May 23, 1933. H. A. SHEESLEY 1,911,001

CREPING MACHINE

Filed Jan. 24, 1930 2 Sheets-Sheet 1

FIG.1.

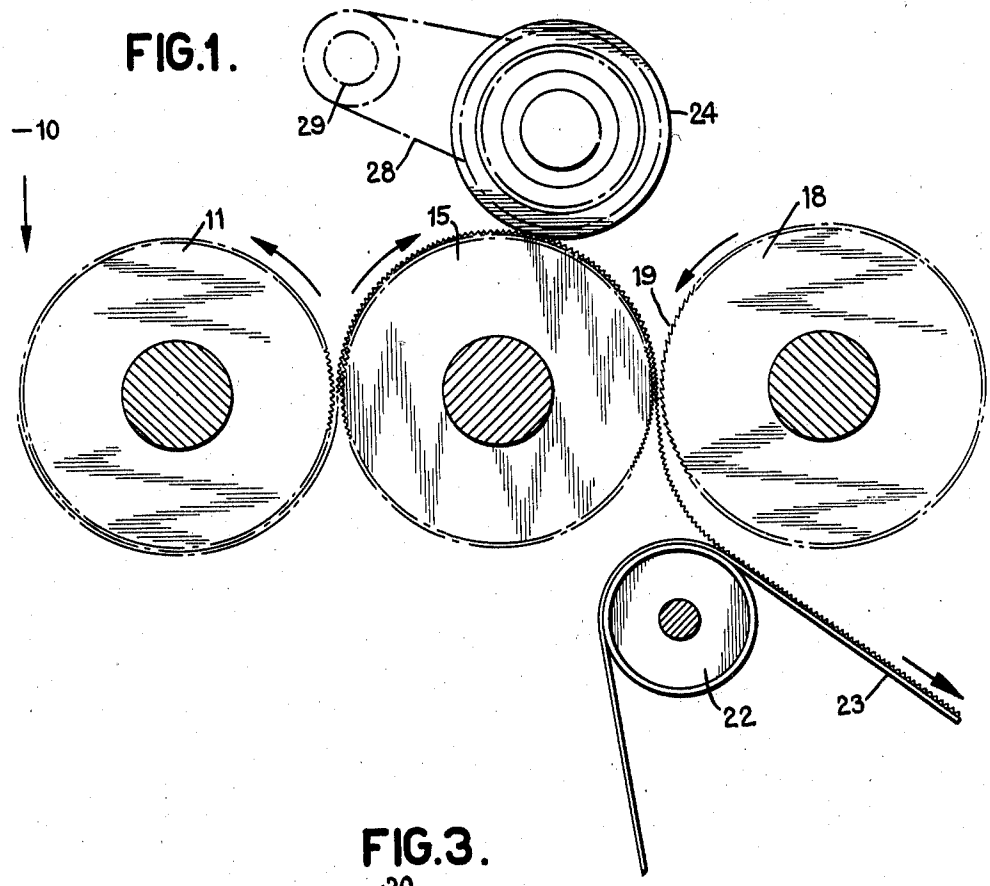

FIG.3.

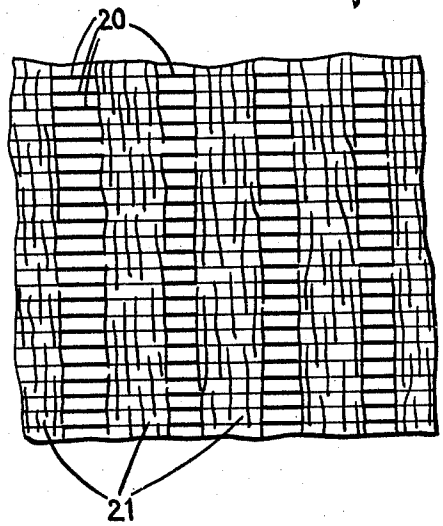

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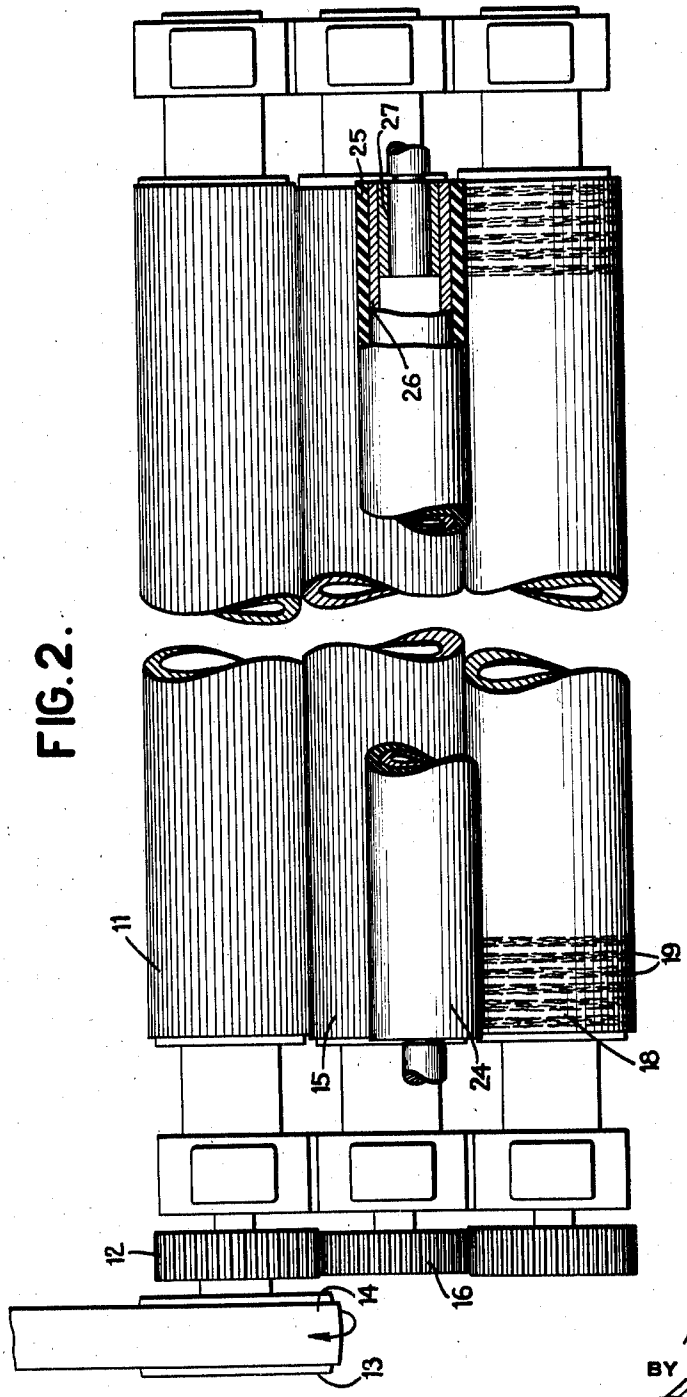
FIG. 2.



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UNITED STATES PATENT OFFICE

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CREPING MACHINE

Application filed January 24, 1930. Serial No. 422,971.

This invention relates to improvements in machines for creping paper, or similar material to adapt it for use in the manufacture of paper towels and the like.

Machines have been devised heretofore for the purpose of creating crimps or folds of various sorts in a long strip or web of paper fed continuously through the machine. These usually have involved the use of a plurality of metallic rollers which are grooved or corrugated or otherwise formed with co-operating teeth or projections adapted to grip the paper fed between them and to force it into the depressions between the teeth. The paper, which is thus passed between these rollers, is wet so that it readily takes the impression of the teeth on the rollers and upon drying it will retain this impression. Frequently, in machines of this sort one pair of rollers is adapted to provide simple lateral crimps or folds in the paper while a separate roller subsequently engages the paper to produce a different effect such as a marring or offsetting of the lateral corrugations or crimps in a number of longitudinal lines.

Difficulties have arisen in these machines however, particularly in the way of providing a uniform feeding of the paper throughout its entire width. It is usually either necessary or desirable that the strip of paper handled by the machine be of considerable width, as much as 80 inches or even more, so that the problem of uniform advance of the paper over this entire width becomes an important one. Where paper is fed around and between a series of rollers having a uniform diameter throughout their length, there is a general tendency for the edges and adjacent portions of the web to be fed slightly in advance of the middle portion of the web. So, in a creping machine, there is a tendency for the lateral lines of the crimp to become distorted and irregular and this distortion may at times be so great as to cause the paper to become bunched and wedged between the rollers. Where this uneven feeding of a long web has been encountered in the handling of paper of considerable width in other types of machine, it has commonly been the practice to provide feeding rollers which are crowned slightly toward their centers so as to compensate for the normal reduction in the feeding at this point.

It is impracticable, if not altogether impossible, however, to adopt this expedient in connection with creping rollers due to the fact that the corrugations in the surfaces of the creping rollers are quite shallow, being usually between .02 and .03 of an inch in depth; it would be exceedingly difficult to provide for this depth of groove uniformly over a roller which has a crown of almost, if not more than, an equal amount. Furthermore, since the paper is wet as it is being handled by the rollers, it is necessary to provide a slight clearance between them equivalent to the thickness of the paper, otherwise the material would be punctured and mutilated. Obviously, if a crown were provided on each of the pair of co-operating rollers it would be impossible to maintain a uniform clearance between them equivalent to the thickness of the paper and it would not be possible to force the paper into the recesses of the rollers throughout their width.

The present invention has for its principal object the general improvement of creping machines and the provision of means for overcoming the obstacles usually encountered in these machines. A feature of the invention is the provision of a soft rubber roller, or roller of similar soft, yielding, elastic qualities, in such relation to the creping rollers as to insure their proper functioning and to bring about a uniform feeding of the paper. In attaining these results this additional roller serves to hold the paper, after it has been crimped, in the grooves or corrugations of one of the creping rollers, and thus prevents formation of loops or the bunching of the paper in later sections of the machine. The use of soft, flexible or yieldable material in the formation of this roller as contemplated makes it possible to provide the desired crown which aids materially in the maintenance of a uniform feed throughout the width of the roller.

Other objects and advantages will appear as the invention is described in detail in con-

nection with the accompanying drawings, in which:

Figure 1 is a diagrammatic end view of the cooperating creping rollers, showing their relation to the web of paper fed through the machine.

Figure 2 is a plan view, partly in section, showing the relation of the rollers and their driving gears, and,

Figure 3 is a detail view showing a section of the creped paper produced by the machine.

While the invention is disclosed herein as applied to a particular form of creping machine adapted to produce a creped or crimped paper of a particular design, it is to be understood that this disclosure is merely for the purposes of illustration and that the invention may, with slight modification, be applied to machines of other types.

Referring now to the drawings, a web of paper 10, fed from any suitable source in a wet condition so that it is adapted to be readily molded into or impressed with any desired design, if fed around a corrugated crimping roller 11 which is adapted to be driven at a suitable speed. Rotation of the roller may be effected by means of a pulley 13 mounted at one end, driven by a belt 14 adapted to receive power from any suitable driving source. After passing partly around the roller 11 the paper encounters a second corrugated or grooved crimping roller 15. This roller is adapted to be driven at a constant speed which is proportional to and preferably directly equal to that of the roller 11. For the purpose of driving this roller, a gear 16 meshing directly with a gear 12 carried by the shaft of the roller 11 may be provided. The rollers 11 and 15 are preferably formed of some metal, such as brass, or other alloy, which will not rust or be subjected to corrosion by the moisture or other constituents in the paper. The surfaces of these rollers are corrugated, being provided with shallow grooves or depressions leaving a series of upstanding teeth or projections which extend across substantially their entire width. In the production of a standard form of creped paper suitable for the manufacture of paper towels, and the like, it has been found desirable to employ teeth or corrugations having a depth of between .02 and .03 of an inch and having a pitch between teeth of about $\frac{1}{16}$ of an inch. The two rollers 11 and 15 are mounted in such relation as to have their teeth or corrugations intermeshing and they are rotated at such speed as to maintain them in mesh. It will be obvious, therefore, that as the paper is fed between these rollers, it will be forced by the teeth of one into the indentations of the other and vice versa, thereby producing the desired longitudinal crimps in the body of the paper.

Having passed between the rollers, the paper travels with the surface of the roller 15 to a point preferably diametrically opposite, where it encounters a third creping roller 18. This roller is also adapted to be driven at a uniform speed proportional to that of the roller 11 and 15. However, its form is quite different from that of the other rollers. It may conveniently have its surface divided into a series of teeth or projections 19 irregularly formed and disposed along the periphery of the roller. Preferably, at suitable intervals along the surface of the roller a gap of any desired width forming a circumferential depression will be left between the teeth so that in the course of rotation of the roller these gaps will have no effect upon the paper while the series of teeth are adapted to grip the crimped portions of the paper and mar the regularity of the lateral crimps in some suitable way so as to produce the desired design.

Referring to Figure 3, a sample of the design produced by the machine is indicated. The lateral crimps produced by the co-operation of the pair of rollers 11 and 15 are visible across the entire width of the strip of paper but they are particularly pronounced along the longitudinal lines 20 where they have not been marred due to the gaps between the teeth of the roller 18. In a series of longitudinal lines 21, however, formed by the teeth 19, the lateral crimps are almost obliterated by the longitudinal impressions left by the teeth. Since the teeth of the roller 18 do not mesh with the teeth of roller 15, these need not have the same peripheral speeds, although the teeth 19 are less apt to tear the paper if the seeds of the two rollers are maintained the same.

Upon leaving the co-operating portions of the rollers 15 and 18, the paper may be passed to any suitable conveyor system, on which it will be permitted to dry before being passed to suitable re-rolling or cutting machines. This conveyor system may, for example, include a roller or pulley 22 adjacent to the roller 18 adapted to carry a conveyor belt 23 in position to receive the creped web of paper and convey it to any suitable point for further disposition.

Theoretically, the series of rollers 11, 15 and 18 should be capable of producing the desired effect on the paper without the necessity of providing any additional means. However, in actual practice it has been found that the various difficulties, hereinbefore alluded to, are encountered in machines of this sort so that the result of the operation of the system thus far disclosed would be the production of irregular crimping effects, and possibly the jamming of the paper between the rollers from time to time, due to the uneven feeding of the web. As has been previously stated, it is not practicable to provide a crown

on any of the crimping rollers 11, 15 and 18 to overcome this unevenness of feed. However, it has been found that by the provision of a roller 24 of a certain type to co-operate with the upper surface of the roller 15, the difficulties mentioned may be more or less completely obviated. The roller 24 should be formed of soft, flexible or yieldable material having elastic qualities so that it is adapted to force or hold the paper in the grooves or corrugations of the roller 15 without permanently distorting the soft surface of the roller. In view of the fineness of the corrugations in the roller 15, it is quite important that the roller 24 should be formed of relatively soft and yieldable material which is capable of entering into the fine variations in the surface. It has been found that a soft rubber roller is admirably suited to this particular purpose. Rubber having a density of between 100 and 110 under the standard P and J plastometer test has been found to be especially desirable, although it will be understood that rubber rollers having a different density, as well as rollers formed of other materials, such as felt or the like, having the desired yielding and elastic qualities, will be suited to the requirements. The roller 24 may be formed more or less completely of rubber, or similar soft material, mounted simply upon a slender mandrel or it may be in the form merely of a relatively thin sheet of rubber applied to the outer surface of a roller formed primarily of metal or other suitable material. The latter construction is regarded as somewhat preferable from the standpoint of expense of manufacture and it is just as effective for the intended purposes, provided the rubber sheet is of sufficient thickness to have the desired yielding qualities. A construction of this sort is indicated in Figure 2, in which the rubber sheet 25 is shown as applied to the surface of a metal cylinder 26 which may be in the nature of a heavy pipe shrunk on or otherwise carried by a mandrel 27.

The two ends of the mandrel are preferably mounted in a pair of arms 28 pivotally suspended from any suitable point 29 of the main frame of the machine. The roller 24 will in this way be held against the surface of the roller 15 by its own weight, which will normally be sufficient. However, if a greater or less pressure is desired between the contact surfaces of these rollers, some other form of suspension may be provided for the mounting of the roller 24 or a suitable series of springs may be employed for maintaining the desired pressure of contact between the surfaces. Preferably, there will be provided no driving means for the roller 24 but the latter will be rotated simply as the result of its frictional contact with the surface of the paper against the rotating roller 15. As a result of this arrangement it is possible to apply a slight crown to the surface of the roller 24 which will aid materially in bringing about a uniform feed of the paper throughout its width. It has been found that a crown of between .02 and .03 of an inch on a roller having a mean diameter of 7 inches gives quite satisfactory results, although a crown of either greater or less magnitude may be found preferable under varying conditions. Therefore, the roller 24 not only serves to force and maintain the partly creped paper in the grooves or corrugations of the roller 15, but it aids materially in the feeding of a continuous web of paper and in the maintenance of a uniformity of action of this feed throughout the width of the web. If desired, a similar roller may be provided beneath the roller 11 to assist in producing uniformity of feed in advance of the first crimping action between the rollers 11 and 15. Such a roller, at the same time, would serve to provide a slight initial crimp in the paper. The provision of this additional roller, however, is not at all essential as, in fact, completely satisfactory results may be obtained by the use of a single flexible roller as indicated.

While various features of the invention have been described in considerable detail and certain specific dimensions have been mentioned, it is to be clearly understood that these have been specified merely by way of illustration of one admirable form of the invention. They are not to be regarded as imposing any limitations on its scope. Furthermore, the terms employed throughout the description are to be regarded merely as appropriately designating the various portions of one suitable form of the invention and not as imposing any limitations thereon.

What I claim is:

1. In a machine of the class described, means for feeding and crimping a continuous web of paper, said means comprising a grooved roller, and means comprising a member formed of yielding material such as soft rubber adapted to extend across substantially the whole width of said grooved roller for maintaining previously crimped paper against bunching and providing for an even feed of the web.

2. A combination as claimed in claim 1 wherein the grooved roller is of substantially uniform diameter and the member of yielding material is a crowned roller.

3. A combination as claimed in claim 1 wherein the grooved roller is positively driven and the member of yielding material is a roller frictionally driven by said grooved roller.

4. A combination as claimed in claim 1 wherein the crimping means comprises a plurality of grooved rollers providing for two successive crimping actions and wherein the member of yielding material contacts with

the web at a point between said crimping actions.

5. In a machine of the class described a plurality of crimping rollers adapted to crimp a web of paper continuously fed around and between said rollers, and separate non-crimping means cooperating with one of said rollers to provide uniform feeding of the paper around said roller.

In testimony whereof, I have signed my name to this specification this 11th day of January 1930.

HORACE A. SHEESLEY.