April 13, 1948. G. D. MARCY 2,439,779

APPARATUS FOR CONTROLLING PRESSURE BANDS

Filed March 29, 1945 2 Sheets-Sheet 1

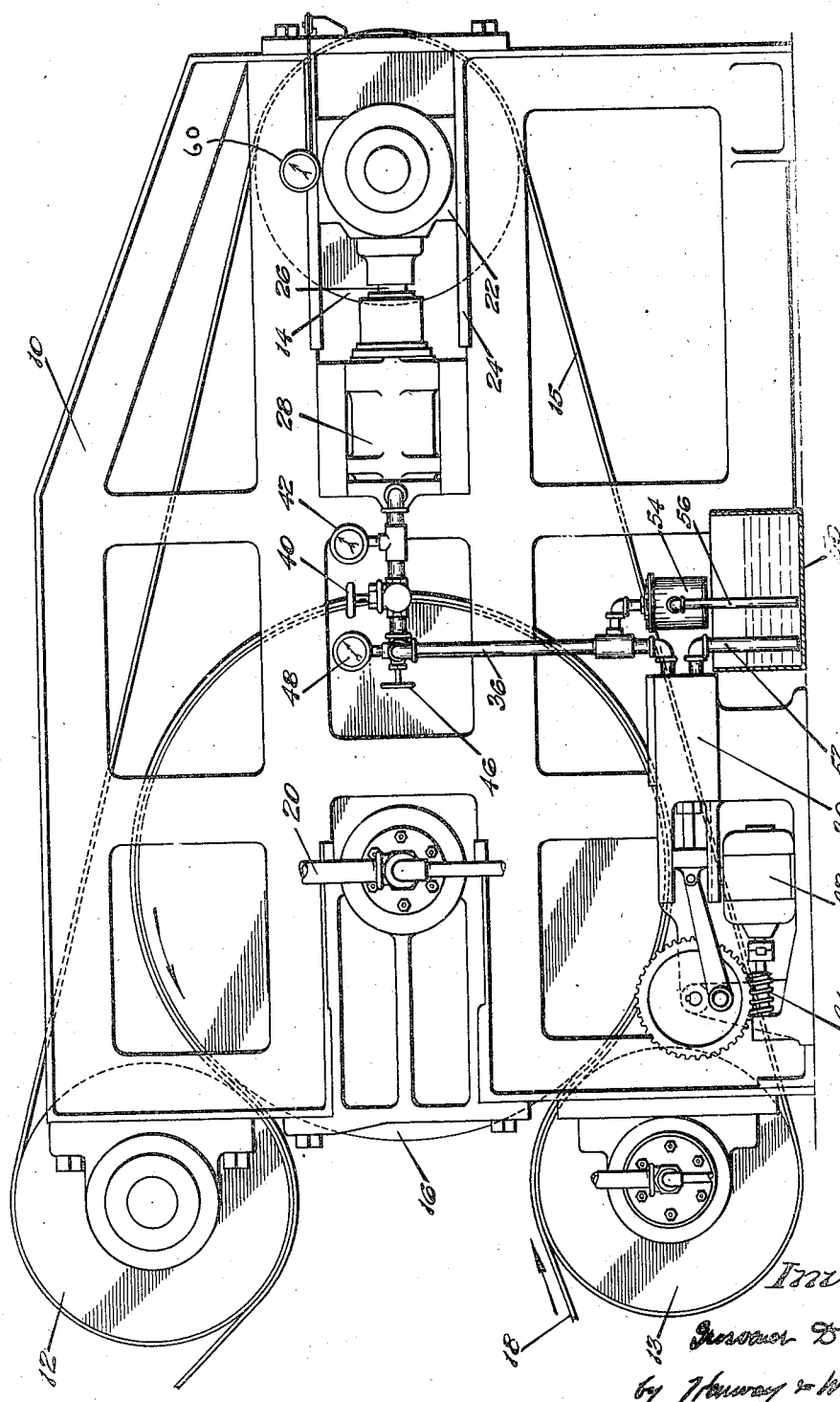


Fig. 1.

Inventor
Grosvenor D. Marcy
by Harway & Walter
Attys

April 13, 1948. G. D. MARCY 2,439,779

APPARATUS FOR CONTROLLING PRESSURE BANDS

Filed March 29, 1945 2 Sheets-Sheet 2

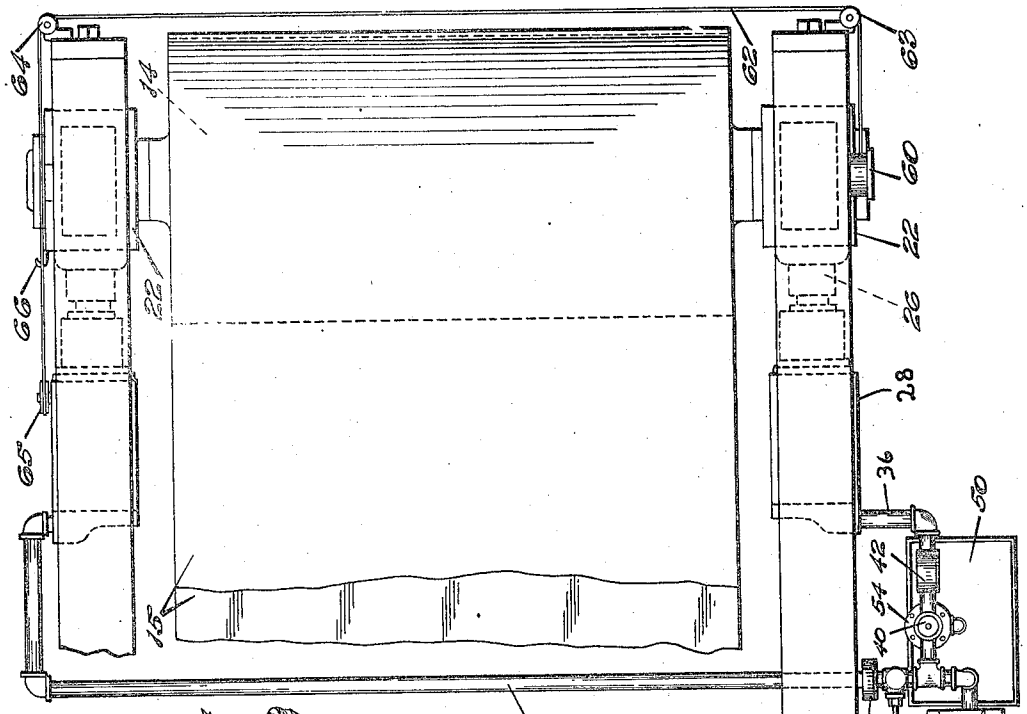


Fig. 2.

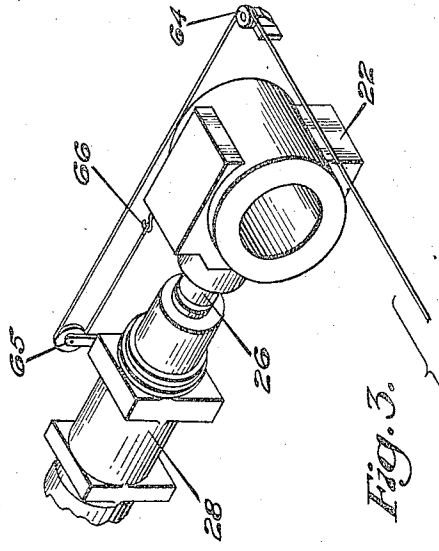
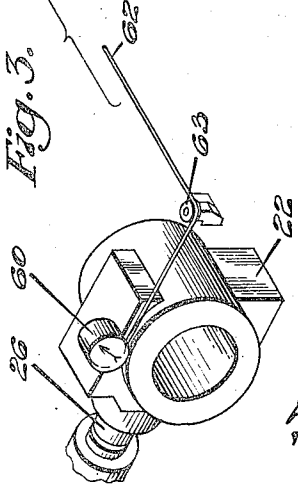


Fig. 3.



Inventor

Grosvenor D. Marcy

by Kenway & Witter.

Attys.

Patented Apr. 13, 1948 2,439,779

UNITED STATES PATENT OFFICE

2,439,779

APPARATUS FOR CONTROLLING PRESSURE BANDS

Grosvenor D. Marcy, Newton Highlands, Mass., assignor to Boston Woven Hose & Rubber Company, Cambridge, Mass., a corporation of Massachusetts

Application March 29, 1945, Serial No. 585,468

5 Claims. (Cl. 18—6)

1

In a vulcanizing machine of the "Rotocure" type which employs a highly tensioned pressure band in cooperation with a heated drum, difficulty has been encountered under some circumstances in maintaining true running of the pressure band in the machine. Great annoyance and loss of time has been caused by the tendency of the pressure band to drift or work slowly toward one edge or other of the drum as the drum continues to rotate hour after hour in the vulcanizing operation. Various attempts have been made to confine the pressure band forcibly to the true and proper path but these have been found objectionable in that they tend to deform the band itself and to create excessive and undesirable friction. In many cases it has become necessary to stop the machine, relieve the band from tension and pressure and shift it back to a central position. This is not only wasteful in time but requires the services of skilled mechanics who can ill be spared, and unless great care is taken the product may be damaged by the interruption of the vulcanizing process. The primary object of the present invention is to provide for the accurate control of the path of movement of the pressure band in vulcanizing machines of the type discussed.

The pressure band is of considerable width and operates under exceedingly high tension. I have discovered that occasionally one side of the band becomes slightly elongated relative to the other side and that this differential causes lateral creep or drift in the band. I have furthermore discovered that this difficulty can be cured and the band caused to travel in its true and fixed path by placing opposite sides of the band under respective tensions proportioned relative to and compensating for the said differential. Under normal conditions of tension the band will tend to creep toward its shorter side and, in accordance with the invention, I place this side of the band under a relatively greater tension so proportioned as to correct the drift and cause the band to follow a true and fixed path.

The pressure band is tensioned on and extends about an arcuate portion of a vulcanizing drum and about a cylindrical tensioning roll. The band may be tensioned by hydraulic pressure acting against the journals of the tensioning roll and, as illustrated in Patent 2,039,271, April 28, 1936, Bierer, equal pressures have heretofore been exerted on both these journals. It appears, however, that such continuous application of equal pressures on both journals causes a condition of unstable equilibrium in the organization of the

2

machine. The band may depart from an exactly centered position for various reasons and in such case the operation of the equal pressures on the two journals produces a resultant couple that effects an angular displacement of the tension roll and an unbalanced band tension. This I have found can be corrected only by providing unequal pressures on the tension roll journals so properly proportioned as to provide a balanced tension in the band. The uneven distribution of stress caused by equal pressures on the journals produces more stretch at one edge of the band than at the other, and this, in turn, permits more angular displacement of the tension roll which induces still more lateral drift of the band. Such action forms a pernicious cycle of mutually aggravating effects which not only causes interruptions in production of the product but may progress to the point where one edge of the band is stretched beyond its elastic limit and becomes permanently deformed and useless and thereby results in a further and considerable financial loss.

Possible causes of an initial lateral displacement of the band from a truly centered position are numerous and cannot be wholly eliminated. The band itself, due to its size and method of manufacture, may be initially shorter on one edge than the other or unrelieved internal stresses may be present to cause unequal elongation under load. Uneven wear of journals may permit slight misalignment of the drum and rolls around which the band passes or the uncured stock fed into the press may vary in thickness, thus causing uneven loading of the band. My invention recognizes the presence of such unavoidable factors tending to cause lateral movement of the band and provides means for counteracting them and preventing their building up to a point where stopping of the machine or injury to the band and product results.

A further advantage resulting from the invention resides in the fact that bands used on vulcanizing machines equipped with this invention tend to improve with continued use, rather than to deteriorate. This is due to the fact that use of my invention continually stretches the short edge of the band, and over a period of time tends to equalize any variation in its effective length, whereas on machines not so equipped, the longer edge of the band is subjected to greater stress than the shorter edge, as explained above, so that its condition becomes progressively worse, and has resulted in bands having to be discarded because

they had become deformed beyond the point of usefulness.

As illustrated herein the invention contemplates the employment of means for applying controlled and unequal pressures to the journals of the tension roll with the result that the roll is canted in the band tensioning direction and at an angle placing a relatively greater tension on the shorter side of the band. Such action not only compensates for any tendency of the band to run off sidewise but furthermore tends also to improve the condition of the band and to bring all elements of the machine into stable equilibrium. In other words, it tends to stretch the shorter edge of the band and so equalize it as a whole. Preferably and as herein shown, this may be accomplished by providing separate hydraulic connections to cylinders acting on the journals of the tension roll and providing valve connections and gauges whereby the two journals may be subjected to predetermined and unequal pressures.

Another feature of my invention consists in providing indicating mechanism for the bearings of the journals of the tension roll to show any angular displacement of the roll and inform the operator as to the nature of the required adjustment, and in providing pressure controlling means conveniently located at one side of the machine and from which means the pressures on the two journals can be adjusted to and maintained in the required proportions.

The invention herein disclosed and claimed contemplates novel apparatus for controlling the path of movement of an endless vulcanizing pressure band of the nature described, correcting lateral drift in such a band and eliminating the faults and disastrous results which would otherwise occur and cause costly delays and considerable damage to both machine and product.

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

Fig. 1 is a side elevation of a vulcanizing machine embodying my invention,

Fig. 2 is a fragmentary plan view, and

Fig. 3 is a fragmentary perspective view of the pressure band tensioning mechanism and indicating mechanism.

The rotary vulcanizing machine illustrated in the drawings comprises a heavy frame embodying spaced side members 10 of similar shape rigidly connected together and supported on a concrete foundation. Rotatably supported in the frame are three cylindrical rolls 12, 13 and 14 over which passes an endless pressure band 15 in a general triangular path with a reentrant loop extending from the rolls 12 and 13 about a substantial arcuate portion of a large vulcanizing drum 16 also rotatably supported by the frame within the general outline of the path of the band. The drum is rotated in the direction of the arrow and strip material 18 to be vulcanized is passed about the drum beneath the pressure band and is vulcanized by steam heat conducted into the drum through piping 20. The roll 14 is a tensioning roll for holding the band under pressure on the drum.

Opposite ends of the tensioning roll 14 are supported in bearings or journals 22 slidably mounted in guideways 24 on the frame, and cooperating with the journals are hydraulically operated pistons 26 moving within cylinders 28 fixed to the frame. Hydraulic pressure is supplied to the two cylinders from a compressor 30 operated by a motor 32 through worm and worm wheel gearing 34. A pipe 36 extends from the compressor to the adjacent cylinder 28 and is provided with a controlling valve 40 and pressure gauge 42. A branch pipe 44 extends to the other cylinder and is provided with a controlling valve 46 and a pressure gauge 48. Oil is conducted from a reservoir 50 to the compressor through a pipe 52 and, in the case of excessive pressure, is returned to the reservoir through a relief valve 54 and pipe 56.

The control valves and pressure gauges are all located at the same side of the machine within easy reach of the operator and it will be apparent that he can by closing either valve and manipulating the other valve place any desired hydraulic pressure within the other cylinder. Such pressure operates directly against its piston to force its journal and the corresponding end of the tension roll away from the vulcanizing drum. When the desired pressure has been attained the valve is closed and retains the indicated pressure within the cylinder. The other valve can then be manipulated in like manner to provide the desired indicated pressure within its cylinder.

As heretofore discussed, various factors may so affect the operation of the pressure band as to require correction in the operation of the band as afforded by my invention. These factors include variations in the effective length of the band across its width, lack of parallelism in the drum and roll axes, variations in the thickness of the material being vulcanized, etc., any of which may require compensating adjustment if the band is to continue to run in a substantially centered path. If all factors were perfect and correct, the axis of the tension roll 14 should be parallel with that of the drum and other rolls and the pressure on the two pistons 26 should be equal, and under such conditions the band would run in a truly centered path. It will be understood however that in practice this perfect condition never exists.

The invention contemplates adjustments which will make corrections for faults inherent in the construction of the pressure band and resulting from dimensional errors, uneven shrinkage after welding or unrelieved internal stresses, whereby the band is caused to travel unevenly as above described. Furthermore, the invention contemplates not only the correcting of the travel path of movement of the band but embodies a treatment of progressive and controlled stretching of tight portions thereof over a period of time until substantial uniformity is produced. The pressure band is usually of sheet steel and ordinarily constructed in the manner described in Patent 2,033,527, June 8, 1937, Bierer, but may be fabricated upon a woven wire base.

It will be apparent that varying of the pressures on the pistons 26 causes the tension roll to be canted from a position departing from its parallel relation with the vulcanizing drum. It is important that this parallel relationship and the departure therefrom be under definite observation and control, and means is provided herein to indicate this condition to the operator at all times. A gauge or indicator 60 is affixed to the journal 22 at the control side of the machine and in view of the operator. It has a wire 62 extending therefrom about sheaves 63, 64 and 65 to a hook 66 attached to the other journal. This gauge is so adjusted that its index points to

zero when the two journals are in parallelism with the axis of the vulcanizing drum. It will be apparent that moving both journals as a unit will have no effect on the gauge but that moving either journal along its guideway 24 relative to the other will move the index and indicate the departure of the tensioning roll from such parallelism in either direction relative to the vulcanizing drum and other rolls.

Having thus disclosed my invention and described in detail an illustrative embodiment thereof, I claim as new and desire to secure by Letters Patent:

1. In a vulcanizing machine of the continuous type employing a drum and a cooperating endless pressure band; a band-tensioning roll having bearings at its opposite ends independently movable lengthwise of the band, in combination with a gauge mounted on one of said bearings and means cooperating with the gauge and the other bearing for indicating on the gauge displacement of said bearings with respect to each other.

2. In a vulcanizing machine of the continuous type employing a drum and a cooperating endless pressure band; a band-tensioning roll having independently movable bearings at its opposite ends, in combination with means including a single gauge located at one side of the machine and a connecting element attached to and cooperating with the gauge and said bearings for indicating on the gauge the relative displacement of the bearings from normal position.

3. In a vulcanizing machine of the continuous type employing a cylindrical vulcanizing drum, an endless pressure band cooperating with an arcuate portion of the drum, a plurality of rolls cooperating with the drum to support the band and including a tensioning roll for placing the band under pressure on the drum, hydraulically operated pistons operative against the opposite ends of the tension roll in a direction tending to move them away from the drum, and means for independently controlling the operative pressure against the pistons; the combination of an indicator cooperating with one end of the tensioning roll, and a flexible cable attached to the indicator and cooperating with the other end of the tensioning roll for indicating on the indicator the relative lateral movement of said ends under the action of the pistons.

4. In a vulcanizing machine comprising a cylindrical vulcanizing drum, an endless pressure band of sheet steel cooperating with an arcuate portion of the drum, a plurality of rolls cooperating with the drum to support the band and including a tensioning roll for placing the band under pressure on the drum, and means for varying the axial parallelism of the tensioning roll relative to the drum and other rolls; the combination of a single gauge positioned on one end of the tensioning roll and a connecting element attached to the gauge and connected to the other end of the tensioning roll to indicate on the gauge the parallel relationship and the departure therefrom of the tensioning roll relative to the drum.

5. In a vulcanizing machine comprising a cylindrical vulcanizing drum, an endless pressure band cooperating with an arcuate portion of the drum, a plurality of rolls cooperating with the drum to support the band and including a tensioning roll for placing the band under pressure on the drum, hydraulically operated pistons operative against the opposite ends of the tensioning roll in a direction tending to move them away from the drum, and means at one side of the machine for independently controlling the operative pressure against the pistons; the combination of a gauge cooperating with one end of the tensioning roll to partake of its movement parallel with said direction, and a connecting element attached to the gauge and cooperating with the other end of the tensioning roll to indicate on the gauge the relative movement of said ends of the tensioning roll under the action of the pistons.

GROSVENOR D. MARCY.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,250,618	Morgan	Dec. 18, 1917
1,772,188	Mason	Aug. 5, 1930
2,039,271	Bierer	Apr. 28, 1936