preferred form.

The process, it will be noted, consists in the coating of the sheet, tensioning the same and brushing it with a smoothing roller against the tension of the sheet as distinguished from calender rolls operating one against the other, or from bristle or fiber brushes. The tensioning of the web makes it possible to do this work gently and yet at a high speed securing an effective distribution and finish of the coating material without any brush marks and without any waste, putting on as light or as heavy a coat as is required for the particular purpose in hand. It is possible by this means to load a sheet with a heavy load of coating material where it is desired, or to coat the same with a minimum amount when for any reason that is the requirement. The coating may be for sizing, finish, or any other purpose such as gummed paper.

It is also possible with a single machine to coat either both sides or one side of the sheet by simply cutting off the spray and delivering the web as required for the purpose, and the machine is of great advantage on that account.

While I have shown a pair of cross reciprocating brushes for acting on the sheet after it has been finished by the rolls, I desire to state that a larger number of brushes might be provided at that point, and that a very good product is secured if no brushes are

made use of at all. Whether the surface shall be brushed, or to what extent, after this treatment, is a matter of choice, depending on circumstances. The surface is considerably improved by the brushing and, of course, at that stage, cannot leave any brush marks on the finished sheet.

Having thus described my invention what I claim as new and desire to secure by Letters Patent is:

1. In a machine for coating paper, the combination with means for applying a sprayable coating substance to the paper and for limiting the thickness of coating, means for feeding the paper, and separate means for spreading said coating comprising a roll impinging upon the paper, and rotated oppositely to the movement of the paper, said roll driven at a peripheral speed greater than the speed of the paper.

2. In a machine for coating paper, the combination with means for applying a sprayable coating substance to the paper and for limiting the thickness of coating, means for feeding the paper, and separate means for spreading said coating comprising a roll impinging upon the paper, and rotated oppositely to the movement of the paper, said roll being driven at a peripheral speed greater than the speed of the paper, and between $2\frac{1}{2}$ to 3 times the speed of the paper.

3. In a machine for coating paper, the combination with means for applying a sprayable coating substance to the paper and for limiting the thickness of the coating, means for feeding the paper, and separate means for spreading said coating comprising a series of rolls impinging upon the paper, and rotated oppositely to the movement of the paper, said rolls being driven at a peripheral speed greater than the speed of the paper.

4. In a machine for coating paper, the combination with means for spraying a coating substance onto the paper, and for limiting the thickness of the coating, means for feeding the paper, and separate means for spreading said coating comprising a series of rolls impinging upon the paper, and rotated oppositely to the movement of the paper, said rolls being driven at a peripheral speed greater than the speed of the paper, and between $2\frac{1}{4}$ to 3 times the speed of the paper.

5. A process of coating paper which comprises applying a sprayable coating to a traveling web of paper in a controlled thickness, and without providing for an intervening drying stage for plasticizing the coating by a subsequent step, spreading said coating by picking up coating and redepositing it upon the traveling web by one or more cylindrical surfaces rotating oppositely to the travel of the paper and at a peripheral speed greater than that of the paper.

6. A process of coating paper which comprises applying a sprayable coating to a

traveling web of paper in a controlled thickness, and without providing for an intervening drying stage for plasticizing the coating by a subsequent step spreading said coating by picking up coating and redepositing it upon the traveling web by one or more cylindrical surfaces rotating oppositely to the travel of the paper and at a peripheral speed from $2\frac{1}{2}$ to 3 times that of the paper.

In witness whereof I have hereunto set my hand.

LUTHER A. PARKER.