April 15, 1941. W. S. CORBIN 2,238,157

MECHANISM FOR PRODUCING PERFORATED WEBS

Original Filed April 1, 1939 2 Sheets-Sheet 1

Fig. 1.

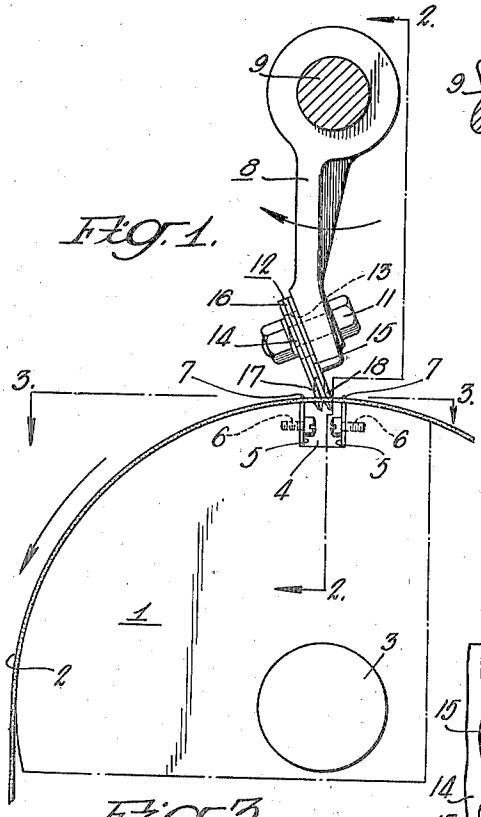


Fig. 2.

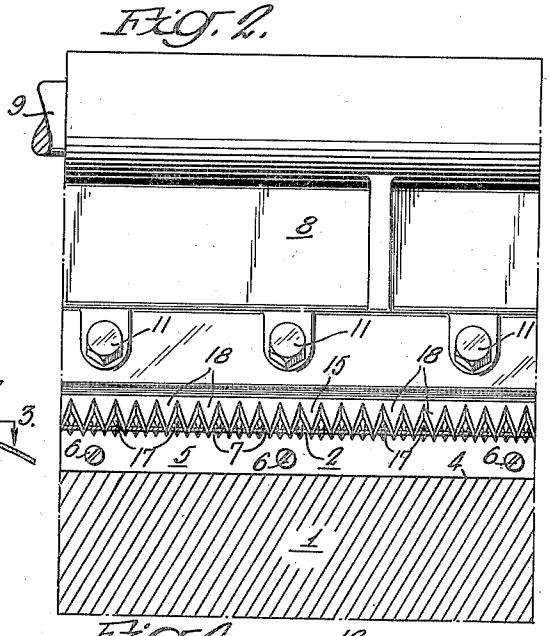


Fig. 4.

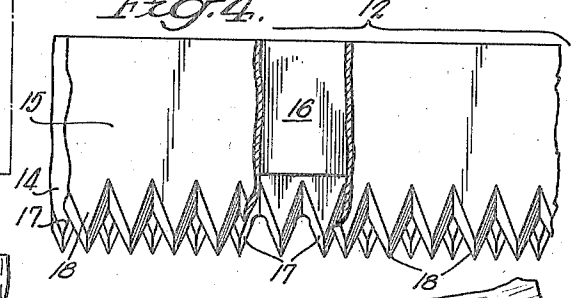


Fig. 3.

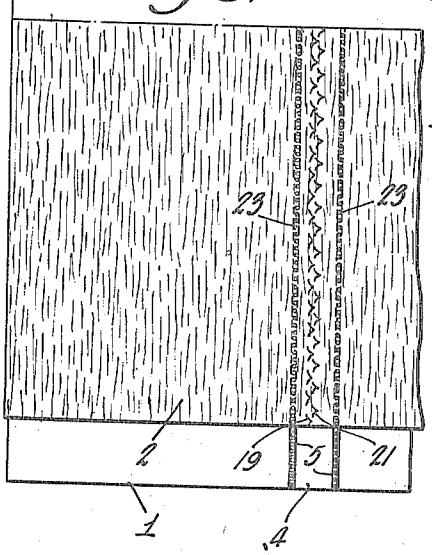
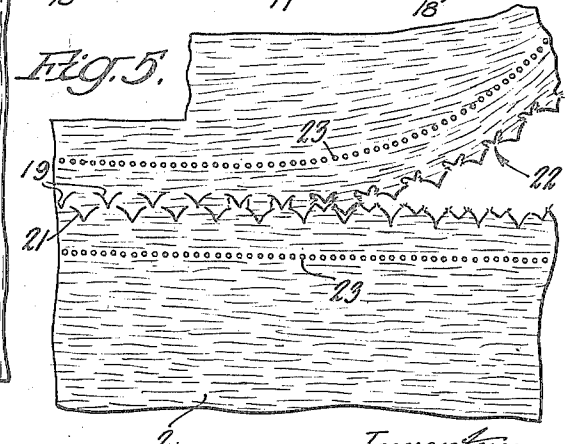


Fig. 5.



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Fig. 6.

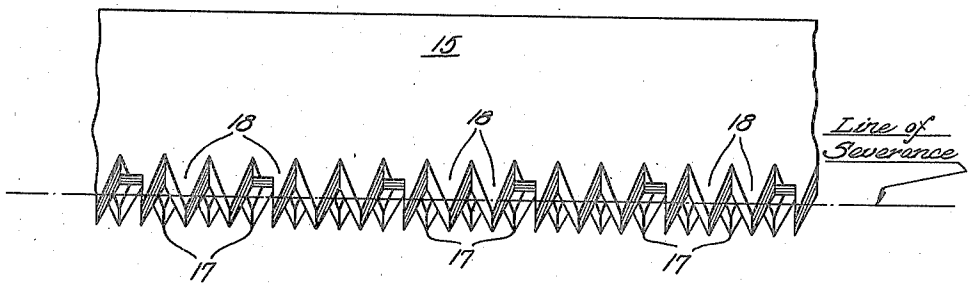


Fig. 7.

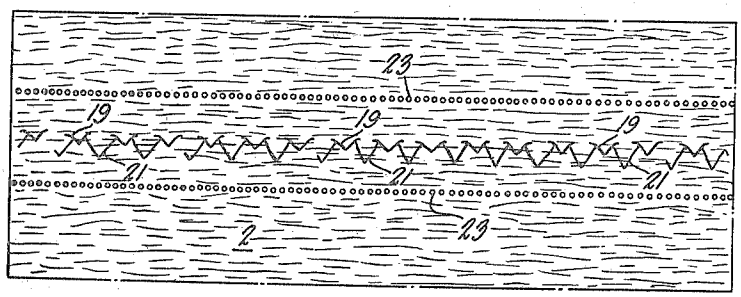
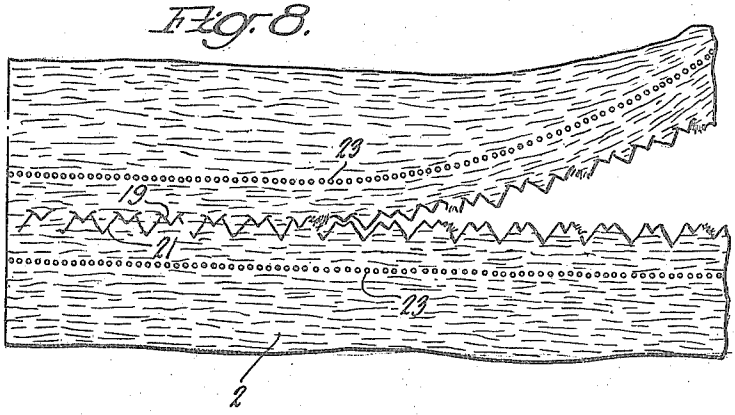


Fig. 8.



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UNITED STATES PATENT OFFICE

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MECHANISM FOR PRODUCING PERFORATED WEBS

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Original application April 1, 1939, Serial No. 265,561. Divided and this application April 4, 1940, Serial No. 327,907

4 Claims. (Cl. 164—99)

This is a division of my application for patent filed April 1, 1939, Serial Number 265,561.

In the manufacture of toilet and towel papers in roll form, it is customary to provide the continuous strip of paper which forms the roll with transverse lines of perforations to thereby facilitate the separation from the strip of sections or individual sheets of predetermined size. The character of perforation heretofore employed is not highly efficient in the function of establishing a line along which the paper will readily separate, and in my copending application Serial Number 265,561, of which the present application is a division, I have disclosed and claimed an improved and more highly efficient form of perforation which while maintaining the strip intact under all normal conditions will yet provide lines of rupture on which the individual sections or sheets may be separated easily and efficiently.

A principal object of the present invention is to provide an improved mechanism for producing the aforesaid perforations with the required accuracy and uniformity.

In the attached drawings:

Figure 1 is a fragmentary, more or less diagrammatic, transverse sectional view of the principal elements of a perforating machine made in accordance with my invention;

Fig. 2 is a section on the line 2—2, Fig. 1;

Fig. 3 is a section on the line 3—3, Fig. 1;

Fig. 4 is an enlarged fragmentary view showing the form of the novel perforating device;

Fig. 5 is a fragmentary enlargement showing the character of the perforation and the manner in which it functions in the sheet-separating operation;

Fig. 6 is an enlarged fragmentary view showing a modified form of perforating device;

Fig. 7 is an enlarged fragmentary view showing the character of perforation produced by the device shown in Fig. 6, and

Fig. 8 is a view corresponding to Fig. 7 showing the paper sheet partially separated along the perforated line.

With reference to Fig. 1, the perforating mechanism therein illustrated consists of a rotary cylinder 1 on which travels the continuous paper strip or web 2 which forms the roll. The cylinder is mounted upon a shaft 3 and rotates in the direction indicated by the arrow. The cylinder has in its periphery one or more axially extending recesses 4, and in accordance with the invention, I provide at each longitudinal side of the recess a blade 5, said blades being secured by screws 6 to the cylinder, and having at their outer edges and as best shown in Fig. 2 a longitudinal series of small teeth 7 which project slightly beyond the peripheral surface of the cylinder and penetrate the paper web 2, see Fig. 1.

Coacting with the cylinder 1 is a member 8 which is mounted for rotation upon a shaft 9, this shaft paralleling the shaft 3 of the cylinder. The member 8 is axially coextensive with the cylinder and carries at its outer edge and secured thereto by bolts 11 a perforating head 12. As shown in Fig. 2, the head 12 is provided with slots 13 for reception of the said bolts 11 for radial adjustment. The perforating head 12 comprises in the present instance two blades 14 and 15 which are held in spaced parallel relation by an intervening spacer plate 16, and the outer edge of each of the blades 14 and 15 is provided with a series of pointed teeth, 17 and 18 respectively, the forms of which are best shown in Fig. 4. The member 8 is rotated in synchronism with the cylinder 1 and is so relatively arranged with respect to the cylinder that the outer edges of the blades 14 and 15 enter the recess or recesses 4 of the cylinder, as shown in Fig. 1. In the operation of this mechanism, the paper web 2 traveling on the face of the cylinder 1 is penetrated by the points of the teeth 17 and 18 to form in the latter two closely adjoining series of angular incisions, as shown in Fig. 3, the two series or rows of incisions formed respectively by the blades 14 and 15 being designated by the reference numerals 19 and 21. It will be noted that the teeth 17 and 18 of the blades 14 and 15 are laterally relatively offset so that the incisions 19 and 21 are staggered or interspersed with respect to each other.

It will be apparent that as the blades 14 and 15 contact the paper web 2 they exert a certain amount of side thrust tending to displace the web downwardly into the recess 4. This tendency of the paper to sag or stretch under the action of the blades is prevented by the aforedescribed blades 5, 5, the upper toothed edges of which penetrate the web at the opposite sides of the recess and function to hold the intervening portion of the web at the top of the recess 4 in taut condition. Since the blades 5 prevent any longitudinal displacement of the web and retain the web taut in the immediate area engaged by the teeth of the blades 14 and 15, the incisions 19 and 21 are cleanly cut and uniformly spaced, and the device thus makes possible accurate formation in the paper of the two closely adjoining lines of incisions.

It will be noted by reference to Fig. 5 that the

incisions 19 and 21 of the two series are in more or less overlapping relation in the direction longitudinally of the paper strip, i. e. in the direction of the natural grain of the paper, and it is in this direction that the paper exhibits the least resistance to tear. It will be noted further that the distance between the proximate ends of the V-shaped incisions 21 and the sides of the correspondingly shaped incisions 19 in the direction longitudinally of the sheet is relatively small, and it is at these points that the paper ruptures when the one section is pulled away from the adjoining section. This is clearly shown in Fig. 5. Thus the individual sections or sheets defined by the lines of incision are connected together at a number of small juncture areas extending in series transversely of the strip, and each of these areas lies longitudinally of the paper web, or substantially so, between two closely adjoining incisions. Also by reason of the staggered relation of the incisions, the latter establish lines of connection between each adjoining pair of the juncture areas, and since each juncture area is thus connected to the immediately adjoining areas by the respective incisions, it will be apparent that in separating the individual sheets rupture of the web occurs only within said juncture areas and longitudinally of the sheet.

It will be noted that when the sections of the sheet are separated as described along the lines of incisions, the edges of the sheets at the line of separation are left with a highly ornamental and symmetrical pattern, as indicated at 22 in Fig. 5. This ornamental appearance at the edge of the residual portion of the web is accentuated and enhanced by the line of perforations or indentations 23 which are formed in the sheet by the teeth of the sheet-retaining blades 5.

In the aforedescribed embodiment of my invention, the teeth 17 and 18 of the blades 14 and 15 are caused to penetrate the paper to an extent affording two clearly defined lines of V-shaped incisions, each separate incision of both series being separate from each other and from the incisions of the adjoining series. In the embodiment of my invention shown in Figs. 6, 7 and 8, the teeth 17 and 18 are caused to penetrate the sheet to an extent such that the incisions of one series intersect the incisions of the other, and it is apparent that if blades of the character of those shown in Figs. 1, 2 and 4 are employed, the paper strip would be completely divided by these incisions into a plurality of sections. By modifying one of the blades, as shown in Fig. 6, by cutting away portions of certain of the teeth, the continuity of the incision may be interrupted, see Fig. 7, to leave the strip intact at a plurality of points along the lines of incision. With this form of incision, the adjoining sections of the paper strip at opposite sides of the incision line are joined together at a relatively few number of points, and preferably these points of connection are somewhat greater in extent than those in the previously described embodiment wherein the number of connecting points is relatively great. In this arrangement, however, when tensile force is placed upon the sheet, the latter will tend to tear along the line of incision and between the terminal ends of the adjoining incisions in a direction longitudinally of the sheet or in the direction of the grain, as in the embodiment previously described.

I claim:

1. In perforating mechanism, the combination with a peripherally recessed rotary drum constituting a support for a moving web of paper or like sheet material, of a perforating blade operating in synchronism with the movement of the drum and arranged to enter said recess and to thereby perforate the web, and means at opposite sides of said recess for positively anchoring the web to the drum during the perforating operation.

2. In perforating mechanism, the combination with a peripherally recessed rotary drum constituting a support for a moving web of paper or like sheet material, of perforating blades operating in synchronism with the movement of the drum and arranged to enter said recess and to thereby perforate the web, and toothed elements fixed to the drum at opposite sides respectively of said recess and arranged to penetrate the web, whereby the portions of the web at opposite sides of the points of perforation are relatively immobilized with respect to the drum during the perforating operation.

3. A perforating device of the character described comprising two parallel spaced blades each having at its active edge a series of cutting teeth, the teeth of one of said blades being offset laterally with respect to and being thereby interspersed with the teeth of the other blade, and said teeth having cutting edges sufficiently extended longitudinally of the blades so that the said cutting edges of the teeth of one blade overlap the cutting edges of the immediately adjoining teeth of the other blade.

4. In mechanism for perforating webs of paper or like flexible sheet material, the combination with a perforating element and means for actuating said element to perforate the web, of a support for said web, including rigid means engageable with the web at opposite sides of and adjoining the point of perforation for maintaining the web within the local area substantially taut during the perforating operation.

WESLEY S. CORBIN.