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Jespersen

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[54] **CONTOURED FEED SPRING**

[75] Inventor: **Paul W. Jespersen,** Stamford, Conn.

[73] Assignee: **Georgia-Pacific Corporation,** Portland, Oreg.

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[51] **Int. Cl.** **B65h 17/22**

[58] **Field of Search** 226/121, 122, 127, 128, 226/129, 152, 156; 185/37, 45, 38, 39; 267/155, 156, 62, 58

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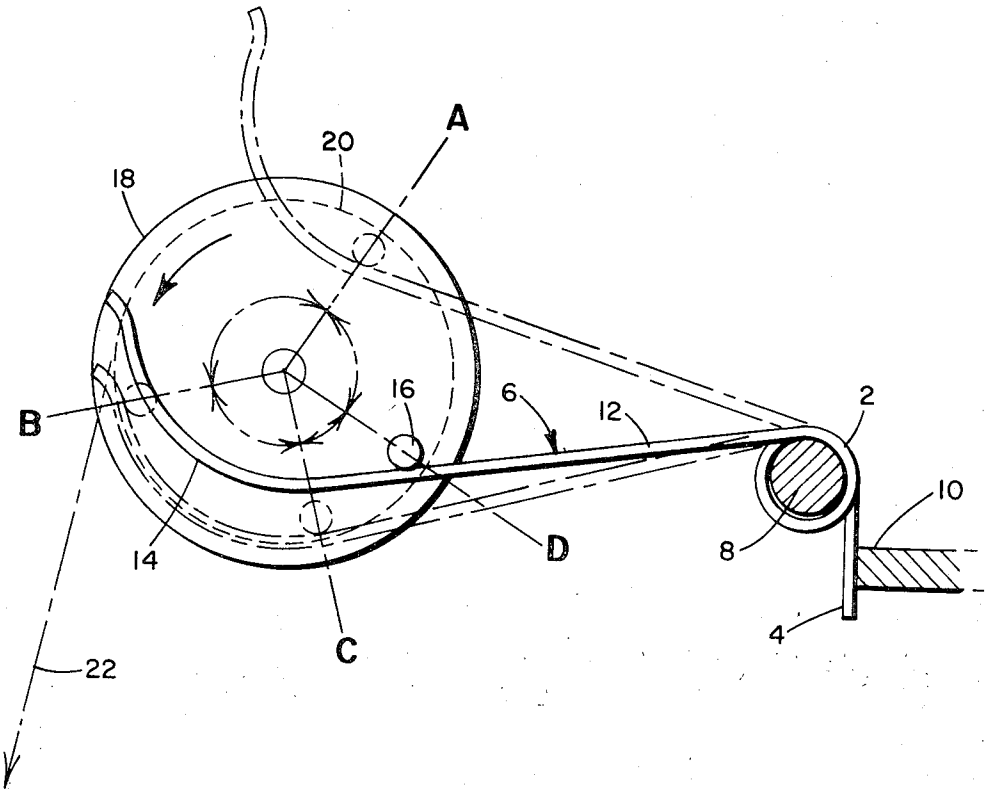
Primary Examiner—Richard A. Schacher

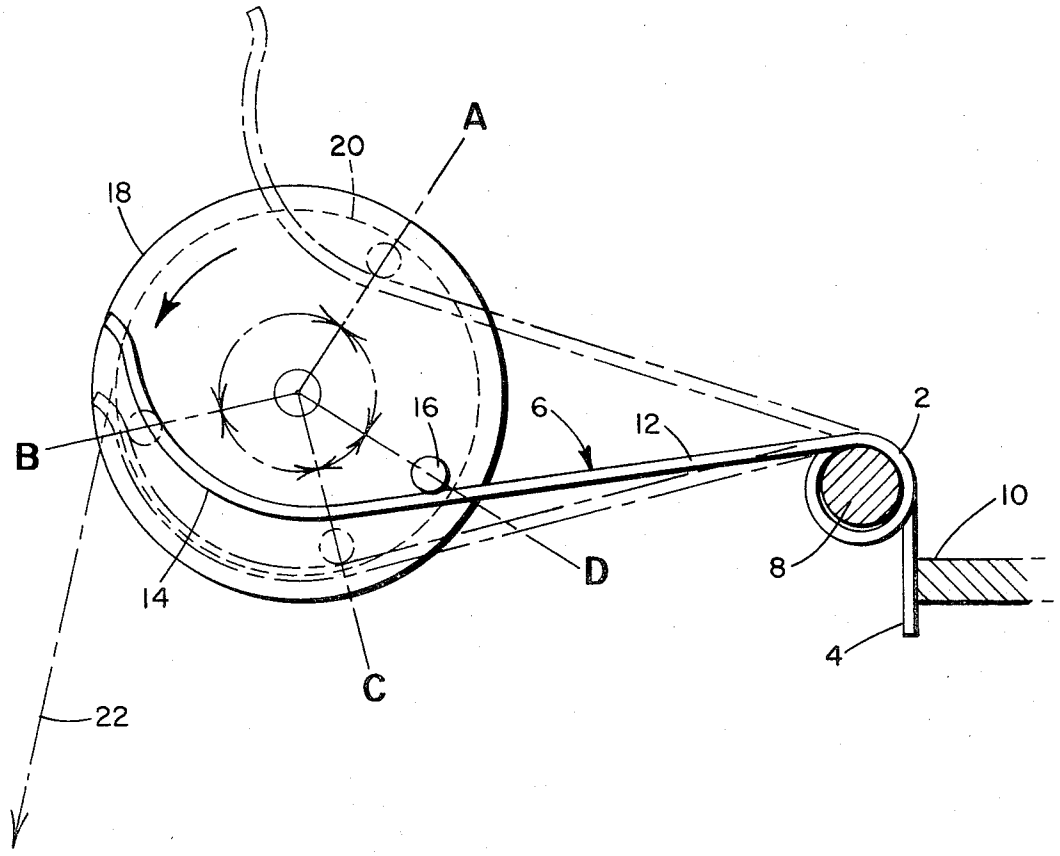
Attorney, Agent, or Firm—Schuyler, Birch, Swindler, McKie & Beckett

[57] **ABSTRACT**

In a dispenser for a web of flexible sheet material, such dispenser having a chassis and a rotatable feed roller for feeding the web material out of the dispenser, such roller having a member mounted adjacent one end with such member having a cam follower eccentrically mounted thereon, a drive spring comprising an intermediate portion anchored to the dispenser chassis and first and second outwardly extending portions integrally affixed to opposite ends of such intermediate portion. The first outwardly extending portion abuts a portion of the dispenser chassis. The second outwardly extending portion cooperates with the cam follower for deflection thereby during rotation of the feed roller and provides a decreasing moment against rotation of the feed roller while maintaining substantially constant deflection of the spring during a portion of the feed roller rotation.

5 Claims, 1 Drawing Figure




A
20
18
B
16
6
12
2
10
8
D
14
C
4
22

CONTOURED FEED SPRING

BACKGROUND OF THE INVENTION

The instant invention relates to a spring for drivingly rotating a feed roller in a dispenser for a web of flexible sheet material. The device is particularly applicable to dispensers in which a preselected length of the supply web is severed after being withdrawn by a user, and another preselected length is automatically fed outside the dispenser to be grasped by another user.

The prior art presents several types of springs for drivingly rotating a dispenser feed roller during a portion of its cycle, but none has been completely satisfactory. The prior art devices generally include an arm mounted for rotation with the feed roller and carrying an eccentrically mounted member for coacting with a spring, either a tension spring, a leaf spring, or a tangentially extending portion of a torsion spring. In such prior art devices the rotation of this arm from its position of minimum spring deflection to a position 180° from that position has entailed increasing deflection of the drive spring. Accordingly, the restoring force exerted by the drive spring increases throughout this 180° rotation, thus presenting substantial resistance to the rotation of the feed roller during this portion of the cycle and thus substantial resistance to the withdrawal of the web material. Excessive resistance to the withdrawal of the web material is undesirable and may cause a towel to be torn prior to completion of the dispensing cycle.

SUMMARY OF THE INVENTION

It is a primary object of this invention to provide a dispenser feed spring adapted to provide a low and generally decreasing resistance to feed roller rotation during the major portion of the dispensing cycle.

Another object of the invention is to provide a feed roller spring which is fully cocked to its position of maximum deflection during a small portion of the rotation of the dispenser feed roller, and which has a constant or decreasing deflection over a substantial majority of the rotation of such feed roller.

Briefly, the invention contemplates a drive spring for use in a dispenser for a web of flexible sheet material, such dispenser having a chassis and a rotatable feed roller for feeding the web material out of the dispenser and such feed roller having a member mounted adjacent one end thereof with a cam follower eccentrically mounted on such member. The drive spring comprises an intermediate portion anchored to the dispenser chassis and having a first outwardly extending portion integrally affixed to one end of such intermediate portion and a second outwardly extending portion integrally affixed to the opposite end of such intermediate portion. The first outwardly extending portion abuts the dispenser chassis, and the second outwardly extending portion cooperates with the cam follower for deflection thereby during rotation of the feed roller and provides a decreasing moment against rotation of the feed roller while maintaining a substantially constant deflection during a portion of the feed roller rotation.

BRIEF DESCRIPTION OF THE DRAWING

The invention having been generally described, a specific embodiment thereof will be discussed in detail with reference to the accompanying drawing, which is a side view of the device taken axially of the dispenser feed roll.

DESCRIPTION OF A PREFERRED EMBODIMENT

The drive spring of this invention is shown in the illustration mounted on a flexible sheet material dispenser of the general type disclosed in U.S. Pat. No. 3,575,328, the teaching of which is incorporated herein. As described herein, the dispenser feed roller cooperates through the wheel mounted adjacent one end thereof, with the angularly deflectable drive spring of this invention instead of the extension spring disclosed in the prior patent.

The drive spring includes three general portions, an intermediate portion **2**, a first outwardly extending portion **4** integrally affixed to the intermediate portion **2** at one end thereof and a second outwardly extending portion **6** integrally affixed to the intermediate portion **2** at the opposite end thereof. In this preferred embodiment the intermediate portion **2** comprises a coil torsion spring, although other similar structures, such as a beam spring, could readily be subsitituted therefor with substantially identical results. The intermediate portion **2** conveniently may be anchored to the dispenser by mounting the coil thereof over a post **8** affixed to the dispenser chassis. The first outwardly extending portion **4** of the spring is arranged to abut a stop **10** also affixed to the dispenser base, thus restraining rotation of the drive spring about the anchor member **8.** The second outwardly extending portion **6** of the spring includes a generally straight first section **12** adjacent the intermediate portion **2** of the spring and an arcuate second section **14** extending outwardly from the straight first section **12.**

The second outwardly extending portion **6** cooperates with a cam follower **16,** which is eccentrically mounted on a member **18,** such as a wheel, which is mounted adjacent one end of the feed roller **20** (indicated in phantom) of the dispenser.

The rotational positions "A," "B," "C" and "D" of the cam follower **16** illustrate the manner in which the drive spring is deflected during a dispensing cycle of rotation of the feed roller **20** and its associated wheel **18.** At position "A" the drive spring is in its configuration of minimum deflection, the only load on the spring being any preload desirable to maintain contact between the first outwardly extending portion **4** of the spring and the stop **10** and between the second outwardly extending portion of the spring **6** and the cam follower **16.** As a length of web material **22** (indicated in phantom) is withdrawn from the dispenser over the surface of the feed roller **20,** it causes counterclockwise rotation of the wheel **18,** as indicated by the arrow. During rotation of the wheel **18** between positions "A" and "B" the drive spring is deflected from its position of minimum deflection at "A," as shown in phantom, to its position of maximum deflection at "B," also shown in phantom. The arcuate second section **14** of the second outwardly extending portion **6** of the drive spring has a radius of curvature substantially equal to the radial distance between the axis of rotation of feed roller **20** and wheel **18** and the radially outer surface of the cam follower **16,** which surface is in contact with the drive spring at position "B." Accordingly, during rotation of the feed roller **20** and wheel **18** from position "B" to position "C," wherein the cam follower **16**

remains in contact with the constant radius arcuate section **14** of the drive spring, the deflection of such drive spring remains constant. Due to this constant deflection, the force exerted by the spring, normal to its deflected position, remains constant. The force exerted by this drive spring resisting rotation of the feed roller **20** derives from the component of force exerted by the spring in the direction normal to the linear first section **12** of the spring, thus normal to a radial line extending from the center of the wheel **18** at position "B." The resulting rotation-resisting moment created by such spring force equals the spring force multiplied by the linear displacement of the cam follower **16** from the center of rotation of the wheel **18** along the "B" axis. This linear displacement component decreases continually from a maximum at the "B" position to zero at the "C" position, when the force normal to the spring deflection is exerted directly through the center of rotation of the feed roller and wheel. Accordingly, due to the constant deflective force exerted by the spring and the decreasing moment arm upon which it acts, the moment exerted by the spring resisting rotation of the feed roller **20** decreases continuously as the feed roller is rotated between position "B" and position "C." Between position "C" and position "A" the force exerted by the spring tends to cause further counterclockwise rotation of the feed roller **20.**

Position "D" in the cycle of rotation of the feed roller corresponds to the momentary stop position described in the aforementioned U.S. Pat. No. 3,575,328. At this point, the feeding of the web of material out of the dispenser is stopped momentarily so that the dispensed predetermined length may be torn from the web. After a momentary pause, a timing mechanism releases the feed roller **20** and wheel **18** to permit the upward force exerted by the driving spring against the cam follower **16** to rotate the wheel and roller from position "D" to the rest position "A" of minimum spring deflection.

By virtue of this invention the resistance by the spring to the rotation of the feed roller between positions "B" and "D," in which part of the dispensing cycle the perforating or severing of the web occurs, is substantially reduced in comparison to the prior art structures. This reduction in resistance to such rotation facilitates even perforation and severing of a predetermined length from the web.

The foregoing illustrates a preferred embodiment of the structure of this invention. However, since numerous variations in the structure, including the use of a leaf spring instead of a coil spring, varying methods of anchoring the spring to the dispenser chassis and the use of a crank arm or other member in the place of the wheel will be readily apparent to those skilled in the art and are considered to be fully within the scope of the invention herein, the invention is not to be limited to the specific structure described but is to embrace all equivalents within the scope of the claims appended hereto.

I claim:

1. In a dispenser for flexible sheet material, said dispenser having a chassis and a rotatable feed roller for feeding said material out of the dispenser, said feed roller having a member mounted adjacent one end thereof, said member having a cam follower eccentrically mounted thereon, a drive spring comprising:

an intermediate portion anchored to said chassis;

a first outwardly extending portion integrally affixed to one end of said intermediate portion and abutting a portion of said chassis; and

a second outwardly extending portion integrally affixed to the opposite end of said intermediate portion and cooperating with said cam follower for deflection thereby during rotation of said feed roller and member, said second portion being configured to provide a decreasing moment against rotation of said feed roller while maintaining substantially constant deflection during a portion of said feed roller rotation.

2. A drive spring according to claim **1,** wherein said second outwardly extending portion comprises a first section adjacent said intermediate portion and a second section remote from said intermediate portion, said second section defining an arc of substantially constant radius with said radius generally equal to the radial displacement of the radially outer surface of said cam follower from the axis of rotation of said feed roller and said member.

3. A drive spring according to claim **2,** wherein said first section of said second outwardly extending portion is linear.

4. A drive spring according to claim **1,** wherein said intermediate portion comprises a coil.

5. A drive spring according to claim **4,** wherein said outwardly extending portions extend tangentially of said coil.

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