Jan. 15, 1963 N. MARCALUS 3,073,196

PROGRESSIVE CUTTER FOR A WEB WINDING MACHINE

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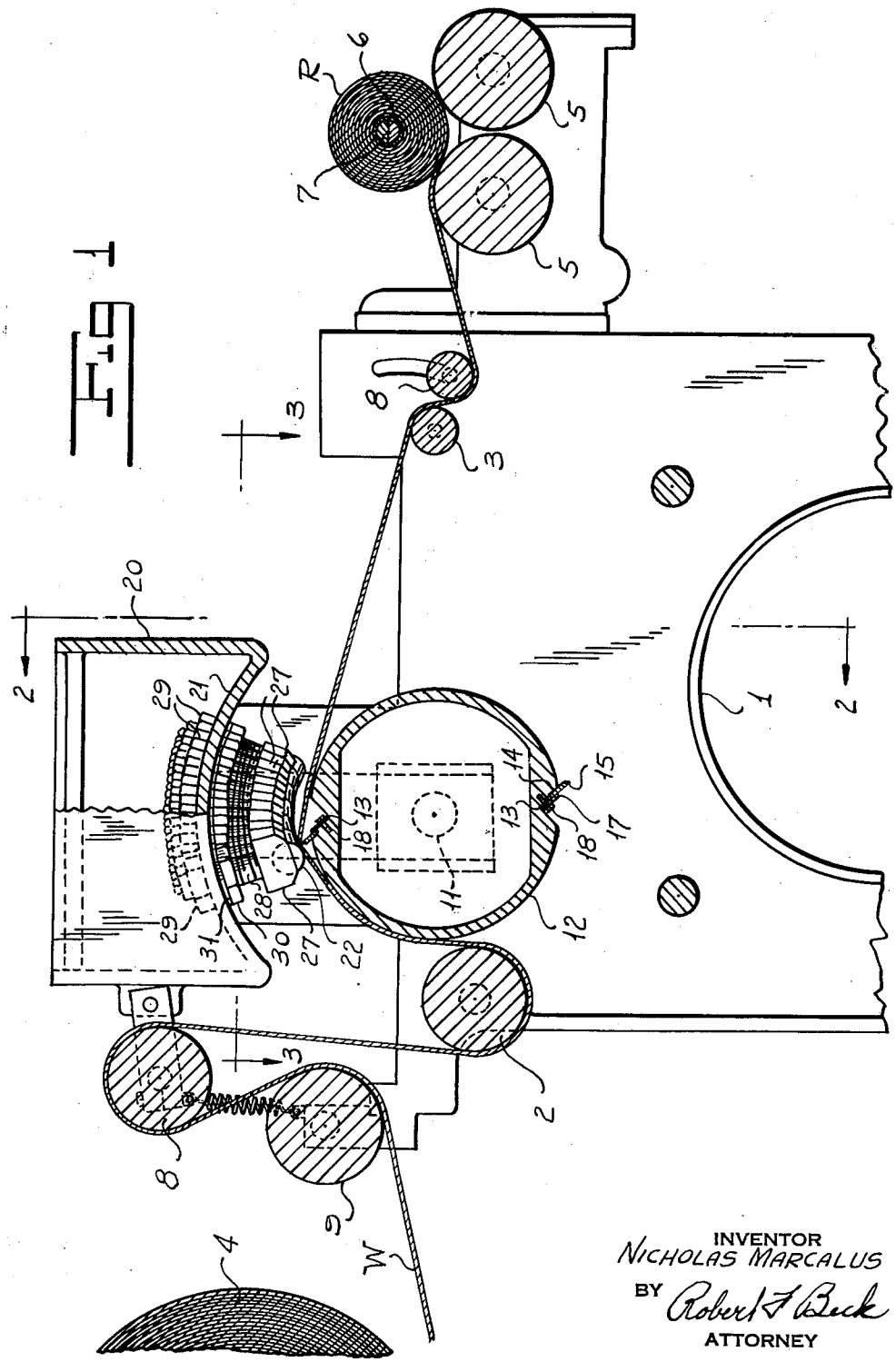


FIG. 1

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Jan. 15, 1963 N. MARCALUS 3,073,196

PROGRESSIVE CUTTER FOR A WEB WINDING MACHINE

Filed July 5, 1962 10 Sheets-Sheet 2

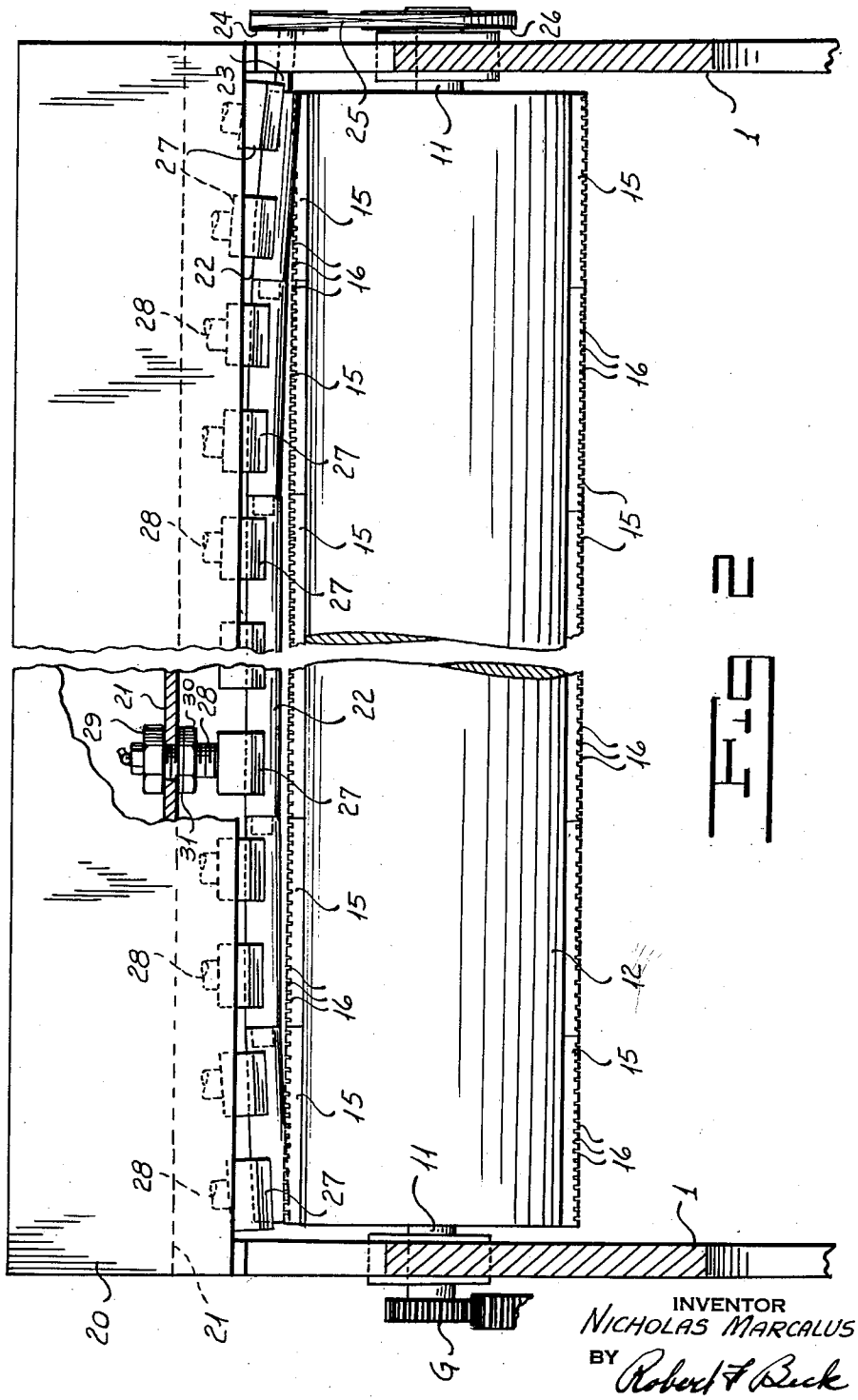


FIG. 2

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PROGRESSIVE CUTTER FOR A WEB WINDING MACHINE

Filed July 5, 1962 10 Sheets-Sheet 3

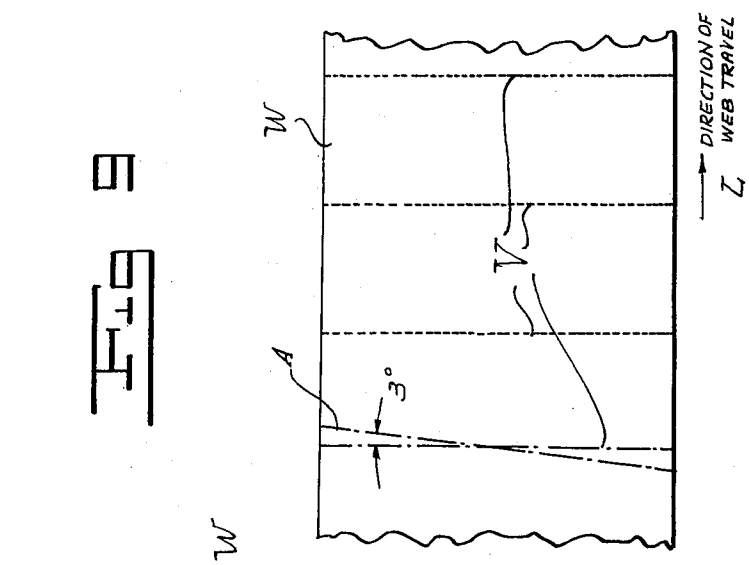


FIG. 9

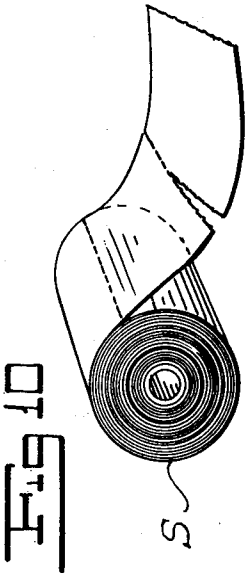


FIG. 10

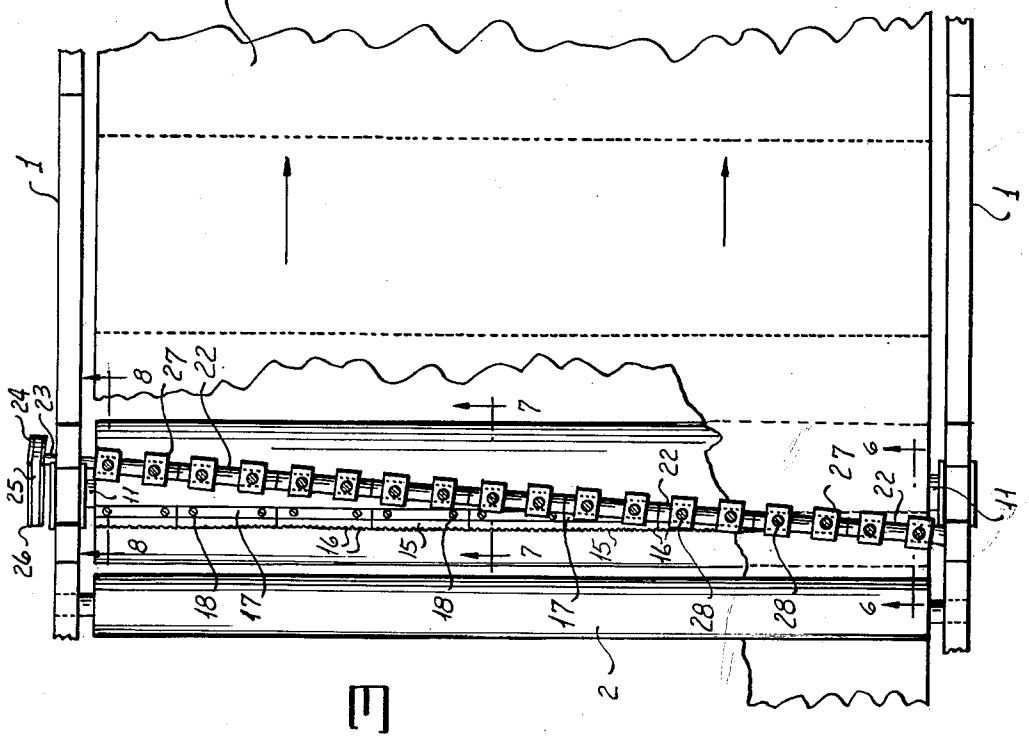


FIG. 8

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Jan. 15, 1963 N. MARCALUS 3,073,196

PROGRESSIVE CUTTER FOR A WEB WINDING MACHINE

Filed July 5, 1962 10 Sheets-Sheet 4

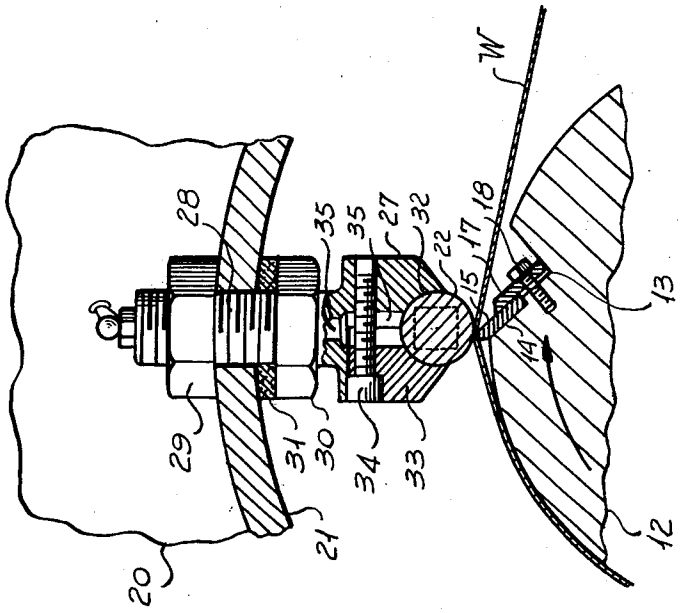


FIG. 5

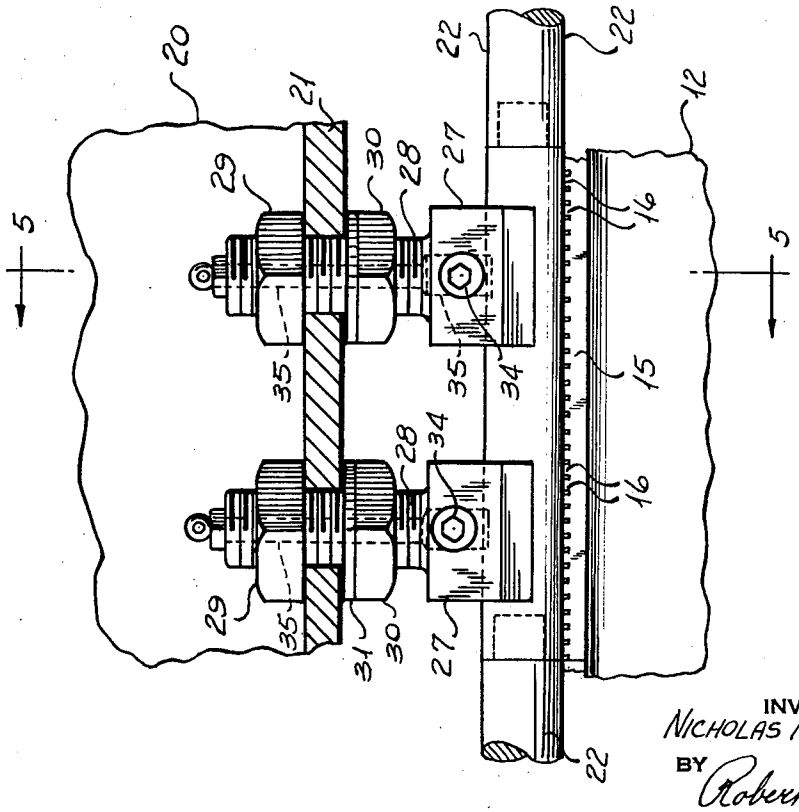


FIG. 4

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PROGRESSIVE CUTTER FOR A WEB WINDING MACHINE

Filed July 5, 1962 10 Sheets-Sheet 5

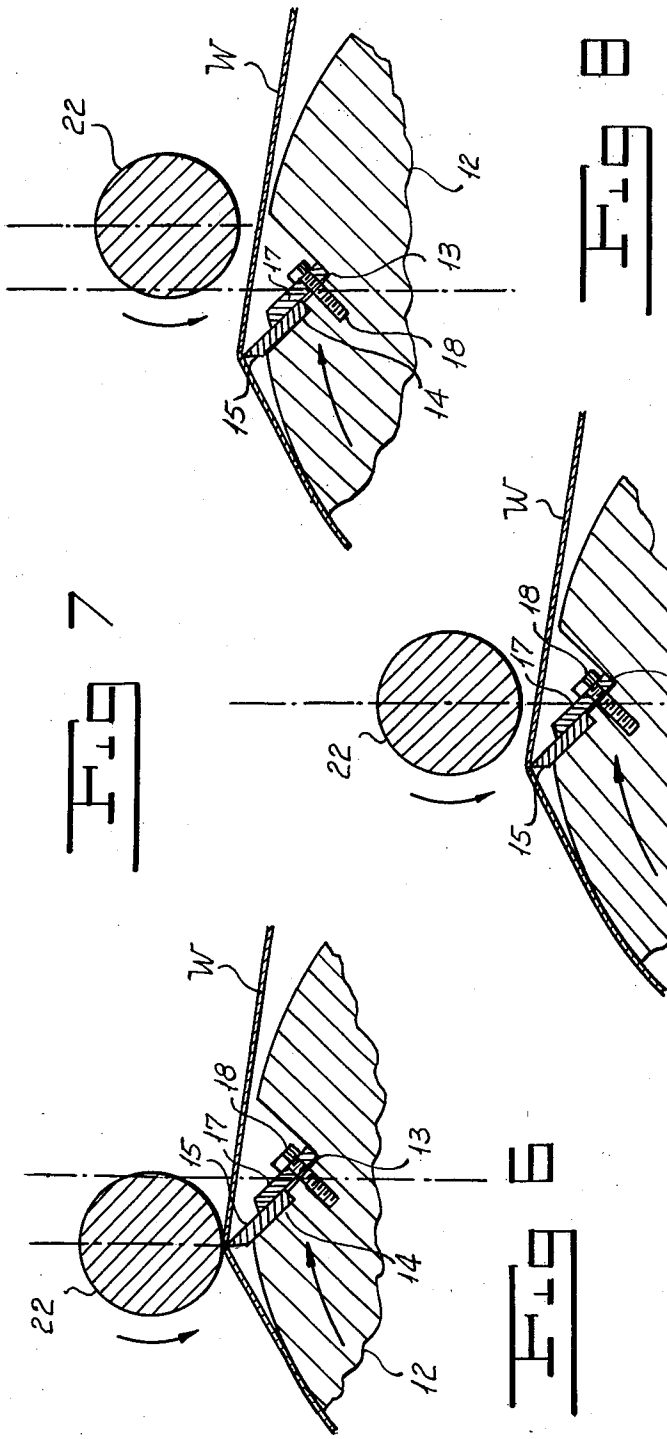


FIG. 8

FIG. 7

FIG. 6

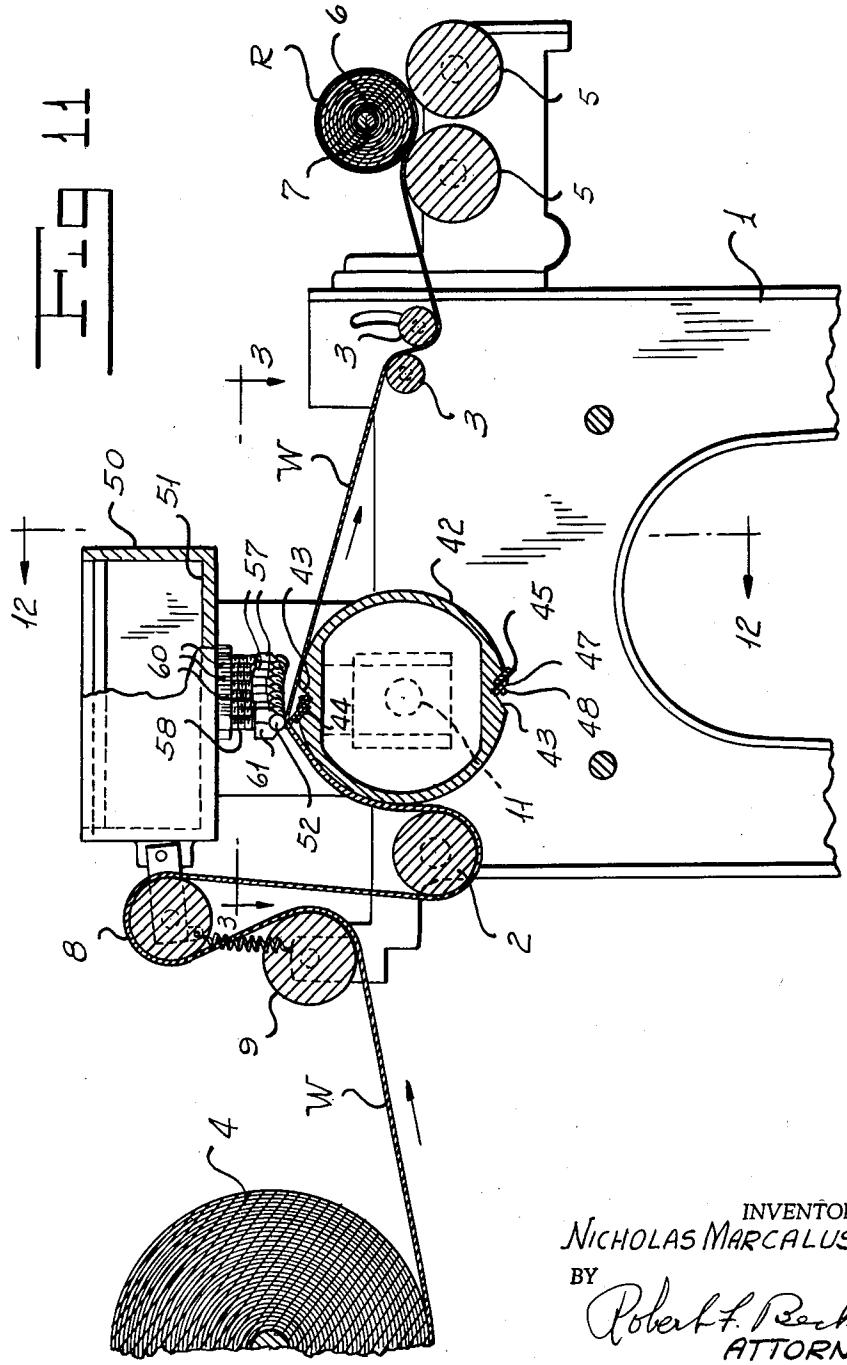
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Jan. 15, 1963 N. MARCALUS 3,073,196

PROGRESSIVE CUTTER FOR A WEB WINDING MACHINE

Filed July 5, 1962 10 Sheets-Sheet 6

FIG 11



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Jan. 15, 1963 N. MARCALUS 3,073,196

PROGRESSIVE CUTTER FOR A WEB WINDING MACHINE

Filed July 5, 1962 10 Sheets-Sheet 7

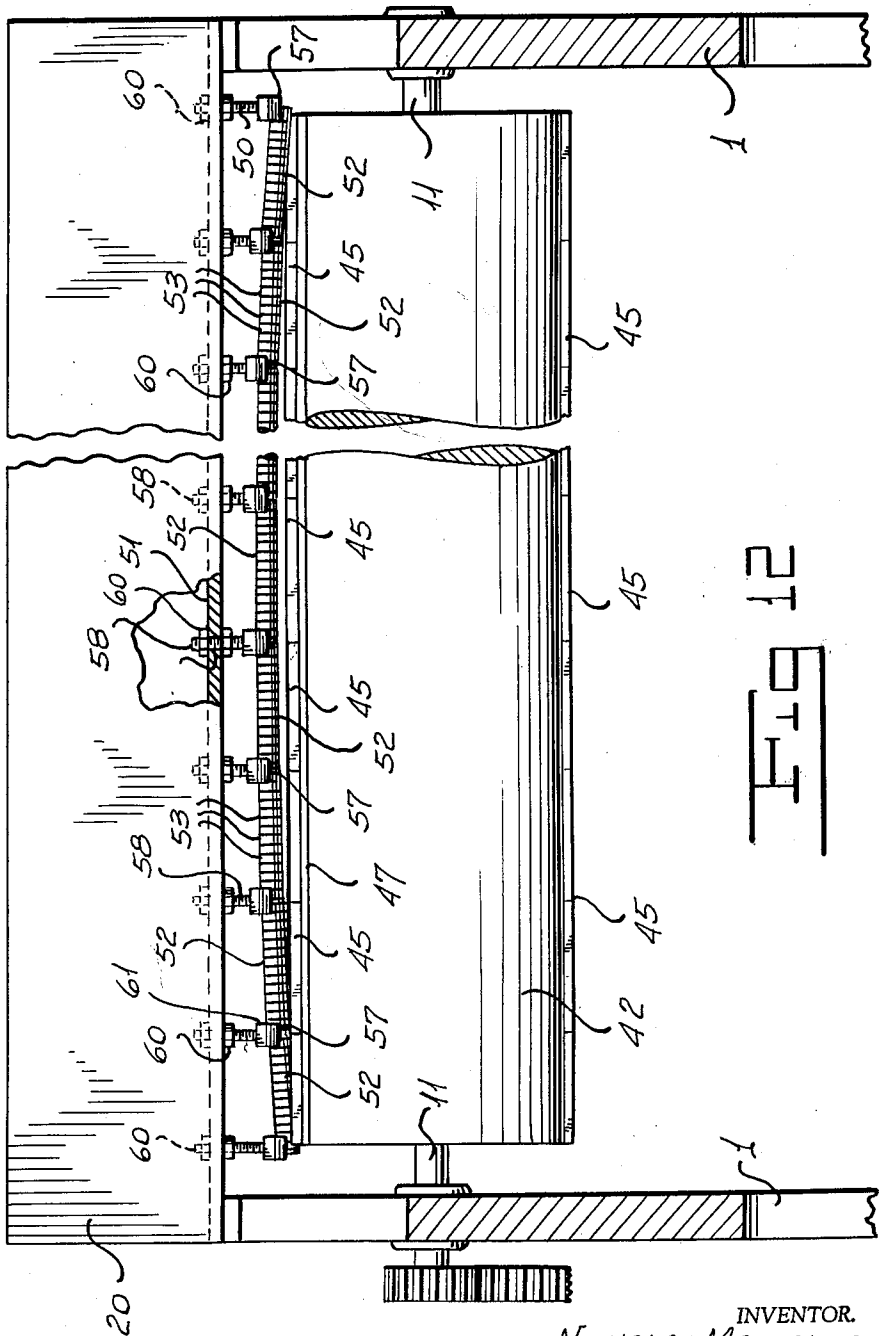


FIG. 12

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Jan. 15, 1963 N. MARCALUS 3,073,196

PROGRESSIVE CUTTER FOR A WEB WINDING MACHINE

Filed July 5, 1962 10 Sheets-Sheet 8

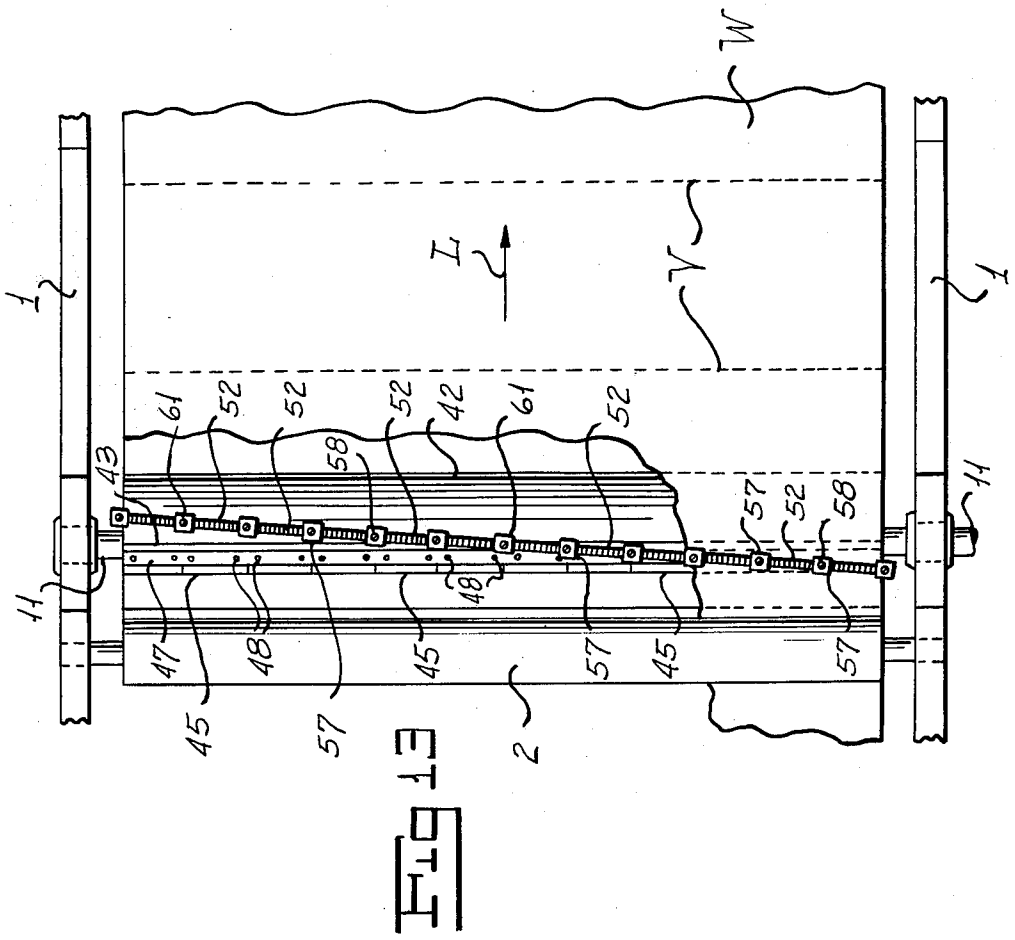


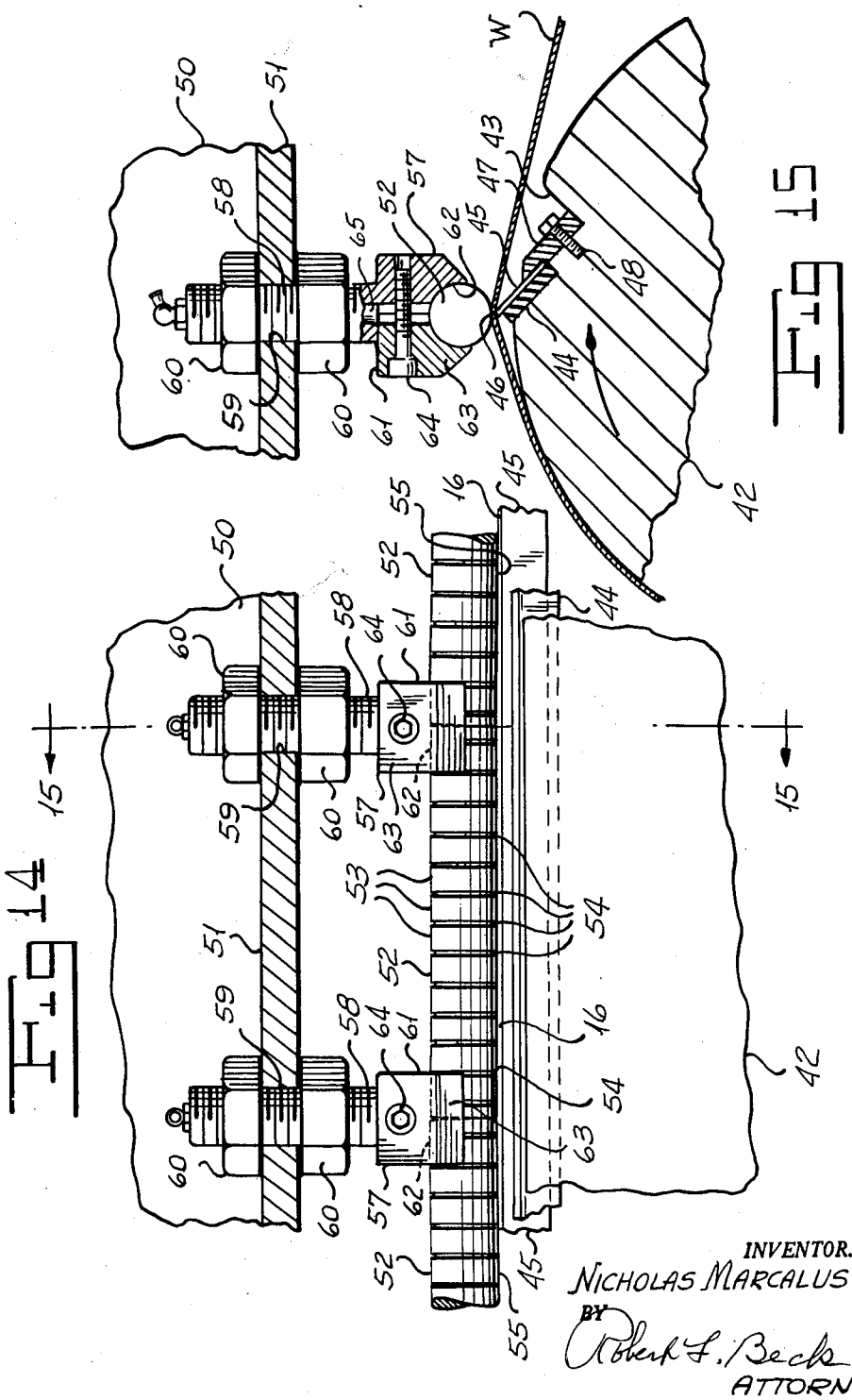
FIG. 13

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Jan. 15, 1963 N. MARCALUS 3,073,196

PROGRESSIVE CUTTER FOR A WEB WINDING MACHINE

Filed July 5, 1962 10 Sheets-Sheet 9



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Jan. 15, 1963 N. MARCALUS 3,073,196

PROGRESSIVE CUTTER FOR A WEB WINDING MACHINE

Filed July 5, 1962 10 Sheets-Sheet 10

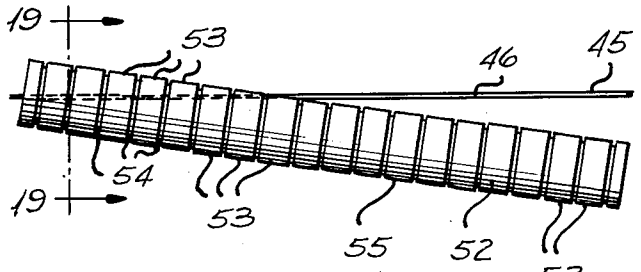


Fig 16

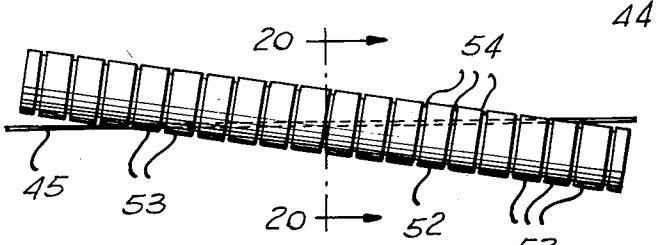


Fig 17

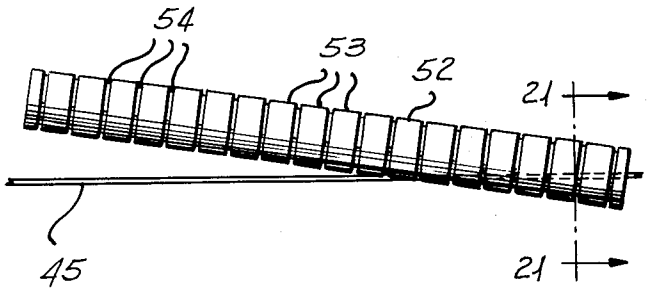


Fig 18

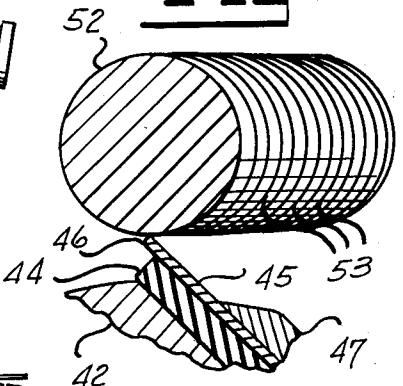


Fig 19

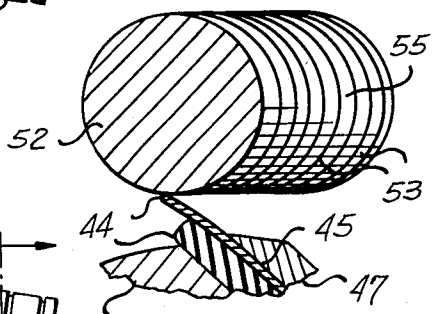


Fig 20

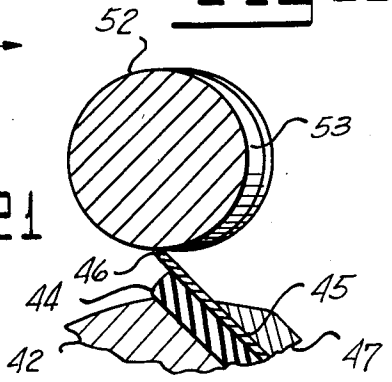


Fig 21

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United States Patent Office 3,073,196
Patented Jan. 15, 1963

3,073,196
PROGRESSIVE CUTTER FOR A WEB WINDING MACHINE

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(1 Market St., East Paterson, N.J.)
Filed July 5, 1962, Ser. No. 208,680
21 Claims. (Cl. 83—341)

My invention relates to winding machines and more particularly to web winding and treating machines, this application being a continuation-in-part of my copending applications Serial No. 747,909, filed July 11, 1958, now abandoned, and Serial No. 118,892, filed June 22, 1961, and now abandoned.

In the fabrication of toilet paper or tissue rolls, it has been the customary practice to employ a web winding machine to wind paper web about a core to constitute an elongated or major roll for subsequent transverse severing to form relatively short or minor rolls of toilet tissue. Perforating means is also employed and arranged between the paper supply roll and the core station to form the web with spaced rows of transversely extending perforations defining therebetween sections of paper of uniform lengths for detachment from the minor rolls by severance along the lines of perforations. Heretofore, in a machine of this character, numerous difficulties and disadvantages have been experienced in the winding of the major rolls because the web, which is maintained in a somewhat taut condition to effect uniform winding, is often torn or partially severed along one or more lines of perforations, by reason of the taut condition of the web coupled with the fact that the entire length of each line of perforation is formed simultaneously, with the result that it is necessary to arrest the web feeding operation of the machine, remove the partially wound core, condition the free end of the web for engagement with another core, and then initiate winding of the web about the core.

My invention overcomes the foregoing difficulties and disadvantages, it being one of the objects of my invention to provide means for transversely forming aligned perforations or slits in the web in a manner to overcome the aforementioned tearing and partial severing and, in addition, facilitate removal of the sheets or sections from the tissue rolls along lines of perforations without tearing of the marginal areas of the sheets as is often the case in ordinary perforated rolls.

Another object of my invention is to provide means of the foregoing described character for perforating the paper web with spaced transverse lines of openings or slits and which means is effective for forming, in each line, the outermost slits at the sides of the web one in advance of the other with the intermediate slits being formed therebetween in progressive order from one outermost slit to the other whereby to preclude severing or tearing of the web through slits and/or the adjacent margins of the web during winding of the latter about a core.

A further object of my invention is to provide a slit forming or perforating mechanism for a paper web wherein a movable component is equipped with longitudinally extending means having a surface transversing the web and progressively engaging, throughout the length of said means, the surface of another component angularly disposed relative to said means and with one of the surfaces being formed with spaced lands to effect spaced lines of transverse perforations in the web passing between said surfaces.

A still further object of my invention is to provide a slit forming or perforating mechanism for a paper web equipped, in one form of the invention, with rotatable blade means having longitudinally extending teeth for transversing the web and progressively engaging, throughout the length of said means, the arcuate surface of an abaxially disposed anvil to effect spaced lands of perforations in the web passing between said means and said anvil and, in another form of the invention, to provide the rotatable blade means with longitudinally extending web engaging surfaces, in lieu of teeth, for progressively engaging the arcuate surface of an angularly disposed anvil form with spaced lands to form said perforations.

An important object of my invention is to provide components, such as blades and sections of the anvil, which are readily replaceable and adjustable with a minimum of labor and time.

Another important object of my invention is to provide a slit forming or perforating mechanism of the foregoing described character capable of being incorporated within winding machines already in use without appreciable modification and which mechanism is simple in construction, durable in use, efficient in operation, and economical in maintenance.

With the above and other objects in view, as will hereinafter appear, the invention consists in the combination and arrangement of parts hereinafter set forth and illustrated in the accompanying drawings from which the several features of the invention and the advantages attained thereby will be readily understood by those skilled in the art.

Referring to the drawings wherein like reference characters designate like parts throughout the several views:

FIGURE 1 is a fragmentary and somewhat diagrammatic longitudinal sectional view of a paper web winding machine having my invention incorporated therein;

FIGURE 2 is a transverse sectional view taken on the plane of the line 2—2 of FIGURE 1;

FIGURE 3 is a plan view taken on the plane of the line 3—3 of FIGURE 1 and looking in the direction of the arrows, certain parts being sectionalized and others removed in the interest of clarity;

FIGURE 4 is an enlarged detail fragmentary rear view, partly in section, of the perforating mechanism;

FIGURE 5 is a detail sectional view taken on the line 5—5 of FIGURE 4;

FIGURES 6, 7, and 8 are enlarged transverse sectional views taken on the lines 6—6, 7—7, and 8—8 of FIGURE 3, respectively, and depicting the positions of a ternary of blades of one of the sets relative to their respective rollers of the anvil;

FIGURE 9 is a diagrammatic view illustrating a portion of the web, its line of travel, the position of the anvil relative thereto and the lines of perforations formed in the web;

FIGURE 10 is a perspective view of a roll of toilet tissue illustrating a plurality of the outer end sections extending from the roll with the outermost section being partially severed along the line of perforations from the adjacent section;

FIGURE 11 is a fragmentary and somewhat diagrammatic longitudinal sectional view of the paper web winding machine wherein a modified form of my invention is incorporated therein;

FIGURE 12 is a transverse sectional view taken on the plane of the line 12—12 of FIGURE 11;

FIGURE 13 is a plan view taken on the plane of the line 13—13 of FIGURE 11 and looking in the direction of the arrows, certain parts being sectionalized and removed in the interest of clarity;

FIGURE 14 is an enlarged detail fragmentary rear view, partly in section, of the perforating mechanism of the modified form;

FIGURE 15 is a sectional view taken on the line 15—15 of FIGURE 14;

FIGURE 16 is a diagrammatic top plan view of an anvil and a coacting blade of the modified form and illus-

trating the position of the blade relative to the anvil upon engagement of the leading end of the blade with the anvil;

FIGURE 17 is a view similar to FIGURE 16 but illustrating the position of the blade relative to the anvil upon engagement of the intermediate portion of the blade with the anvil;

FIGURE 18 is a view similar to FIGURES 16 and 17 but illustrating the position of the blade relative to the anvil upon engagement of the trailing end of the blade with the anvil; and

FIGURES 19, 20, and 21 are somewhat diagrammatic sectional views, on enlarged scales, taken on the lines 19—19, 20—20, and 21—21 of FIGURES 16, 17, and 18, respectively.

In practicing my invention, as illustrated in the drawings, I provide a winding machine having spaced side frames 1 in which are journaled a pair of transversely extending rear and front paper-web guide rolls 2 and 3, respectively, for guiding a paper web W from a supply roll 4 to a core winding device equipped with a pair of rolls 5 which engage the web and effects winding thereof about the core 6 in the usual manner to form a major paper roll R for transverse severing into relatively short minor paper rolls S of toilet tissue, the core, in operation, being carried on a demountable mandrel 7. Also mounted within the frames 1 is a tension roll 8 for applying tension to the web W and a spreader roll 9 as is usual in machines of this character. Inasmuch as the foregoing described components of the machine constitute no part of the present invention per se, a more detailed description thereof is not believed necessary, suffice to say that said components are only diagrammatically illustrated and operate in conjunction with other components not illustrated to feed the web W from the supply roll to the core winding device for winding about the core 6.

Interjacent the guide rolls 2 and 3 and in accord with my invention there is rotatably journaled in the frames 1 the trunnions or sectional shaft 11 of a transversely extending rotating member, beam or roller 12 having its peripheral face formed with a pair of oppositely disposed longitudinally extending slots 13 with one side face defining each slot being formed with a seat 14 for accommodating thereon the rear face of the inner portion of a set of aligned perforating blades 15 extending somewhat tangentially and beyond the periphery of the roller 12. Each set of blades 15 is provided with an outwardly projecting section extending from the member 12 and having an outer margin or web engaging surface formed with web penetrating portions or means comprising a plurality of aligned spaced teeth or lands defined by grooves, said web penetrating portions constituting a component of web perforating means. Blade clamping means is disposed in each of said slots 13 and includes a bar 17 fixed therein by screws 18. The bar 17 thus secures the inner portions of the blades 15 within the slot 13 in clamped relation with the seat 14 as clearly illustrated in the drawings.

Suitably attached to the frames 1 and extending transversely over the member 12 is a beam or yoke 20 having a lower incurvated flange 21 disposed in confronting relation with the member 12, the curvature of the lower face of the flange 21 being generated from substantially the same axis as the peripheral surface of the member 12. Subjacent the flange 21, there is provided a plurality or set of longitudinally extending rollers 22 having blade engaging portions and coacting together to form an anvil having a web engaging surface or zone also constituting a component of the aforementioned web perforating means. The anvil extends over the member 12 with the axes of the rollers 22 being disposed in abaxial relation with the axis of the member 12. The rollers 22 are slightly disaligned relative to each other and have their ends connected together in a manner to insure unitary rotation of the rollers and with one of the outermost rollers having an end portion 23 extending beyond the yoke and equipped with a pulley 24 connected by a drive belt 25, having crossed runs, to a similar pulley 26 mounted on the shaft 11 of the member 12 whereby the roller 12 and the anvil 22 rotate in opposite directions at the same linear speeds in accord with a pre-established timed relation, the shaft 11 being connected to and driven by suitable gearing G from a power source (not shown). It is to be noted that while the rollers 22 are slightly disaligned relative to each other, their blade engaging portions lie substantially equal distances from the axis of the member 12 for insuring engagement with the web penetrating portions of the blades 15 as hereinafter more fully described.

Each of the rollers 22 is journaled within a pair of holders 27 equipped with threaded shanks 28 extending into the flange 21 and secured in fixed relation therewith by means of upper and lower nuts 29 and 30, respectively, threaded on the shanks 25. Each of the shanks 28 has sleeved thereon, subjacent the flange 21, a washer 31 constructed of compressible material, for example, leather, and which washer is engaged by the lower nut 30 and thereby clamped between the lower nut 30 and the flange. Each of the holders 27 is formed on its under face with an arcuate groove 32 for accommodating and retaining therein a roller 22 with one side of the groove being defined by a removable wall 33 normally secured in fixed relation with the opposite wall of the holder by means of a screw 34 or the like. This construction permits the rollers 22 to be removed from the holders for replacement and to effect assembly thereof. The holders are each provided with a lubricating opening 35 extending through the shank 28 to permit lubricant to be supplied to the groove 32 whereby the roller 22 therein is lubricated for rotation.

As the member 12 rotates, each of the blades of each set will engage the anvil and inasmuch as the latter is disposed abaxially with respect to the member 12, the outer tooth of an outermost blade will engage the proximus roller 22 of the anvil in advance of the other teeth of the blades with the other teeth progressively engaging the anvil throughout the length of each blade during rotation of the member 12, it being understood that the outer teeth of each blade have only sufficient brushing or wiping engagement with their respective roller 22 to effect perforation of the web and with the central teeth of the blades having a greater degree of engagement with the anvil by reason of the respective roller being disposed in angular relation with the member 12. As new or replacement blades are secured to the member 12, the central portion of each blade will engage the anvil to a greater degree than the respective ends and due to the rotational power of the member 12 will be forced under the respective roller and thus perforate the web. It is to be understood that after sufficient wear has occurred between the blade and the anvil substantially the same degree of engagement will obtain throughout the length of each blade. Furthermore, due to the compressibility of the leather washers 31, the rollers may move slightly upwardly with the holders to thus permit passing of the blades under the anvil without injury to the blades. In this connection, and with reference to FIGURE 9, it will be assumed that the anvil extends at an angle of 3° relative to the axis of the member 12 as indicated by the line A, whereby, due to the travel of the web at a speed commensurate with that of the anvil and member 12, there is formed lines of perforation V in the web extending at right angles to its line of travel as denoted by the line L. Obviously, as the web travels to the core 6 from the supply roll 4, it passes between the member 12 and the rollers 22 with the result that each blade engages the web and travels with it to the anvil where the teeth of each blade progressively penetrate the web, as each tooth engages the anvil, thereby, perforating the web in the form of spaced slits of a size and shape defined by the teeth as shown in FIGURE 9. An example of the relative positions of the endmost and intermediate rollers 22 of the anvil with respect to the

end and central blades of a set is clearly illustrated in FIGURES 6, 7, and 8, it being understood that the same number of blades are provided for the same number of rollers 22. As viewed in these figures, one of the end blades is disclosed as engaging an end roller of the anvil (FIGURE 6) while an intermediate blade is shown (FIGURE 7) as approaching an intermediate roller of the anvil. In the same position of the member 12, the other end blade is shown in approaching position to the other end roller (FIGURE 8) to effect final engagement of the blades of the respective set with the anvil. The holders 27 are adjustable relative to the flange 21 to dispose the rollers 22 at a desired angle relative to the axis of the member 12 with the ends of the rollers being spaced a greater distance from the peripheral face of the member 12 than their central portions thereby forcing the blades under the rollers 22 intermediate their ends as heretofore described.

In the modified form of my invention, as illustrated in FIGURES 11 to 21 of the drawings, the transversely extending rotating member or roller 42 has its peripheral face formed with a pair of oppositely disposed longitudinally extending slots 43 with the rear faces defining the slots receiving thereagainst the rear faces of somewhat elastic strips 44 extending throughout the length of the slots and constituting brakes or cushions accommodating, against their front faces, the inner portions of blade means comprising sets of aligned perforating blades 45. Each set of blades 45 extends somewhat tangentially and beyond the periphery of the roller 42 and is provided on its outer margin with an anvil or web engaging surface 46. Blade clamping means is disposed in each of said slots 43 and includes a bar 47 fixed therein by screws 48. The bar 47 thus secures the inner portions of the blades 45 within the respective slot 43 in clamped relation with the cushion 44 as clearly illustrated in the drawings.

Suitably attached to the frames 1 and extending transversely over the member 42 is a beam 50 having a lower flange 51 provided with an under face disposed in confronting relation with the member 42. Subjacent the flange 51, there is provided a plurality of longitudinally extending components or cylinders 52 constituting an anvil extending over the member 42 at an angle of approximately three degrees relative to the axis of the member 42 and the longitudinality of the blades 45 as depicted in FIGURES 16, 17, and 18, the axes of the cylinders 52 being also disposed in abaxial or angular longitudinal relation with the axis of the member 42. The cylinders 52 are slightly disaligned relative to each other and have their ends disposed in somewhat abutting relation as shown in the drawings. Each cylinder is formed with spaced circumferentially extending lands 53 defining therebetween grooves or slots 54 and with the lands 53 providing a blade engaging surface 55 for engaging the surfaces 46 of the blade means.

Each of the cylinders 52 is journaled within a pair of holders 57 equipped with threaded shanks 58 extending into the flange 51 through openings 59 and secured in fixed relation with the flange 51 by means of upper and lower nuts 60 threaded on the shanks 58. Each of the holders 57 is formed with a head 61 provided on its under face with an arcuate groove 62 for accommodating and retaining therein the ends of cylinders 52 with one side of the groove being defined by a removable wall 63 normally secured in fixed relation with the opposite wall of the holder by means of a screw 64 or the like. This construction permits the cylinders 52 to be readily replaced, assembled and/or circumferentially adjusted, when maintained in a fixed position, to compensate for wear. The openings 59 are so arranged in the flange 51 that the shanks 58 may be suitably adjusted relative to the flange to dispose the heads 61 in proper position for receiving the cylinders 52. The holders 57 are each provided with a lubricating opening 65 extending through the shank 58 to permit lubricant to be supplied to the groove 62 whereby the cylinders 52 therein may be lubricated for rotation.

It will be apparent that due to the angularity of the anvil relative to the blades and the uniform projection of the latter from the member 42, each of the blades, when rotationally engaging the lands 53 of a correlated cylinder 52, will be subjected to a progressively increasing stress from its leading end (FIGURES 16 and 19) toward its intermediate portion (FIGURES 17 and 20) and thence to a progressively diminishing stress towards its trailing end (FIGURES 18 and 21). During engagement of the blades and cylinders, the brakes will respond to stress variation by permitting a slight cushioning of the blades away from the anvil to compensate somewhat for the variation in stress and thereby provide a substantially smooth running, brushing or wiping engagement of the blades with the cylinders without any damage thereto and/or rupture to a web passing therebetween, it being understood that a slight flexing of the blades may also contribute to the smooth running engagement of the components. In some instances, a relatively slight wear imparted to either the blades or the cylinders will sometimes relieve some of the stress until such time as the cylinders or blades are replaced.

In the forms of the invention herein disclosed, when the machine is operated and the web W fed from the supply roll 4 to the rolls 5 of the winding device and between the anvil and blade means, the latter, during rotation, will perforate or form slits in the web by penetrating and engaging the cylinders and in a manner wherein the slits or openings in each line of perforations are progressively formed from one side of the web to the other. When thus formed, the slits define transverse lines of perforations or openings V disposed in right angular relation to the direction of the web travel L as previously noted in connection with FIGURE 6, the angularity of the anvil relative to the axis of rotation of the blade means being indicated by the broken line A.

In actual reduction to practice, a plurality of winding machines having been equipped with my invention, I have found that the positioning of the anvil in angular relation to the longitudinality of the blades produces a highly satisfactory result in that the transverse lines or perforations, progressively formed, enables the machines to be operated at greater speeds without rupture of the web as is usually inherent in the operation of prior art machines. In the operation, the member (which mounts the blades) rotates at a speed commensurate with that of the linear speed of the web W to thus preclude any tearing of the web during perforation thereof.

Furthermore, a paper web treated by my invention will be provided with transverse rows of perforations in the form of spaced slits or openings which facilitate detachment of sections of toilet tissue from each other along the lines of perforations and without tearing or rupturing the marginal areas of the sections as would be the case wherein the perforations in each line were simultaneously formed in contradistinction to being progressively formed during longitudinal travel of the web. It is to be understood that the term "perforation" and its declensions, as herein set forth, shall be construed in their broadest sense and be inclusive of "slit," "score," "opening," and "cut" and their respective declensions.

Without further elaboration, the foregoing will so fully explain the invention that others may, by applying current knowledge, readily adapt the same for use under various conditions of service. Moreover, it is not indispensable that all the features of the invention be used conjointly since they may be employed advantageously in various combinations and subcombinations.

It is obvious that the invention is not confined solely to the use herein disclosed in connection therewith as it may be utilized for any purpose to which it is adaptable. It is therefore to be understood that the invention is not limited to the specific construction as illustrated and de-

scribed, as the same is only illustrative of the principles involved which are capable of extended application in various forms, and the invention comprehends all construction within the scope of the appended claims.

What I claim is:

1. In a web winding machine, perforating means for forming spaced transverse lines of perforations in a web substantially normal to the line of travel of said web and comprising a pair of relatively rotatable members with one of said members being equipped with axially extending blade means provided with spaced teeth for rotation over a circular path about said one member, the other of said members being equipped with rotatable cylindrical means having sections coupled together in angular and end to end relation, said sections being disposed in abaxial and angular relation to said blade means and having blade engaging portions extending substantially equal distances into said path for engagement with said teeth, means for rotating said blade means and said cylindrical means in synchronism to effect progressively angular engagement of said teeth with said portions, from one end of said blade means to the other, whereby, upon travel of a web between said blade means and said cylindrical means, said teeth will penetrate said web and engage said portions to thus form spaced transverse lines of aligned perforations in said web.

2. In a web winding machine, perforating means for forming spaced transverse lines of perforations in a web and comprising a rotatable member equipped with a set of axially aligned elongated blades projecting outwardly from said member and provided on their outer ends with spaced teeth, and a rotatable anvil having a plurality of disaligned rollers and extending in abaxial and angular relation to said blades throughout the length of said set, said rollers having blade engaging portions lying substantially equal distances from the axis of said one member to effect progressive angular engagement of said teeth with said rollers from one end of said set to the other, upon rotation of said member and said anvil, whereby, upon travel of a web between said anvil and said set, said teeth will penetrate said web and engage said portions to thus form spaced transverse lines of aligned perforations in said web substantially normal to the line of travel of said web.

3. In a web winding machine, perforating means for forming spaced transverse lines of perforations in a web and comprising a rotatable member equipped with a set of axially aligned elongated blades projecting outwardly from said member and provided on their outer ends with spaced teeth, and an anvil extending lengthwise relative to said member and having a plurality of disaligned rotatable substantially cylindrical rollers extending in abaxial and angular relation to said blades throughout the length of said set to effect angular progressive engagement of said teeth, with said rollers, from one end of said set to the other, upon rotation of said rollers and said member, the blade engaging portions of said rollers lying substantially equal distances from the axis of said rotatable member whereby, upon travel of a web between said rollers and said blades, said teeth penetrate said web and thus form spaced transverse lines of aligned perforations in said web substantially normal to the line of travel of said web.

4. In a web winding machine, perforating means for forming spaced transverse rows of perforations in a web and comprising a frame, a rotatable member mounted in said frame and equipped with a set of elongated aligned blades projecting outwardly from said member, said blades being provided on their outer ends with spaced teeth, and an anvil extending lengthwise relative to said member and having a plurality of longitudinally disaligned rotatable substantially cylindrical rollers extending in abaxial and angular relation to said blades throughout the length of said set and in positions to effect angular progressive engagement of said teeth, with said rollers, from one end of said set to the other, upon rotation of said rollers and said member, the blade engaging portions of said rollers lying substantially equal distances from the axis of said rotatable member whereby, upon travel of a web between said rollers and said blades, said teeth penetrate said web and thus form spaced transverse rows of aligned perforations in said web substantially normal to the line of travel of said web, supporting means connected to and spanning said frame, roller mounting means carried by said supporting means and mounting said rollers in said positions to effect said progressive angular engagement.

5. In a web winding machine, perforating means for forming spaced transverse lines of perforations in a web substantially normal to the line of travel of said web and comprising rotatable means equipped with sets of aligned elongated blades projecting from said rotatable means and with each of said blades being provided on its outer margin with spaced teeth, and rotatable anvil means having a plurality of disaligned rollers disposed lengthwise of said sets and in angular extending relation thereto, said rollers having blade engaging portions lying substantially equal distances from the axis of said rotational means to effect progressive rotational and angular engagement of said teeth with said rollers, from one end of said anvil to the other, upon rotation of said rotatable means and said anvil means, whereby, upon travel of said web between said anvil means and said blades, said teeth will penetrate said web and engage said portions to thus form spaced transverse lines of aligned perforations in said web, and retractable means mounting said anvil means and capable of being actuated by teeth of said blades to insure said rotational and angular engagement of said teeth and said portions of said rollers at all times during rotation of said rotatable means.

6. In a web winding machine, perforating means for forming spaced transverse lines of perforations in a web and comprising a frame, a rotatable member mounted in said frame and equipped with a set of elongated lengthwise aligned blades projecting from said member and provided on their outer ends with spaced teeth, and a rotatable roller assembly having a plurality of lengthwise disaligned unitary rotatable substantially cylindrical rollers mounted in abaxial and angular extending relation to said set to effect progressive angular engagement of said teeth with said rollers, from one end of said set to the other, upon rotation of said rollers and said member, the blade engaging portions of said rollers lying substantially equal distances from the axis of said rotatable member whereby, upon travel of a web between said rollers and said blades, said teeth penetrate said web and thus form spaced lines of aligned spaced slits in said web to constitute perforations substantially normal to the line of travel of said web, and roller mounting means connected to said frame and rotatably mounting said rollers to insure complementary rotational engagement of all of said teeth with all of said rollers.

7. In a web winding machine, perforating means for forming spaced transverse rows of perforations in a web and comprising a frame, a rotatable member mounted in said frame and equipped with a set of elongated longitudinally aligned blades projecting from said member, said blades being provided on their outer ends with spaced teeth, and rotatable anvil means extending in circumjacent relation to said member and including a plurality of longitudinally disposed disaligned rotatable substantially cylindrical rollers mounted lengthwise of and in angular extending relation to said set to effect progressive angular engagement of said teeth with said rollers, from one end of said set to the other, upon rotation of said rollers and said member, the blade engaging portions of said rollers lying substantially equal distances from the axis of said rotatable member whereby, upon travel of a web between said rollers and said blades, said teeth penetrate said web and thus form spaced trans-

verse rows of aligned perforations in said web substantially normal to the line of travel of said web, supporting means connected to and spanning said frame, mounting means carried by said supporting means and mounting said rollers individually in said relation, said mounting means being retractable relative to said supporting means to insure passage of said teeth beyond said rollers after engagement therewith.

8. In a web winding machine, perforating means for forming spaced transverse rows of perforations in a web and comprising a frame, a rotatable member mounted in said frame and equipped with a set of elongated longitudinally aligned blades projecting from said member, said blades being provided on their outer ends with spaced teeth, and an anvil extending adjacent said member and including a plurality of disaligned rotatable substantially cylindrical rollers connected together in end to end relation for unitary rotation and disposed lengthwise of and in angular extending relation to said set to effect progressive angular engagement of said teeth with said rollers, from one end of said set to the other, upon rotation of the latter and said member, the blade engaging portions of said rollers lying substantially equal distances from the axis of said rotatble member whereby, upon travel of a web between said rollers and said blades, said teeth penetrate said web and thus form spaced transverse rows of aligned perforations substantially normal to the line of travel of said web, roller mounting means carried by said frame and mounting said rollers, and power means connected to said member and said anvil for rotating said member and rollers in unison.

9. Perforating means for effecting spaced transverse lines of perforations in a web and comprising a pair of rotatably synchronized members, one of said members being equipped with axially extending blade means provided with spaced teeth, the other of said members including disaligned rollers disposed in angularly extending relation with said blade means and provided with curved faces for confrontment with said teeth, said rollers coacting with said blade means to effect progressive angular engagement of said teeth with said rollers, from one end of said blade means to the other, upon rotation of said members, the blade engaging portions of said rollers lying substantially equal distances from the axis of said rotatable member whereby, upon travel of a web between said members, said teeth progressively penetrate said web to form spaced transverse lines of aligned perforations in said web substantially normal to the line of travel of said web.

10. In combination with a web winding machine having a frame equipped with a transverse yoke, web perforating means mounted within said frame and provided with a rotatable member having its axis extending transversely of said frame, said member being equipped with a set of lengthwise extending blades disposed in parallelism with said axis, said blades having outer margins projecting radially outwardly from said member and provided with teeth for movement over a circumferential path, a plurality of disaligned substantially cylindrical rollers disposed circumjacent said member and in lengthwise and angular extending relation to said blades, the blade engaging portions of said rollers lying substantially equal distances from the axis of said rotatable member, roller mountings carried by said yoke and rotatably mounting said rollers, respectively, in said path to effect engagement with said blades in angular and progressive order from one end of said set to the other, coupling means connecting said rollers together for unitary rotation, and actuating means connecting said member to said rollers for rotating the latter with said member to effect said engagement and cause said teeth to penetrate a web fed between said blades and said rollers and thus form transverse lines of perforations in said web substantially normal to the line of travel of said web.

11. The structure as set forth and defined in claim 10 including, said blades being replaceable to compensate for wear by engagement with said rollers, said mountings being retractable relative to said yoke to insure passage of said teeth by said rollers during an initial replacement phase of said blades.

12. In perforating means for forming spaced transverse lines of perforations in a relatively thin web, a plurality of cylindrical members having peripheral faces and arranged in coupled end to end relation for effecting unitary rotation, elongated rotatable means disposed in circumjacent relation to said cylindrical members and provided with lengthwise extending blades having spaced teeth for engaging said faces, said faces having teeth engaging portions and with said members being disposed at an angle relative to each other and said rotatable means to effect progressive angular engagement of said teeth with said members, from one end of said rotatable means to the other, said teeth engaging portions being disposed substantially equal distances from the axis of said rotatable means whereby, upon rotation of said members and said blade means and the feeding of a web between said faces and said blades, said teeth will penetrate said web and engage said portions to form spaced transverse lines of aligned perforations in said web substantially normal to the line of travel of said web.

13. In perforating mechanism for effecting spaced transverse lines of perforations in a web, a pair of relatively rotatable beams with one of said beams being equipped with a set of longitudinally extending aligned blades disposed in parallelism with the axis of said one beam and having web engaging portions, a set of disaligned members arranged in end to end relation and carried by said other beam, said members extending in angular relation with said set of blades and having blade engaging portions, the portions of one of said sets constituting web penetrating means for angular progressive engagement with the portions of the other set from one end of the latter to the other, the web engaging portions of said members lying substantially equal distances from said axis to render said penetrating means effective for penetrating a web fed between said sets upon relative rotation of said beams to thus form spaced transverse lines of aligned perforations in said web substantially normal to the line of travel of said web.

14. In perforating mechanism for effecting spaced transverse lines of perforations in a web, a pair of relatively rotatable members, one of said members being equipped with a set of longitudinally extending blades disposed in parallelism with the axis of said one member and extending substantially equal distances outwardly from said one member for rotation over a circumjacent path, the other of said members provided with a set of disaligned rollers arranged substantially in an arc and disposed in angularly extending relation with said set of blades, each of said sets having web engaging portions extending into said path and with the portions of one of said sets being formed with spaced web penetrating lands for engagement with the portions of the other set for progressive angular engagement of said blades with said rollers from one end of said second mentioned set to the other whereby, upon rotation of said one member and the feeding of a web between said sets, said lands will penetrate said web to form spaced transverse lines of aligned perforations in said web substantially normal to the line of travel of said web.

15. In a web winding machine, perforating means for forming spaced transverse lines of perforations in a web and comprising a pair of relatively rotatable members with one of said members being equipped with axially extending blade means provided with a land engaging surface for rotation over a circular path about said one member, said other member being equipped with rotatable cylindrical means having a peripheral face provided with spaced lands extending into said path and in abaxial

and angular relation to said blade means, means for rotating one of said members relative to the other to effect progressively angular engagement of said lands with said surface from one end of said blade means to the other, whereby, upon travel of a web between said blade means and said cylindrical means said blade means will penetrate said web and thus form spaced transverse lines of aligned perforations in said web.

16. In a web winding machine, perforating means for forming spaced transverse lines of perforations in a web and comprising a rotatable member equipped with a set of axially aligned elongated blades projecting outwardly from said member and provided on their outer portions with anvil engaging surfaces for rotation over a circular path about said member, and an anvil having a plurality of disaligned cylinders provided with spaced lands extending into said path and in abaxial and angular relation to said blades throughout the length of said set to effect progressive angular engagement of said lands with said surfaces from one end of said set to the other, upon rotation of said member relative to said anvil, whereby, upon travel of a web between said anvil and said set, said blades penetrate said web and thus form spaced transverse lines of aligned perforations in said web substantially normal to the line of travel of said web.

17. In a web winding machine, perforating means for forming spaced transverse lines of perforations in a web and comprising a rotatable member equipped with a set of axially aligned elongated blades projecting outwardly from said member and provided on their outer portions with anvil engaging surfaces, and an anvil extending lengthwise relative to said member and having a plurality of disaligned cylinders provided with spaced lands extending in abaxial and angular relation to said blades throughout the length of said set to effect angular progressive engagement of said lands with said surfaces, from one end of said set to the other, upon rotation of said member relative to said anvil, the proximous zones of said lands and the distal zones of said blades, relative to said member, lying substantially equal distances from the axis of said rotatable member whereby, upon travel of a web between said cylinders and said blades, said blades penetrate said web and engage said lands to thus form spaced transverse lines of aligned perforations in said web substantially normal to the line of travel of said web.

18. In a web winding machine, perforating means for forming spaced transverse rows of perforations in a web and comprising a frame, a rotatable member mounted in said frame and equipped with a set of elongated aligned b.ades projecting outwardly from said member and provided on their outer portions with anvil engaging surfaces, and an anvil extending lengthwise relative to said member and having a plurality of longitudinally disaligned cylinders provided with spaced circumferentially disposed lands and extending in angular relation to said blades throughout the length of said set and in positions to effect angular progressive engagement of said lands with said surfaces, from one end of said set to the other, upon rotation of said member relative to said anvil, the proximous zones of said lands and the distal zones of said blades, relative to said member, lying substantially equal distances from the axis of said member whereby, upon travel of a web between said cylinders and said blades, said blades penetrate said web and engage said lands to thus form spaced transverse rows of aligned perforations in said web substantially normal to the line of travel of said web, supporting means connected to and spanning said frame, cylinder mounting means carried by said supporting means and mounting said cylinders in said positions to effect said progressive angular engagement.

19. In a web winding machine, perforating means for forming spaced transverse lines of perforations in a web and comprising rotatable means equipped with sets of elongated aligned blades projecting from said rotatable means and with each of said blades having an anvil engaging outer margin for rotation over a common path about said rotatable means, and anvil means having a plurality of disaligned elongated members extending into said path, each of said members provided with spaced transverse slots and disposed lengthwise of said sets in angular extending relation therewith to effect progressive rotational and angular engagement of said margins with said members, from one end of each of said sets to the other, upon rotation of said rotatable means relative to said anvil means, whereby, upon travel of a web between said members and said blades, said blades penetrate said web and engage said members to thus form spaced transverse lines of aligned perforations in said web, and cushioning means engaging said blades and capable of being rendered effective by stress applied to said blades to insure said rotational and angular engagement of said margins and said members at all times during rotation of said rotatable means.

20. In perforating means for forming spaced transverse rows of perforations in a web and comprising a frame, a rotatable member mounted in said frame and equipped with a set of elongated longitudinally aligned blades projecting from said member and provided with anvil engaging margins, and an anvil extending in adjacent and fixed relation with said member and including a plurality of disaligned elongated members, said members being provided with spaced lands and arranged end to end in lengthwise and angular extending relation with said set to effect progressive angular engagement of said margins with said lands from one end of said set to the other upon rotation of said rotatable member relative to said anvil, said margins and the blade engaging portions of said lands lying substantially equal distances from the axis of said rotatable member, whereby, upon travel of a web between said cylinders and said blades, said margins penetrate said web and engage said lands to thus form spaced transverse rows of aligned perforations substantially normal to the line of travel of said web, anvil mounting means carried by said frame and rotatably mounting said cylinders to position said lands at said distances.

21. Perforating means for incorporation into a web winding machine to form spaced transverse lines of perforations in a web treated by said machine and comprising, a pair of relatively rotatable members with one of said members being equipped with axially extending blade means provided with anvil engaging outer margins for rotation over a circular path about said one member, the other of said members including an anvil having disaligned sections extending into said path, said sections being disposed in angularly extending relation with said blade means and provided with spaced lands having curved faces for engagement with said margins, said sections coacting with said blade means to effect progressive angular engagement of said margins with said lands, from one end of said blade means to the other, upon relative rotation of said members, whereby, upon travel of a web between said members, said blade means progressively penetrates said web and engages said lands to form spaced transverse lines of aligned perforations in said web substantially normal to the line of travel of said web.

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