Feb. 12, 1929 1,702,166

W. A. LORENZ

PAPER CRINKLING MACHINE

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Fig. 1.

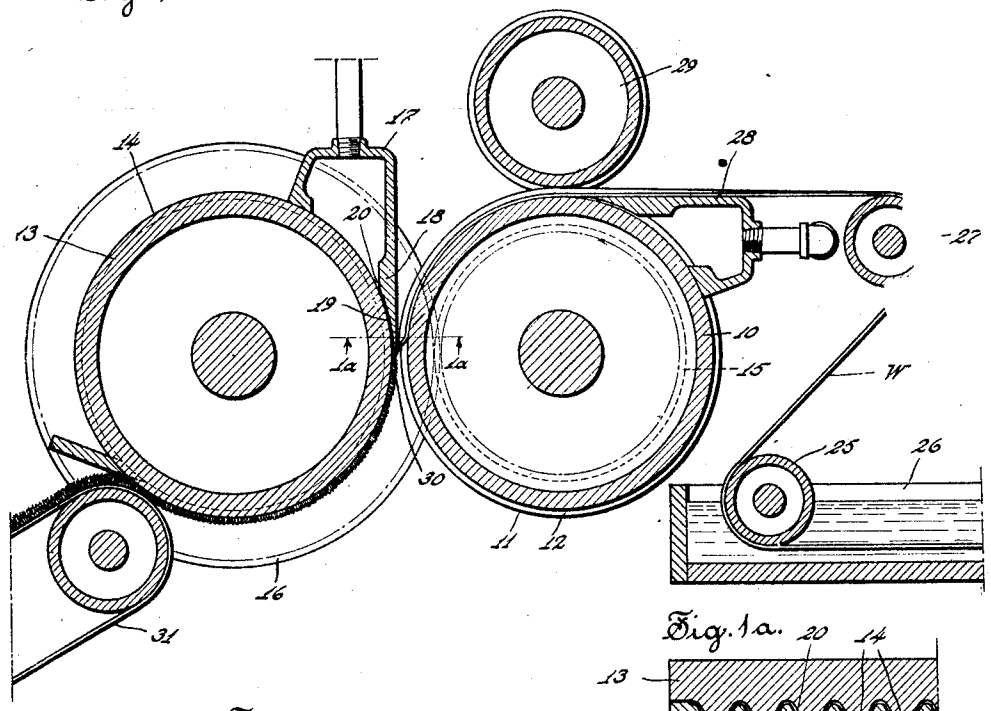


Fig. 1a.

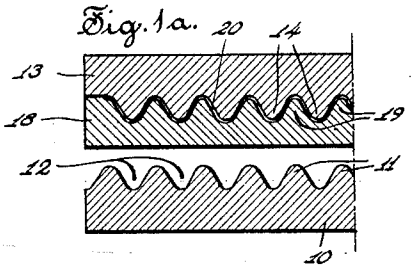
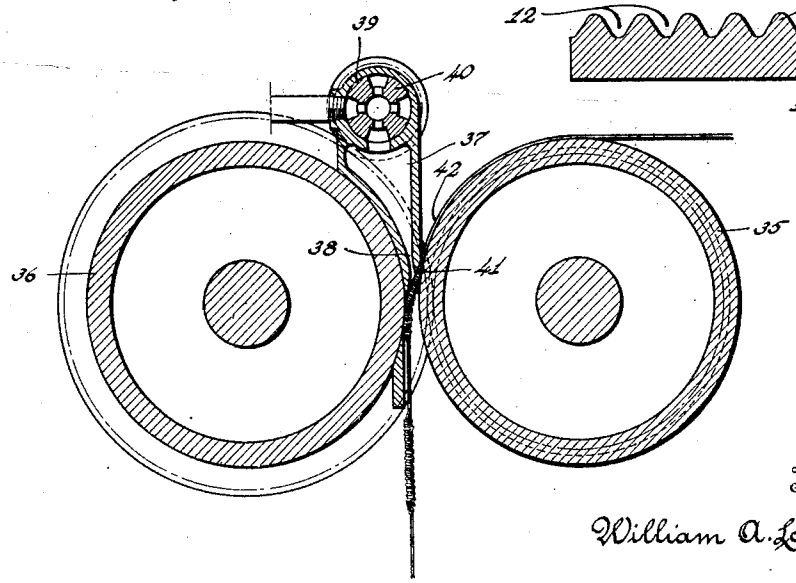


Fig. 2.



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Fig. 3.

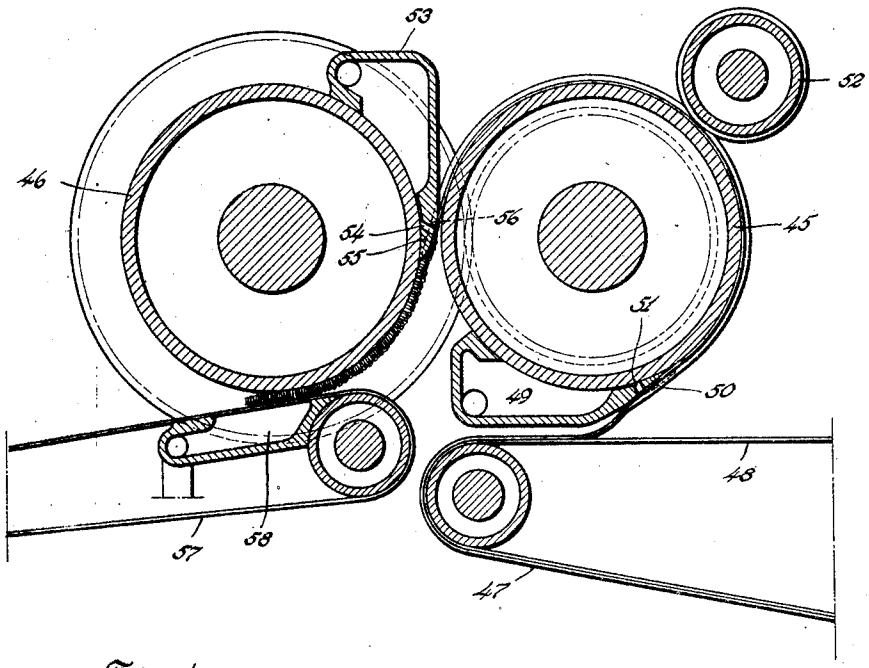
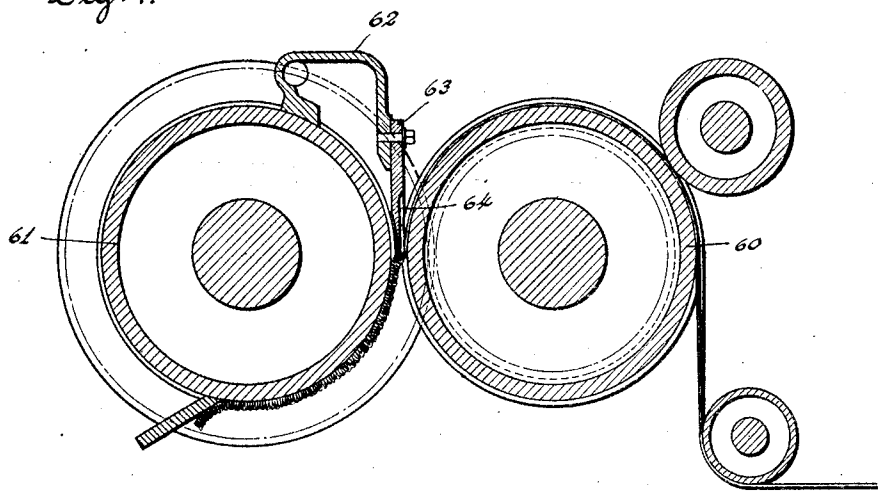


Fig. 4.



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Fig. 6

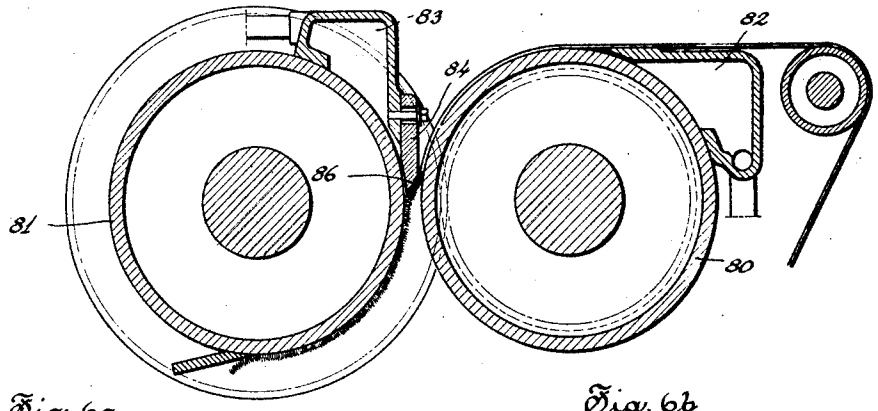


Fig. 6a

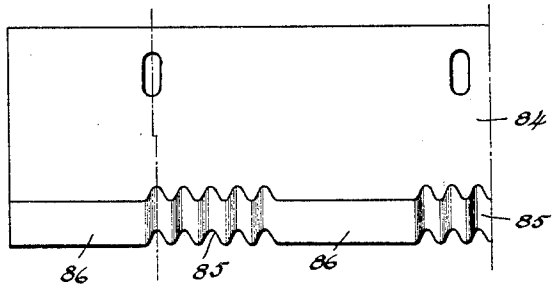


Fig. 6b

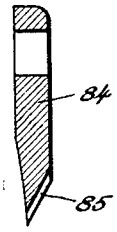
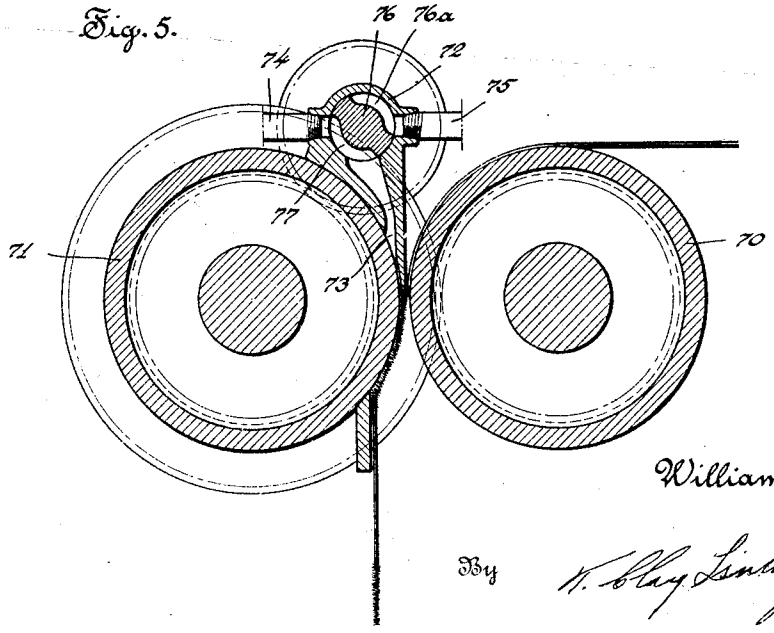


Fig. 5.



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Patented Feb. 12, 1929. 1,702,166

UNITED STATES PATENT OFFICE.

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PAPER-CRINKLING MACHINE.

Application filed July 2, 1927. Serial No. 203,060.

The present invention relates to machines for making elastic paper. As pointed out hereinafter more in detail, the improvements of the present invention may be employed for making paper having transversely extending crinkles or paper which has transversely extending crinkles and longitudinally extending corrugations.

The aim of the invention is to provide machines of this sort having various features of novelty, and particularly to provide machines by means of which webs of paper or pulp may be very effectively and economically rendered elastic.

Other objects will be in part obvious and in part pointed out more in detail hereinafter.

The invention accordingly consists in the features of construction, combination of elements and arrangements of parts which will be exemplified in the construction hereinafter set forth and the scope of the application of which will be indicated in the appended claims.

In the accompanying drawings, I have shown, more or less diagrammatically, several embodiments which my invention may take, it being understood that these disclosures are by way of illustration only and are not to be taken as restrictive of my conception.

In said drawings:

Figure 1 is a diagrammatic view with parts in section of a machine for corrugating and transversely crinkling a paper or pulp web;

Fig. 1[a] is a detail view showing, in section, the portions of the cylinders and suction box, this view being taken substantially on line 1[a]—1[a] of Fig. 1;

Fig. 2 is a view showing an arrangement by means of which the paper may be crinkled at intervals;

Fig. 3 is a view similar to Fig. 1, but showing another embodiment of the invention.

Fig. 4 is a view showing a pair of cylinders with an associated suction box so arranged as to corrugate and crinkle the paper;

Fig. 5 is a view similar to Fig. 2, but shows another embodiment;

Fig. 6 discloses still another form of the invention;

Fig. 6[a] is a view of a blade with which the suction box of Fig. 6 is provided; and

Fig. 6[b] is a sectional view through the blade.

In each embodiment of the invention, there is provided one or more cylinders about which the web of paper or pulp is adapted to pass and a suction box adapted to assist in the crinkling operation, and in some instances, to effect or aid in effecting the operation of corrugating the web longitudinally. In some of the figures, the cylinders about which the web passes are circumferentially corrugated or grooved and, in other cases, one or more of the cylinders are smooth. Obviously, the cylinders of the various figures may be corrugated or smooth, depending on whether or not it is desired to produce a paper which is longitudinally corrugated as well as transversely crinkled. The machines are adapted to operate upon webs of pulp delivered from a paper making machine, or upon webs of paper which may be either in a dry or partially dry or wet condition. It it also understood that the various parts will be supported in suitable frames, and the vacuum boxes will be connected up with suitable suction devices. The frames and the suction devices are not shown in the drawings as the particular construction thereof forms no part of the present invention.

Referring to Fig. 1 of the drawings, the numeral 10 designates a cylinder or roll provided with circumferential ribs 11 and intervening grooves 12 so that the cylinder is circumferentially corrugated. This cylinder 10 delivers the paper to a cylinder 13 which is similar in construction to the cylinder 10, it having circumferential ribs 14 which are disposed oppositely to the grooves 12 of the cylinder 10. The cylinders are spaced apart as illustrated. The cylinder 13 is preferably driven at a lesser peripheral speed than is the cylinder 10, and to this end the cylinder 13 may be driven from the cylinder 10 through gears 15 and 16, the latter of which is of the greater diameter. The numeral 17 designates a suction box having a lip or side 18 extending down between the cylinders. The face of the lip opposed to the cylinder 13 is corrugated as at 19 in

order to match the corrugated surface of the cylinder 13. The mouth of the suction box may be considered as being the space or channel 20 between the lip 18 and the cylinder 13.

The web W of paper or the like may be wetted by passing the same about a roller 25 located in a tank of water 26. The wet paper passes about a guide roller 27 onto the corrugated cylinder 10. Positioned in the angle between the web and the cylinder 10 may be a suction box 28, the purpose of which is to cause the paper to take the form of the cylinder 10 by means of a vacuum created in the box 28 and closely hug the periphery of this cylinder. If desired, a corrugated roll 29 may be provided adjacent the suction box 28 for more closely pressing the web into the grooves of the cylinder 10. The web is carried by the cylinder 10 to a point adjacent the cylinder 13 where it is transferred onto this latter cylinder. Since the cylinder 13 travels at a slower surface speed than the cylinder 10, the paper will be crinkled, as at 30. Any desired degree of crinkling may be obtained by varying the relative speeds of the two cylinders. It will be noted that the vacuum box 17 is effective to aid in the transfer of the paper from the cylinder 10 to the cylinder 13. The vacuum created in this box is preferably greater than that created in the box 28. By way of example, a three pound vacuum may be created in the box 28 and a nine pound or greater vacuum may be maintained in the box 17. The cylinder 13 may carry the crinkled and corrugated paper to a belt 31. The machine just described is of advantage in that it is very simple in construction and will operate at a relatively high speed to produce a superior product. The vacuum created by the vacuum box 17 in the throat between the two cylinders insures that the paper will be continuously transferred from one cylinder to the other.

Referring now to the embodiment shown in Fig. 2, 35 is a cylinder which may be circumferentially corrugated or smooth, in the present instance it being illustrated as being smooth. 37 is a vacuum box having a mouth 38 which is opposed to the cylinder 35. Interposed between the vacuum box and the suction device or pump, employed for creating a vacuum in that box, is a valve 39 which may be of any suitable type for alternately opening and closing the connection between the vacuum pump and the vacuum box. In the present instance, this valve is shown as being of a rotary type and as having a number of closing members 40.

The operation of the machine shown in Fig. 2 is briefly as follows. The paper is delivered to the cylinder 35 and is carried thereby to a point opposite the mouth 38 of the vacuum box. The rotary valve 39 allows a momentary vacuum at intervals in the vacuum box 37. When a momentary vacuum is set up in the box, the paper is held against the mouth thereof, thereby retarding the portion of the paper above the box, as at 41, with the result that the paper is crinkled at that point. Then the vacuum is broken momentarily, with the result that the paper will advance with the cylinder 35. When the portion 42 of the paper above the crinkled portion comes opposite to the mouth of the vacuum box, a vacuum is again set up in this box, with the result that the portion of the paper following the portion 42 will be crinkled. Thus, a web of paper is obtained which is alternately crinkled and plain. The vacuum box is of assistance in stripping the paper from the cylinder 35.

In the embodiment shown in Fig. 3, the cylinders 45 and 46 may be smooth. The web of pulp 47 which may come from a paper making machine is delivered by a belt 48 to the cylinder 45. In the angle between the web and the cylinder, there may be interposed a suction box 49, the lip of which may be corrugated and beveled, as at 50. Between the bottoms of the corrugations and the interior of the box may be ports 51 so that the vacuum is effective in the bottom of the corrugations 50. Thus, as the web of pulp or paper is drawn over the corrugated portion 50 of the vacuum box, the paper will be longitudinally corrugated. The cylinder 45 may carry the corrugated paper beneath a corrugated roll 52 which will set and more clearly define the corrugations. The cylinder 45 will carry the corrugated paper to the cylinder 46 which travels at a slower speed than the cylinder 45. The transfer of the web from the cylinder 45 to the cylinder 46 is insured by a vacuum box 53 having a mouth 54 opposed to the smooth or plain surface of the cylinder 46. The lip 55 of the vacuum box which extends down between the two cylinders is corrugated, as at 56, similarly to the corrugated portion 50 of the vacuum box 49. The vacuum in the box 53 will draw the web from the smooth cylinder 45 to the smooth cylinder 46, and the corrugations 56 will insure the retention of the corrugated form of the web. These corrugations 56 may be more pronounced than the corrugations 50 in order to increase the extent of the corrugations. The cylinder 46 will carry the longitudinally corrugated and transversely crinkled web to a delivery belt 57. There may be associated with this belt a vacuum box 58, the purpose of which is to insure that the web will be properly transferred from the cylinder 46 to the belt.

Referring now to the embodiment shown in Fig. 4, the cylinders 60 and 61 are circumferentially corrugated, and the cylinder 61 is driven at a slower peripheral speed than is the cylinder 60. 62 designates a vacuum box having an adjustable blade 63. The face of this blade opposed to the cylinder 60 is corru-

gated, as at 64, so as to match with the corrugations of the delivering cylinder 60. The ribs of the corrugations 64 extend into the grooves of the cylinder 60. With this arrangement, the paper may be corrugated on the cylinder 60, and the corrugated paper is carried by this cylinder to the cylinder 61. The vacuum box is of assistance in transferring the web from one cylinder to the other. It is understood, of course, that the paper is crinkled, because the cylinder 61 travels slower than the cylinder 60.

Reference may now be had to the embodiment shown in Fig. 5. The web of paper or pulp is delivered by the cylinder 70 to the cylinder 71, and the cylinder 71 has a lesser peripheral speed than the cylinder 70, as in the preceding embodiment. These cylinders may be plain, in which instance the web is transversely crinkled, or they may be circumferentially corrugated, in which instance the web would be longitudinally corrugated and cross crinkled. The web may be wet, in order that it will properly adhere to the cylinder 70, or a vacuum box may be used for causing the web, either in a wet or dry state, to adhere to the cylinder 70. 72 designates a suction box having a mouth 73 opposed to the cylinder 71. The suction box is connected by a pipe 74 to a suction device or pump, and it is also connected to a pressure device by means of a pipe 75. Controlling the suction and the pressure is a valve 76 which may be of any suitable type so long as it permits alternate connection between the suction box and the pipes 74 and 75. The valve may be rotated or oscillated and has a groove or passage 76^a for connecting the suction box and the pipe 75. It also has a groove or passage 77 for connecting the suction box and the pipe 74. It will be understood that, with the construction illustrated in Fig. 5, when the suction box is connected through the passage 77 with the pipe 74, a momentary suction is set up in the suction box so that the web will be drawn from the cylinder 70 onto the cylinder 71 and crinkled on this latter cylinder. The valve is then turned so as to connect the suction box with the pressure device, whereupon a blast of air is exerted through the suction box, with the result that the crinkled portion of the paper is forced away from the end of the box. Then the vacuum again comes on with the result that another portion of the web is crinkled, and this crinkled portion is then forced away by a succeeding blast of air. By varying the action of the valve, the paper may be crinkled to any desired extent, and alternate plain and crinkled portions may be obtained so as to give the web a desired design.

Referring now to the embodiment shown in Figs. 6, 6^a and 6^b the cylinders 80 and 81 correspond generally to the cylinders 70 and 71, respectively, in the preceding embodiment. The suction box 82 may be employed for causing the web to adhere to the cylinder 80. The suction box 83 is somewhat similar to the suction box 62 of Fig. 4. In this instance, the forward face of the blade 84, which is opposed to the cylinder 80, is beveled or inclined, and this inclined face has corrugated portions 85 separated by plain portions 86. The suction box 83 assists in transferring the web from the cylinder 80 to the slower moving cylinder 81 where it is crinkled. As the web moves over the beveled face of the blade 84, it is corrugated.

I claim as my invention:

1. In a paper crinkling apparatus, a cylinder, a second cylinder adjacent thereto adapted to receive a paper web from the first cylinder and rotating in a direction opposite to said first cylinder, means for causing a second cylinder to rotate at a slower speed than the first cylinder, and suction means externally of said cylinders for causing the web to adhere to the second cylinder.

2. In a paper crinkling apparatus, a cylinder, a second cylinder adjacent thereto and driven in a direction opposite to, and at a peripheral speed slower than, said first cylinder, and fluid pressure means externally of said cylinders and between the same for assisting in the transfer of the web from the first cylinder to the second cylinder.

3. In a paper crinkling apparatus, a cylinder, a second cylinder adjacent thereto and driven in a direction opposite to said first cylinder, means for causing said second cylinder to rotate at a slower peripheral speed than said first cylinder, and a suction box effective in the bight between the web and said second cylinder and acting against the periphery of said second cylinder.

4. In a paper crinkling apparatus, a cylinder, a second cylinder adjacent thereto adapted to receive a paper web from the first cylinder and rotating in a direction opposite to, and at a slower peripheral speed than, said first cylinder, suction means externally of said cylinders for causing the web to adhere to the second cylinder, and suction means of lesser force than said first suction means for causing the paper to adhere to the first cylinder.

5. In a paper crinkling apparatus, a cylinder, a second cylinder adjacent thereto, means for driving said second cylinder in a direction opposite to, and at a slower peripheral speed than, said first cylinder, one at least of said cylinders being circumferentially corrugated, and suction means externally of said second cylinder and exerting suction at the bight between the second cylinder and web.

6. In a paper crinkling apparatus, a circumferentially corrugated cylinder, a second cylinder adjacent thereto and driven in a direction opposite to, and at a slower peripheral speed than, said first cylinder, and a

suction box externally of said cylinders for exhausting air to cause the atmosphere to press the web against said second cylinder and to assist in transferring the web from one cylinder to the other.

7. In a paper crinkling apparatus, a cylinder, a second cylinder adjacent thereto and driven in a direction opposite to, and at a peripheral speed slower than, said first cylinder, suction means for causing the web to adhere to the second cylinder, and a corrugated surface between said cylinders and against which said suction means is adapted to draw the web as it is transferred from one cylinder to another.

8. In a paper crinkling apparatus, a cylinder, a second cylinder adjacent thereto and driven in a direction opposite to, and at a peripheral speed slower than, said first cylinder, and a suction box for causing the web to adhere to the second cylinder, said suction box having a portion extending down into the bight between the web and the second cylinder, said portion having a corrugated face over which the web is drawn as it is transferred from one cylinder to the other.

9. In a paper crinkling apparatus, a cylinder, a second cylinder adjacent thereto adapted to receive a paper web from the first cylinder and rotating in a direction opposite to, and at a slower peripheral speed than, said first cylinder, suction means externally of said cylinders for causing the web to adhere to the second cylinder, and means for breaking the suction at intervals.

10. In a paper crinkling apparatus, a cylinder, a second cylinder adjacent thereto and driven in a direction opposite to, and at a slower peripheral speed than, said first cylinder, means for exerting suction at intervals for causing the paper to adhere to the second cylinder, and fluid pressure means for forcing the web away from the second cylinder between said intervals.

11. In a paper crinkling apparatus, a cylinder, a second cylinder adjacent thereto and driven in a direction opposite to, and at a slower peripheral speed than, said first cylinder, a suction box externally of said second cylinder and extending down into the bight between the web and the second cylinder, and means for alternately applying suction pressure to said box.

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