

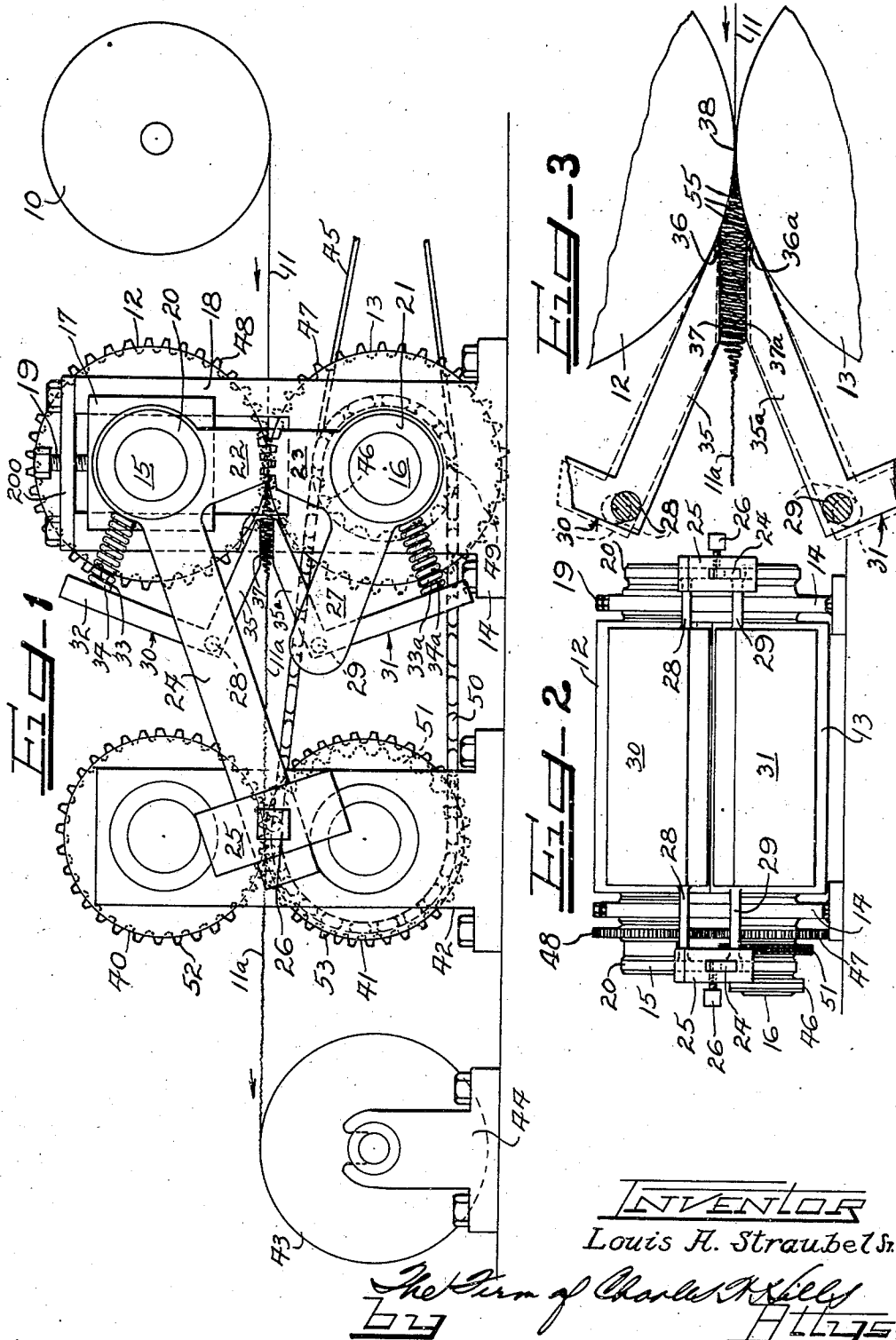
Oct. 22, 1946.

L. A. STRAUBEL, SR

2,409,997

CREPING MACHINE

Filed Nov. 24, 1944



INVENTOR
Louis H. Straubel, Jr.

By *Charles H. Kees*
ATTORNEY

UNITED STATES PATENT OFFICE

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CREPING MACHINE

Louis A. Straubel, Sr., Green Bay, Wis., assignor
to James W. Straubel, trustee, Green Bay, Wis.

Application November 24, 1944, Serial No. 564,916

9 Claims. (Cl. 154—30)

1

This invention relates to a creping machine, and more particularly to a machine for the creping of fibrous material, such as paper and the like, in a dry state.

It has heretofore been proposed to crepe paper in a dry state, but difficulties have been experienced in actual practice in obtaining a satisfactory crepe. These difficulties of prior workers in the art appear to have been due, in part, to the lack of any provision for maintaining the proper pressure upon the paper as it is delivered from the bite between the feeding and creping rolls in order to cause the paper to be upset and creped.

In accordance with my present invention, means are provided for mounting a pair of doctor plates at the delivery side of the bite between the feeding and creping rolls and for holding said plates lightly against the surfaces of said rolls while permitting the pressure of the paper passing between the plates to effect an automatic adjustment of the spacing of the plates to so control such pressure as to bring about the optimum conditions for good creping. To accomplish this I provide two sets of plate-carrying members that are mounted for common pivotal movement about the respective axes of the feeding and creping rolls. A doctor plate is pivotally mounted from each set of these plate-carrying members and placed under a bias, as by means of springs which urge the doctor plates against the respective roll surfaces.

One set of the plate-carrying members is further provided with adjustable means for urging the cooperating surfaces of the doctor plates toward each other in opposition to the pressure of the creped paper passing therebetween, whereby the spacing of such cooperating surfaces of the doctor plates is automatically maintained to create the desired back pressure on the paper and thus cause the paper to be upset ahead of the leading edges of the plates close to the bite of the rolls.

A pair of rolls having resilient or yielding surfaces run at a slightly lower surface speed than the main feeding and creping rolls serve to draw the creped paper uniformly from the restricted passage between the cooperating surfaces of the doctor plates in which the creped paper accumulates as a result of the back pressure referred to. In this way, a heavily and uniformly creped paper can be obtained without danger of tearing the paper, as so frequently happens when sharp-edged doctor plates are used.

It is therefore an important object of this in-

2

vention to provide a creping machine for the creping of dry web material, such as paper and the like, provided with doctor plates and means for holding said plates lightly against the surfaces of the feeding and creping rolls while at the same time permitting the cooperating surfaces of the doctor plates to move relatively toward or away from each other to provide a restricted passage for the web and to exert the proper amount of pressure upon the web accumulating in such restricted passage to cause the paper to be upset substantially at the bite of the feeding and creping rolls ahead of the leading edges of the doctor plates.

It is a further important object of this invention to provide a creping machine for the creping of dry web material, such as paper and the like, including a pair of pivotally mounted doctor plates and means for urging said plates toward each other and into the bite between the feeding and creping rolls to provide a restricted passage between the doctor plates in which because of the friction offered to the passage of paper therethrough, an accumulation of bunched paper builds up and causes the paper ahead of it in the bite of said rolls to be upset and creped.

Other and further important objects of this invention will be apparent from the disclosures in the specification and the accompanying drawing.

On the drawing:

Figure 1 is a side elevational view of a creping machine embodying my invention.

Figure 2 is an elevational view of the creping mechanism viewed from the delivery end.

Figure 3 is a broken, enlarged detail view illustrating the creping operation and showing the movement of the creping plates in dotted lines.

The reference numeral 10 indicates a supply roll of web material, such as paper or the like, that is to be creped. Said roll is supported in any conventional manner and provided with the usual braking means (not shown) to permit a web 11 to be unwound therefrom under the desired tension. A pair of feeding and creping rolls 12 and 13 are mounted between the uprights of a stand 14 with their shafts 15 and 16 in vertical alignment. The ends of the shaft 15 of the upper roll 12 are journaled in bearing boxes 17 that are vertically adjustable within the vertical guiding members 18 of the stand 14. A pair of bolts 19 threaded through cross pieces 200 attached to the upper ends of the uprights 18 serve to adjust the pressure exerted by the upper roll 12 against the lower roll 13. The rolls 12 and 13, instead of

being provided with the usual mild steel surfaces, are provided with chilled steel surfaces to prevent scoring by the paper or other web material passing therebetween.

In accordance with the principles of my invention, doctor plate carrying members 20 are mounted for pivotal movement upon the extended ends of the shaft 15, and other doctor plate carrying members 21 are mounted for pivotal movement upon the extended ends of the lower roll shaft 16. The members 20 and 21 are provided with gear sectors 22 and 23, respectively, having intermeshing gear teeth, whereby pivotal movement of either of the sets of members 20 or 21 effects a like angular movement of the other member.

The members 20 are also provided with radially extending arms 24, on the ends of which are mounted weights 25 for adjustment therealong to vary the effective force tending to rotate the members 20, and, through the intermeshing teeth of the gear sectors 22 and 23, the members 21. Screws 26 serve to hold the weights in adjusted positions upon the arms 24. It will be understood, of course, that by appropriate positioning the arms 24 and weights 25 may form a part of the other doctor plate supporting members 21, instead of the members 20, and the same effect obtained.

The members 21 are also provided with radially extending arms, indicated by the reference numeral 27, which, if extended, would converge with the arms 24. Angularly-shaped doctor plates 30 and 31 are pivotally mounted from said arms 24 and 27 by means of extended trunnions 28 and 29, respectively. Since each of the doctor plates 30 and 31 is similar in construction to the other, only one need be described with particularity.

The doctor plate 30 is substantially right-angular in shape when viewed endwise, and is pivotally mounted at its apex upon its trunnions 28. The upwardly extending leg 32 of said doctor plate 30 is provided at each end with a guide pin 33 which extends toward the axis of the shaft 15. A coiled spring 34 surrounds each of the pins 33 and is held under compression between the leg 32 and the adjacent extended end of the shaft 15. The action of the springs 34 thus tends to urge the upper leg 32 away from the roll 12 about the pivot pins 28.

The lower leg 35 of said upper doctor plate 30 constitutes the doctor plate proper. Said leg 35 is provided with a leading edge 36 from which extends backwardly a plane surface 37. The lower doctor plate 31 is provided with a similar leading edge 36a and with a similar plane surface 37a. Likewise the lower doctor plate 31 is provided with springs 34a and spring guide pins 33a. As a result of the actions of the springs 34 and 34a, the doctor plates 35 and 35a are urged into light yielding contact with the surfaces of the rolls 12 and 13, respectively, for all angular positions of the arms 24 and 27. When the machine is not in operation, the arms 24 and 27, under the action of the weights 25, tend to move toward each other and to advance the leading edges 36 and 36a into the bite 38 (Fig. 3) between said rolls 12 and 13 until the plane surfaces 37 and 37a are in contact with each other, or substantially so.

A pair of rolls 40 and 41 are mounted in a stand 42 in back of the feeding and creping rolls 12 and 13. Said rolls 40 and 41 are preferably covered with a rubber, felt, or other yielding sur-

facing material. The provision of a soft or yielding surface reduces the tendency of the rolls 40 and 41 to calender the crepe out of the web.

After leaving the rolls 40 and 41, the web is wound up into a roll 43 journaled at its ends in a reel stand 44.

The driving means for the machine include a belt 45 driven from any suitable source of power (not shown) and trained around a pulley 46 that is keyed to the shaft 16. Said shaft 16 also carries a large gear 47 adapted to mesh with a similar pinion gear 48 keyed to the shaft 15. The upper roll 12 is thus driven through the train of gears 47 and 48 at the same surface speed as the lower roll 13.

The shaft 16 also carries a gear 49, around which is trained a chain 50. Said chain 50 serves to drive the lower roll 41 through the gear 51. The arrangement is such that the roll 41 is driven at a slightly lower surface speed than the roll 13. The upper roll 40 is driven through a pair of pinion gears 52 and 53 mounted upon the shafts of the upper and lower rolls 40 and 41, respectively.

The operation of the device is substantially as follows:

The machine is first set into operation through the belt drive 45. The leading end of the web 11 is then fed into the bite 38 between the rolls 12 and 13. Since the tendency of the web on the delivery side of the bite 38 is to proceed in a straight line, without following the surface of either of the rolls 12 or 13, the end of the paper will thread itself between the doctor plate surfaces 37 and 37a, tending to spread them apart and provide a restricted passage therebetween. The weights 25, if not already adjusted to proper position, are adjusted at this time. The positions of the weights 25 will depend upon the basis weight of the paper to be creped, its stiffness and other characteristics.

As the web 11 starts to pass through the restricted gap between the surfaces 37 and 37a a certain amount of frictional resistance is generated that causes the paper to be upset upon itself right back into the delivery side of the bite 38, and to fill the nip ahead of the leading edges with folds of the creped paper, as indicated at 55 (Fig. 3). While the pressure of the paper is still in a straight line tangential to the roll surfaces at the bite 38, the increase in the effective thickness of the paper caused by the creping action ahead of the leading edges 36 and 36a causes said leading edges to be forced apart sufficiently to accommodate the creped paper.

The expanding forces so created are balanced by the forces produced by the weights 25 tending to bring said surfaces 37 and 37a closer together. The result is that equilibrium is reached at a point where the two opposing sets of forces balance each other. If the pressure of the bundles of creped paper increases, the doctor plates 30 and 31 are moved angularly away from each other, and at the same time the leading edges 36 and 36a are moved slightly outwardly from the bite 38 to assume the dotted position illustrated in Figure 3.

The springs 34 and 34a serve to hold the back sides of the doctor plates proper 35 and 35a against the respective roll surfaces 12 and 13. With the doctor plates in the position illustrated in Figure 3, the plane surfaces 37 and 37a are slightly convergent toward each other in the direction of the bite 38, or, expressed differently, the restricted passage between said surfaces 37

5

and 37a becomes slightly wider rearwardly of the leading edges 36 and 36a. This arrangement appears to have some advantages over an arrangement where the surfaces 37 and 37a are wider apart at their leading edges than rearwardly thereof.

As the creping operation proceeds, the creped paper crowds in bundles in the restricted passage between the surfaces 37 and 37a until it is forced out rearwardly thereof. The creped paper, now identified by the reference numeral 11a, is then fed between the resilient covered rolls 40 and 41, which, as before stated, run at a slightly lower surface speed than the rolls 12 and 13. The rolls 40 and 41 are urged toward each other by adjustable pressure control means (not shown) but similar to that provided for the rolls 12 and 13, so that the amount of pressure, and hence the calendering effect, upon the creped web 11a may be varied as desired. The rolls 40 and 41 serve to pass the creped web 11 to the reel 44 at a uniform rate from the accumulation of the paper between the doctor plate surfaces 37 and 37a.

From the rolls 40 and 41, the creped web 11a is conducted to the reel 44 to be there wound up into a roll 43. Conventional means (not shown) for operating the winding reel are provided.

By use of a machine such as above described, paper of varying basis weights and varying degrees of stiffness can be satisfactorily creped in the dry state. A creped paper having a stretch in excess of 100% is possible even on relatively heavy weight paper. Regular perforated toilet tissue can be creped in the machine of my invention without any difficulty.

In the operating position of the doctor plates 30 and 31 illustrated in Figure 3, with the other dimensions as given above, the spacing apart of the surfaces 37 and 37a will be in the neighborhood of about 1/4 of an inch at the leading edges 36 and 36a, with the spacing increasing slightly rearwardly of said leading edges.

It will, of course, be understood that various details of construction may be varied through a wide range without departing from the principles of this invention and it is, therefore, not the purpose to limit the patent granted hereon otherwise than necessitated by the scope of the appended claims.

I claim as my invention:

1. In a creping machine, a pair of cooperating rolls for the passage into the bite therebetween of a web to be creped, coaxing members, pivotally mounted about the axes of said rolls, creping plates supported from said members for providing a gap adjacent to the bite of said rolls of adjustable width for receiving said web after the same is creped in said nip, and means tending to urge said plates toward each other to restrict the width of said gap to effect an accumulation of said creped web within said gap.

2. In a creping machine, a pair of cooperating creping rolls, interengaging members pivotally mounted for limited rotational movement, creping plates carried by said members for positioning in adjustable spaced relation to form a gap adjacent the delivery side of the bite between said rolls and means acting upon one of said members to rotate said members and move said plates toward each other to restrict the width of said gap.

3. In a creping machine, a pair of feeding and creping rolls providing a bite therebetween for

6

the creping of a web at the delivery side of said bite, plates positioned at said delivery side of said bite to provide a gap of adjustable width in which an accumulation of said creped web forms, pivotally mounted means supporting said plates and means associated with said plate supporting means urging said plates toward each other to restrict the width of said gap in opposition to the pressure of the web accumulation tending to expand said width.

4. In a dry web creping machine, a pair of creping rolls providing a bite therebetween for the passage of a web to be creped, plates positioned at the delivery side of said bite and in closely spaced relation to said bite to provide a restricted gap into which the creped web is fed, means pivotally mounted about the axes of said rolls and supporting said plates and means biasing said pivotally mounted means tending to restrict said gap to cause said web to be backed up and upset in said bite and thereby creped.

5. In a dry web creping machine, a pair of creping rolls providing a bite therebetween for the passage of a web to be creped, plates positioned at the delivery side of said bite and in closely spaced relation to said bite to provide a restricted gap into which the creped web is fed, and means including coaxing members pivotally mounted about the axes of said rolls and pivotally supporting said plates tending to restrict said gap to cause said web to be backed up and upset in said bite and thereby be creped.

6. In a dry web creping machine, a pair of creping rolls providing a bite therebetween for the passage of a web to be creped, plates having adjustably spaced opposed surfaces terminating in leading edges extending into the delivery side of said bite and biased toward the surfaces of said roll to cooperate in upsetting said web in said nip, and means pivotally supporting said plates and constantly urging said plates bodily together to restrict the gap between said opposed surfaces and between said leading edges into which the web is fed and thereby effect the upsetting and creping of said web.

7. In a dry web creping machine, a pair of creping rolls providing a bite therebetween for the passage of a web to be creped, plates having adjustably spaced leading edges extending into the delivery side of said bite and biased toward the surfaces of said roll to cooperate in upsetting said web in said nip, and means pivotally supporting said plates and constantly urging said plates together to restrict the gap between said leading edges into which the web is fed and thereby effect the upsetting and creping of said web, said means comprising members pivotally mounted about the axes of said rolls and having interengaging gear sectors, and a weight cooperating with one of said members to urge rotation of said members to bring said plates toward each other and closer to said bite of the creping rolls.

8. In a dry web creping machine, a pair of creping rolls providing a bite therebetween for the passage of a web to be creped, plates having adjustably spaced leading edges extending into the delivery side of said bite and biased toward the surfaces of said roll to cooperate in upsetting said web in said nip, means pivotally supporting said plates and constantly urging said plates together to restrict the gap between said leading edges into which the web is fed and thereby effect the upsetting and creping of said web and a pair of rolls having yielding surfaces for

7

receiving therebetween said creped paper from said gap.

9. In a dry web creping machine a pair of creping rolls providing a bite therebetween for the passage of a web to be creped, plates having adjustable spaced leading edges extending into the delivery side of said bite and biased toward the surfaces of said roll to cooperate in upsetting said web in said nip, means pivotally supporting said

8

plates and constantly urging said plates together to restrict the gap between said leading edges into which the web is fed and thereby effect the upsetting and creping of said web and a pair of rolls having yielding surfaces for receiving therebetween said creped paper from said gap and means for driving said last rolls at a slower surface speed than said creping rolls.

LOUIS A. STRAUBEL, Sr.