

May 15, 1956

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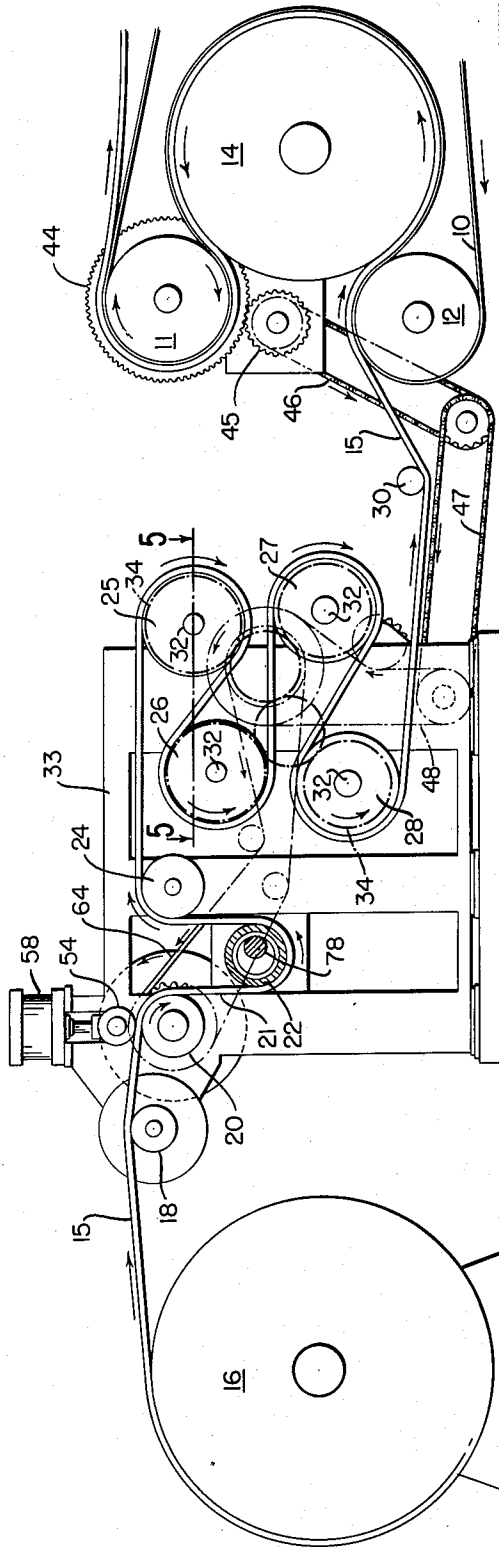
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APPARATUS FOR TENSIONING STRIP MATERIAL

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4 Sheets-Sheet 1

Fig. 1



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Fig. 2

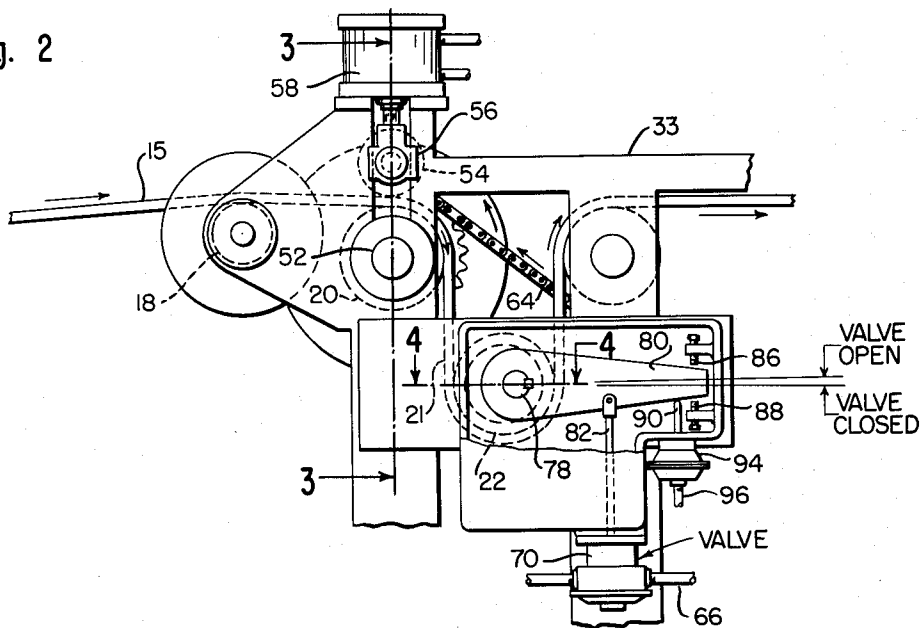


Fig. 3

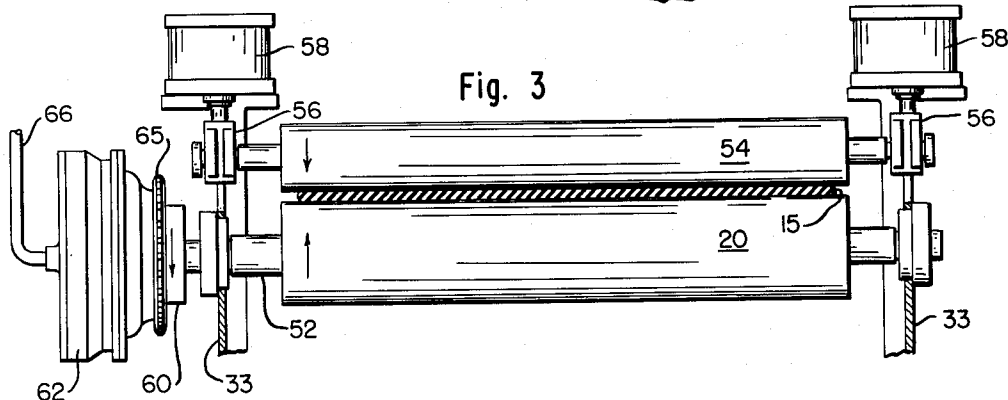
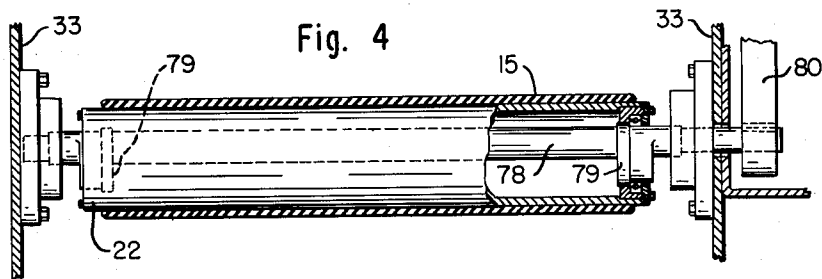


Fig. 4



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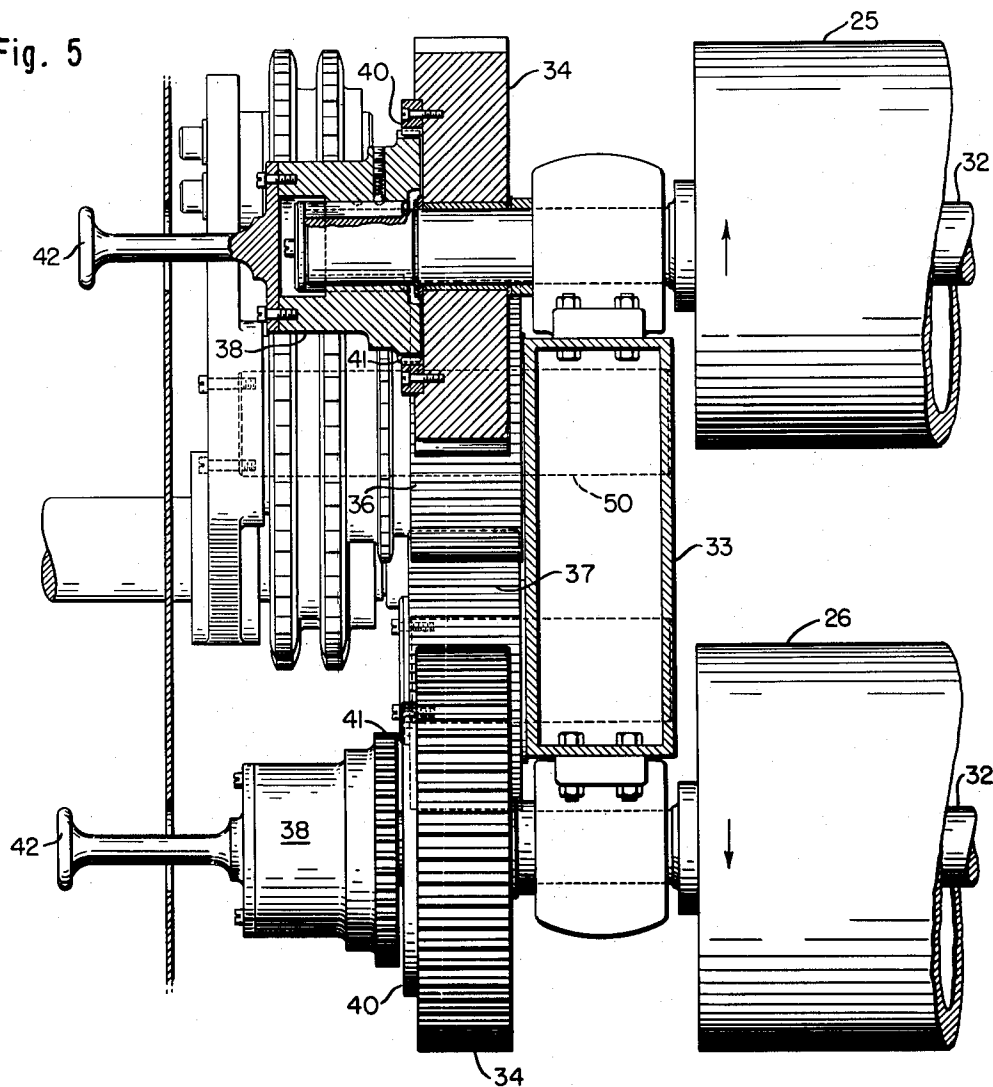
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Fig. 5



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# APPARATUS FOR TENSIONING STRIP MATERIAL

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**Fig. 6**

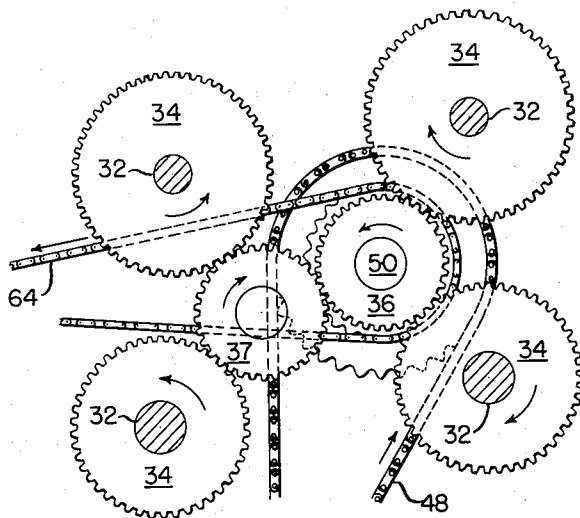
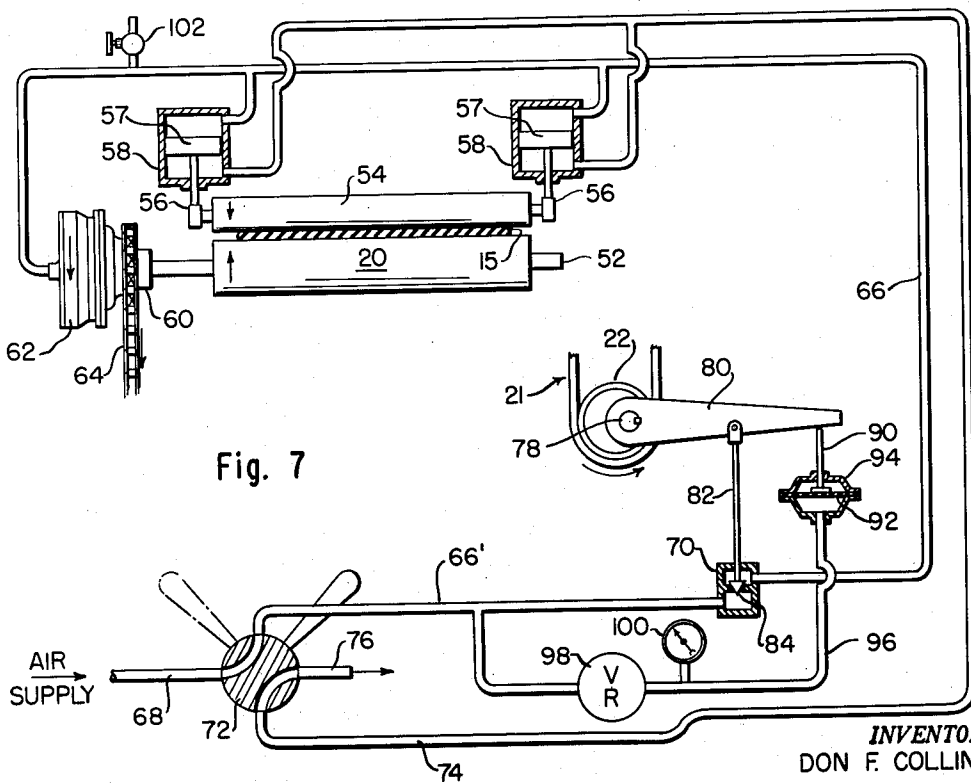


**Fig. 7**



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## APPARATUS FOR TENSIONING STRIP MATERIAL

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Application May 24, 1952, Serial No. 289,866

7 Claims. (Cl. 18—1)

This invention comprises novel and useful improvements in apparatus for tensioning strip material. The invention relates particularly to improvements in the stretching of rubber belting and the like preparatory to vulcanizing it as shown in Reissue Patent No. 19,660 dated July 30, 1935. This patent discloses a plurality of cylindrical rolls disposed to support strip material progressively looped arcuately on and about the rolls which are rotatably connected to rotate at progressively increasing surface speeds adapted to stretch the material therebetween. The material is drawn over the rolls from a braked let-off reel that retards movement of the material to the rolls. A primary object of my invention resides in the production of novel apparatus for placing and maintaining an improved, more uniform and variable retarding effect on the material passing to said rolls and to novel apparatus for placing any desired percentage of stretch in the said material from zero to the maximum stretch for which the mechanism employed is constructed.

An important feature of the invention concerns the placing of said desired percentage of stretch in the material by passing it in arcuately looped frictional contact with a plurality of cylindrical surfaces disposed selectively to give fixed increments of stretch to the material between adjacent surfaces, placing and maintaining a selectively variable stretch in the material in advance of said surfaces and stretching the material to said percentage of its length by adding such of said fixed increments of stretch selectively thereto as will total said desired percentage of stretch.

These and other features of the invention will be more readily understood and appreciated from the following detailed description of a preferred embodiment thereof selected for purposes of illustration and shown in the accompanying drawings in which:

Fig. 1 is a front elevation, partially broken away, of a machine embodying the invention,

Fig. 2 is an enlarged front elevation of a portion of the machine,

Fig. 3 is a fragmentary elevation on line 3—3 of Fig. 2,

Fig. 4 is a fragmentary plan on line 4—4 of Fig. 2, partially broken away,

Fig. 5 is an enlarged fragmentary plan view partially in section taken on line 5—5 of Fig. 1,

Fig. 6 is a fragmentary front elevation of gearing shown in Figs. 1 and 5, and

Fig. 7 is a schematic view illustrating pneumatically operated portions of the machine.

In the accompanying drawings I have illustrated the invention in conjunction with a vulcanizing machine of the continuous type shown in Patent No. 2,039,271. This machine employs an endless steel pressure band 10 passing about supporting rolls 11 and 12 and having a re-entrant loop therebetween passing about and in contact with a substantial arcuate portion of a vulcanizing drum 14. The drum is driven in the direction of the arrows and the strip material 15 to be vulcanized is fed into the bite between the drum and the band above the roll 12. The

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present invention comprises improved apparatus for stretching this material a desired percentage of its length during its passage to the bite whereupon it is vulcanized in such elongated condition. As illustrated in Fig. 1, the material is drawn from a supply reel 16 and is stretched by my novel apparatus during its passage therefrom to the bite.

As illustrated in Fig. 1, the strip material 15 passes from the supply reel 16 over an idler 18, over and in arcuate contact with a cylindrical roll 20, thence into a U-shaped loop 21 about a dancer roll 22, thence over an idler 24, then in looped arcuate engagement on and about a plurality of cylindrical rolls 25, 26, 27 and 28 and thence under an idler 30 to the drum 14. During this passage, the material is given a predetermined tension at the U-shaped loop and thereafter sufficient fixed increments of stretch provided between the rolls 25 to 28 and the drum 14 are added to total the percentage of stretch required.

As hereinafter specifically described, the strip material 15 is given a predetermined initial stretch at the U-loop about the dancer roll 22, the amount of this tension and stretch being variable between zero and a maximum limit. The strip thereafter passes about the rolls 25—28 and to the drum 14 where such additional increments of stretch are provided as to total the percentage of stretch desired. The rolls 25—28 are fixed to shafts 32 rotatable in a frame 33. Gears 34 loose on these shafts are interconnected by intermediate gears 36 and 37 (Fig. 6). Each of the gears 34 cooperating with rolls 25—28 can be clutched to its shaft 32 by a clutch member 38 splined to the shaft and slidable axially into toothed clutching engagement with its gear at 40 and 41. An operating handle 42 is attached to and extends forwardly from each clutch and each clutch can be engaged and disengaged independently of the other clutches. The teeth in the gears 34 so differ in number that when the clutches are engaged, the gears are rotatably connected to rotate the rolls 25—28 at progressively increasing surface speeds adapted to stretch the material a fixed predetermined amount between each two adjacent rolls.

A like additional fixed increment of stretch is given to the material between the roll 28 and the drum 14 by means of a driving connection therebetween. This connection includes a gear 44 fixed to the roll 11 and in mesh with a gear 45. Means including sprockets and driving chains 46, 47 and 48 directly connect the roll 11 to a shaft 50 carrying the gear 36 and the ratio of this driving connection is such that the surface speed of the drum 14 is greater than the surface speed of the roll 28 an amount adapted to give the desired increment of stretch therebetween.

The roll 20 is fixed to a shaft 52 rotatably supported in fixed bearings in the frame 33. An idler roll 54 cooperates with the roll 20 to grip the material 15 therebetween. The idler is rotatably supported at its ends in bearings 56 vertically movable in the frame and adapted to be forced downwardly pneumatically by pistons 57 within cylinders 58. The shaft 52 is normally free to rotate with the roll as the material 15 is drawn thereover, however, means is provided for placing a desired and predetermined retarding effect on such rotation of the roll to provide the desired tension and stretch in the material at the U-loop. The means herein illustrated comprises a rotary member 60 loose on the shaft 52 and driven in the direction opposite to the movement of the material, together with a friction clutch between the member and shaft. The friction clutch is preferably pneumatically operated and includes one friction element carried by the member 60 and a cooperating friction element splined to the shaft and adapted to be forced into frictional engagement with the first element by air pres-

sure operating on a diaphragm. The clutch which may be of known conventional type is enclosed within a housing 62 and no novelty is claimed therefor per se. The member 60 can be conveniently driven from the shaft 50 by a chain 64 connecting a sprocket on the shaft 50 to a sprocket 65 fixed to the member 60.

Air pressure is supplied to the housing 62 and preferably to the rear of the pistons 57 by a pipe 66 common to both. This air from a source 68 is automatically controlled by a valve within a housing 70 hereinafter described. A hand-operated four-way valve 72 together with a pipe 74 and an exhaust 76 are provided for conducting air forwardly of the pistons 57 and exhausting the pipe 66 when the valve is turned 90° from the position shown in Fig. 7.

The dancer roll 22 is mounted eccentrically on a shaft 78 rotatably supported at its ends in fixed bearings in the frame 33, the roll being rotatable on the eccentric bearings 79 independently of the shaft. An arm 80 is fixed to and extends radially and horizontally from one end of the shaft. A rod 82 pivoted at its top end to the arm carries a valve 84 on its bottom end cooperating with a valve seat within the housing 70. The arm is permitted a slight movement between stops 86 and 88. When the arm is engaged with the stop 86 the valve is open and when engaged with the stop 88 the valve is closed. A rod 90 cooperating with a diaphragm 92 within a housing 94 is adapted to lift the arm by air pressure provided by a pipe 96 to the portion 66' of the pipe 66. A pressure regulator 98 and gauge 100 are provided in the pipe 96. A bleeder valve 102 is also provided in the pipe 66 for permitting a slight leakage as hereinafter described.

The invention as above described and illustrated in the drawings provides for giving any desired stretch from zero to maximum to the material 15, the threading of the material through the machine being identical for all stretch requirements. It will be apparent that tension on the material at the U-loop 21 will tend to lift the eccentrically mounted roll 22 and rock the arm 80 downwardly, thus closing the valve 84. Such action together with the air leakage at the bleeder valve 102 reduces the air pressure in the housing 62 and the gripping pressure of the roll 54 on the material and results in reducing the tension on the material. The common air pressure line 66 to the housing 62 and the cylinders 53 provides a varying squeeze roll pressure on the material which is in direct relation with the braking torque being applied to the roll 20. The regulator 98 will initially be set at a pressure to produce the tension and stretch desired in the material at the U-loop 21 and the eccentrically operated mechanism will thereafter automatically maintain that tension. A calibrated chart will ordinarily be provided with the machine to indicate the tensions resulting from various pressure settings.

The increments of stretch between the adjacent rolls 25—28 and between the roll 28 and the drum 14 are fixed and, to give the material the required percentage of stretch when it reaches the bite at the drum, it is only necessary to add to the initial stretch at 21 such fixed increments as will total the desired percentage of stretch. Since the stretch increment produced by any of the rolls 25—28 can be eliminated by releasing its clutch 38, it is only necessary to release such clutches as will eliminate the increments not required. If, for example, all clutches 38 are released, the rolls 25—28 will be entirely free and the only stretch resulting will be such as is given at the U-loop 21. If clutches at the rolls 25—27 are released the stretch resulting will be the initial stretch at 21 plus the increment between the roll 28 and the drum 14. Thus any desired percentage of stretch can be placed in the material by combining the variable stretch at 21 with such of the fixed increments as are necessary to produce the desired result. Only two adjustments are

required, namely (1) the air pressure at 98 and (2) the proper clutch engagements at 38.

When initially threading the strip material through the machine the hand valve 72 will be thrown to the broken line position of Fig. 7, thus exhausting the air above the pistons 57 and forcing the pistons and roll 54 upwardly by the admission of air below the pistons. It is also pointed out that the employment of a rotary braking torsion on the roll 20 provides a smooth and uniform braking effect that is not possible with ordinary braking mechanisms which tend to function with a jerky and non-uniform action especially when high braking pressures are applied.

Having thus disclosed my invention what I claim as new and desire to secure by Letters Patent is:

1. A machine for tensioning strip material, comprising a cylindrical rotary roll adapted to receive and support a strip of material in arcuate surface contact therewith, rotary cylindrical means beyond the roll for supporting the material and drawing it along from the roll, rotary means in frictional driving relation with the roll, means for driving said rotary means in a direction opposite to the movement of the material and roll, and means cooperating with said rotary means and the material between the roll and rotary cylindrical means for automatically varying the frictional driving torsion on the roll in inverse ratio to the tension on the material passing from the roll to the rotary cylindrical means.

2. The machine defined in claim 1 in which said rotary means includes a pneumatically operated friction clutch, and the means cooperating with the rotary means and the material includes an air valve for the friction clutch and cooperating mechanism disposed to cooperate with the tensioned material between the roll and rotary cylindrical means for controlling the valve.

3. The machine defined in claim 2 in which the means cooperating with the rotary means and the material includes an idler roll disposed to engage a loop of said material between the first named roll and the rotary cylindrical means, an eccentric mounting rotatably supporting the idler roll, a laterally extending arm fixed to the mounting, and a valve operating connection between the arm and the valve.

4. The machine defined in claim 3 in which the eccentric mounting and arm are so disposed that increased tension on the material moves the arm in the valve closing direction, and resiliently operated means operative on the arm in the valve opening direction.

5. The machine defined in claim 4 in which said resiliently-operated means is pneumatically operated, and means for varying the air pressure thereto.

6. The machine defined in claim 1 in which said rotary means includes a pneumatically operated friction clutch, a second roll cooperating with the first named roll for gripping the material therebetween, pneumatically operated means for forcing the second roll into gripping relation with the first roll, and common means under the control of said valve for directing air to the clutch and said pneumatically operated means.

7. The machine defined in claim 1 in which said rotary cylindrical means includes a plurality of cylindrical stretching rolls disposed to support said strip of material progressively looped arcuately on and about the rolls and cylindrical means forwardly of the rolls for receiving the material in arcuate engagement therewith and drawing the material over the rolls, gearing rotatably connecting said rolls to rotate at progressively increasing surface speeds adapted to stretch the material therebetween, and means for individually and selectively disengaging the rolls from driving engagement with the companion rolls.

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