United States Patent

[11] 3,608,804

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[54] **WEB HANDLING MECHANISM FOR CARTON-BLANK-FORMING APPARATUS OR THE LIKE**
10 Claims, 6 Drawing Figs.

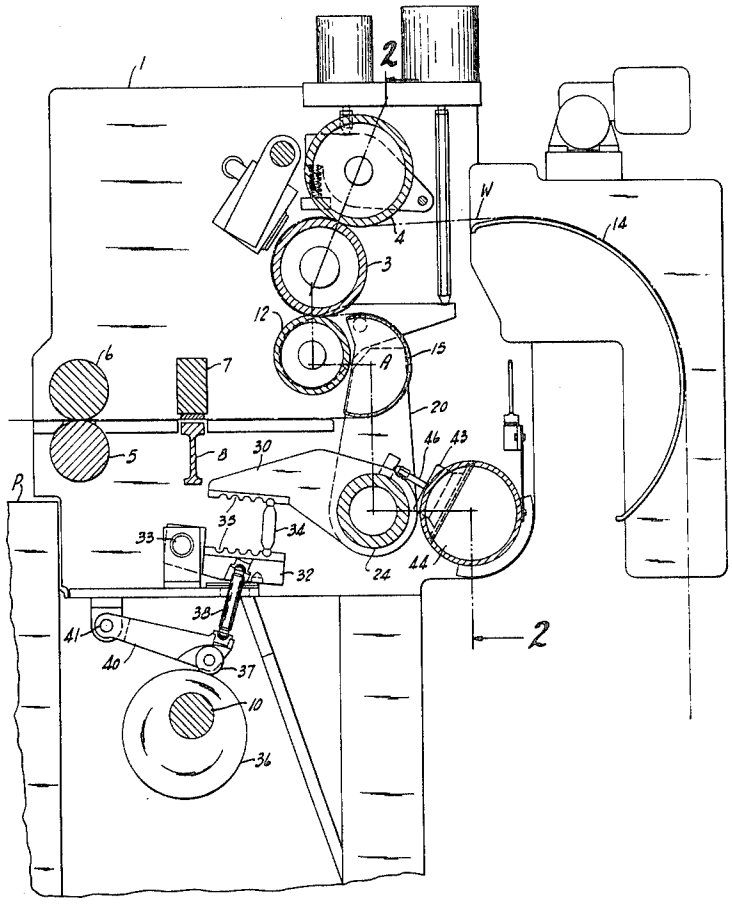
[52] **U.S. Cl.** **226/114,** 226/117
[51] **Int. Cl.** **B65h 17/44**
[50] **Field of Search** 226/113, 114, 117, 115; 83/236, 262

[56] **References Cited**
UNITED STATES PATENTS

2,550,680	5/1951	Ewing et al.	226/117
3,385,178	5/1968	Zernov	226/117 X

Primary Examiner—Allen N. Knowles
Assistant Examiner—Gene A. Church
Attorney—James E. Nilles

ABSTRACT: web-handling apparatus for feeding a web to a carton-forming press or the like and in which the web is continuously fed by metering rolls and after passing through the metering rolls the web is intermittently stopped prior to its entry into the press. The loop in the web which is intermittently formed between the metering rolls and the intermittent feed rolls has means movable therewith and which prevents slapping action of the loop as it is taken up by the feed rolls when the latter are engaged.



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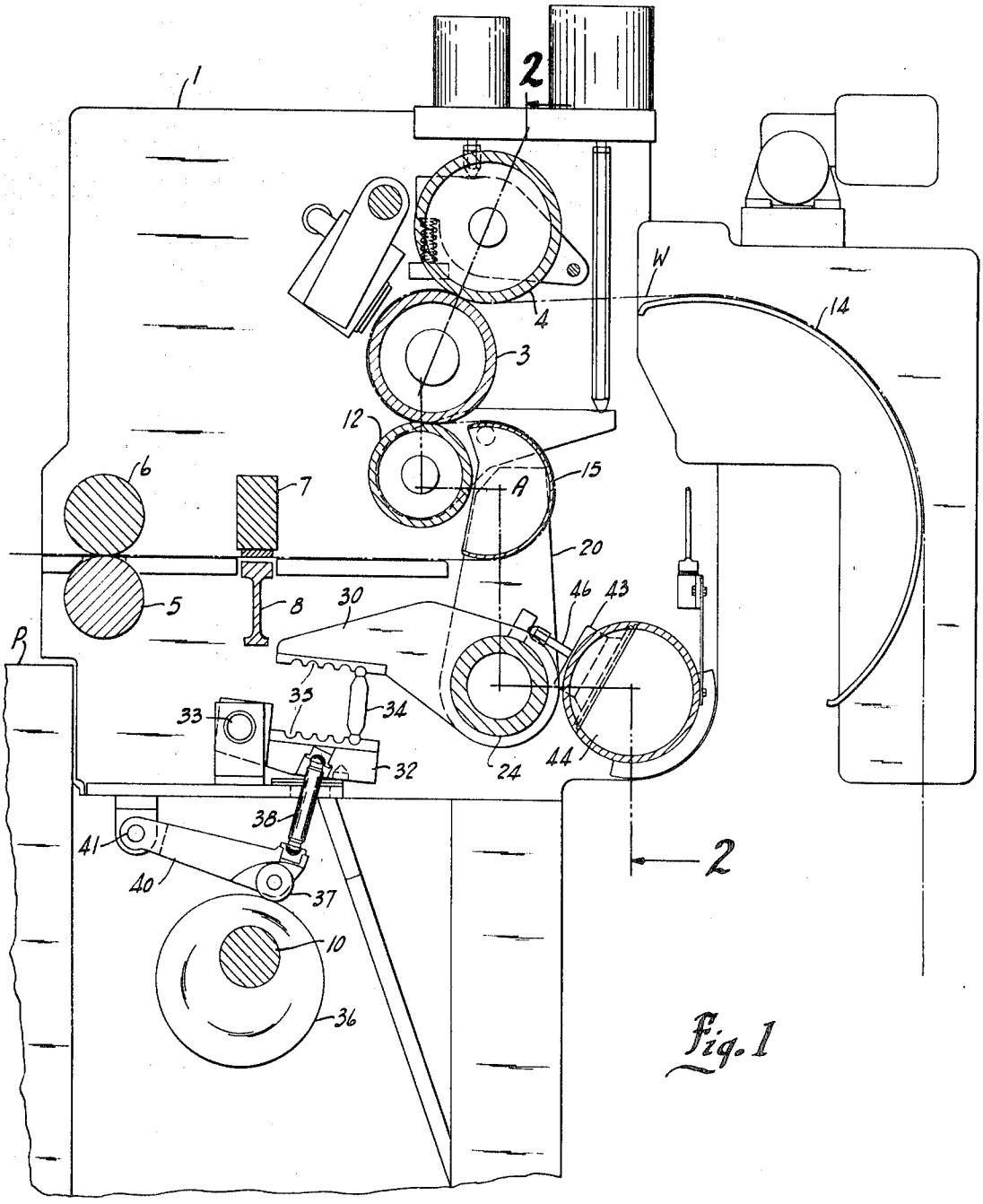

Fig. 1

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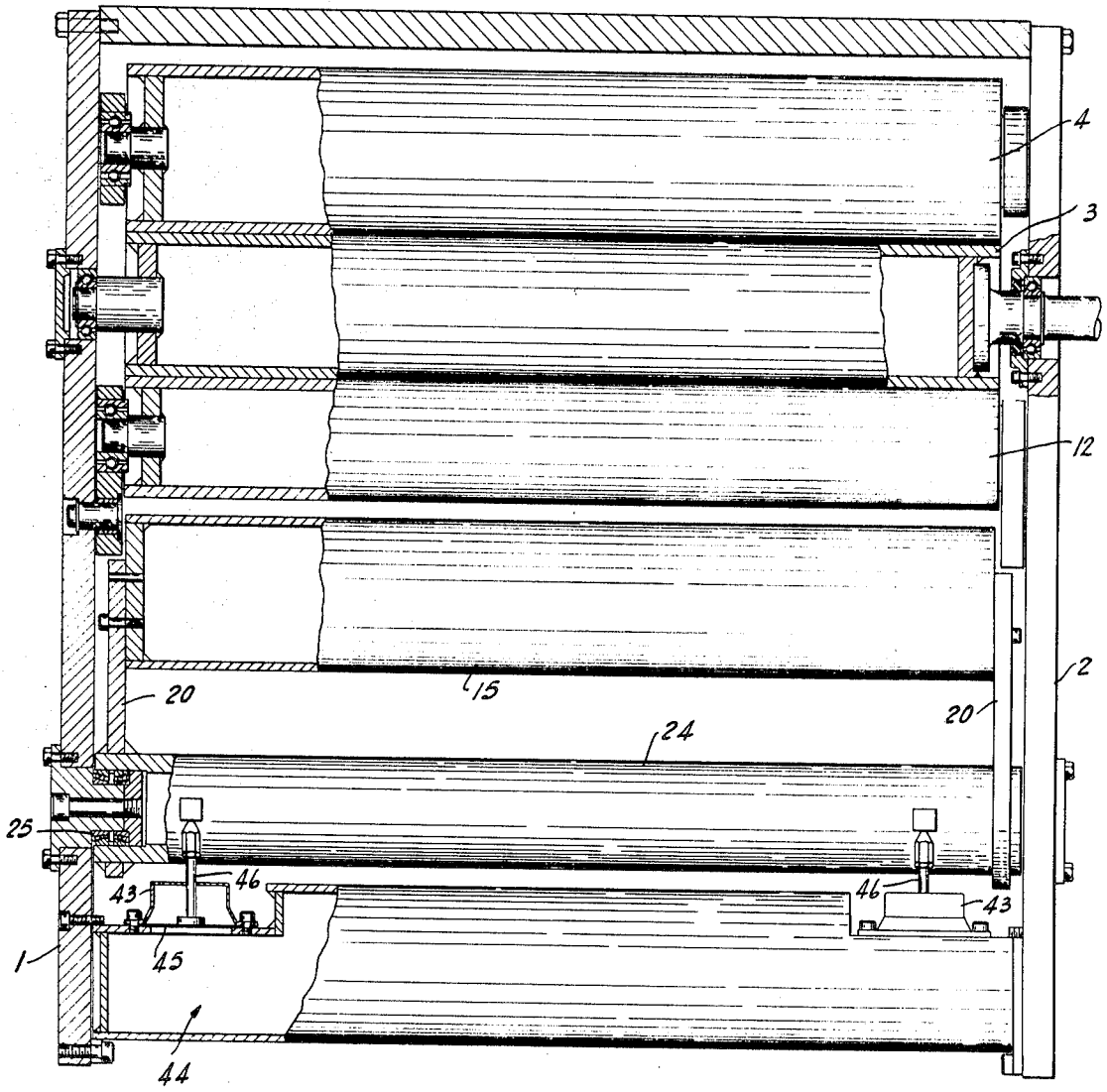

Fig. 2

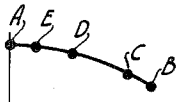

Fig. 6

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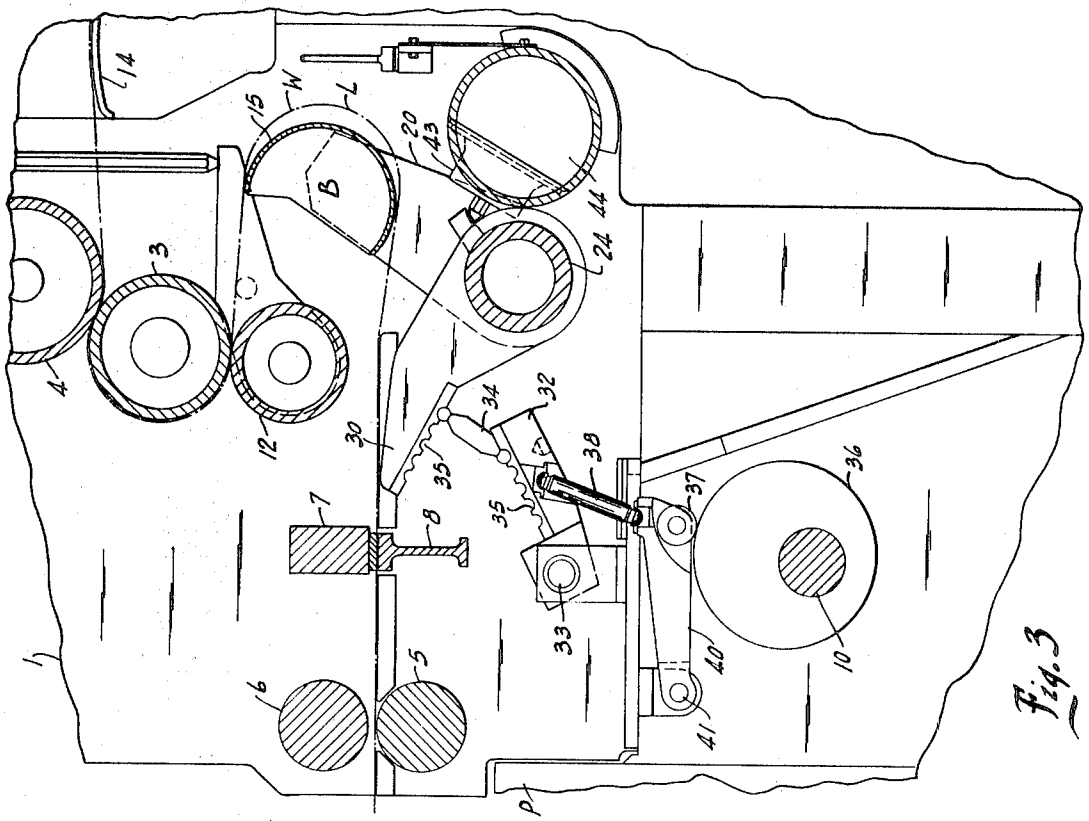

Fig. 3

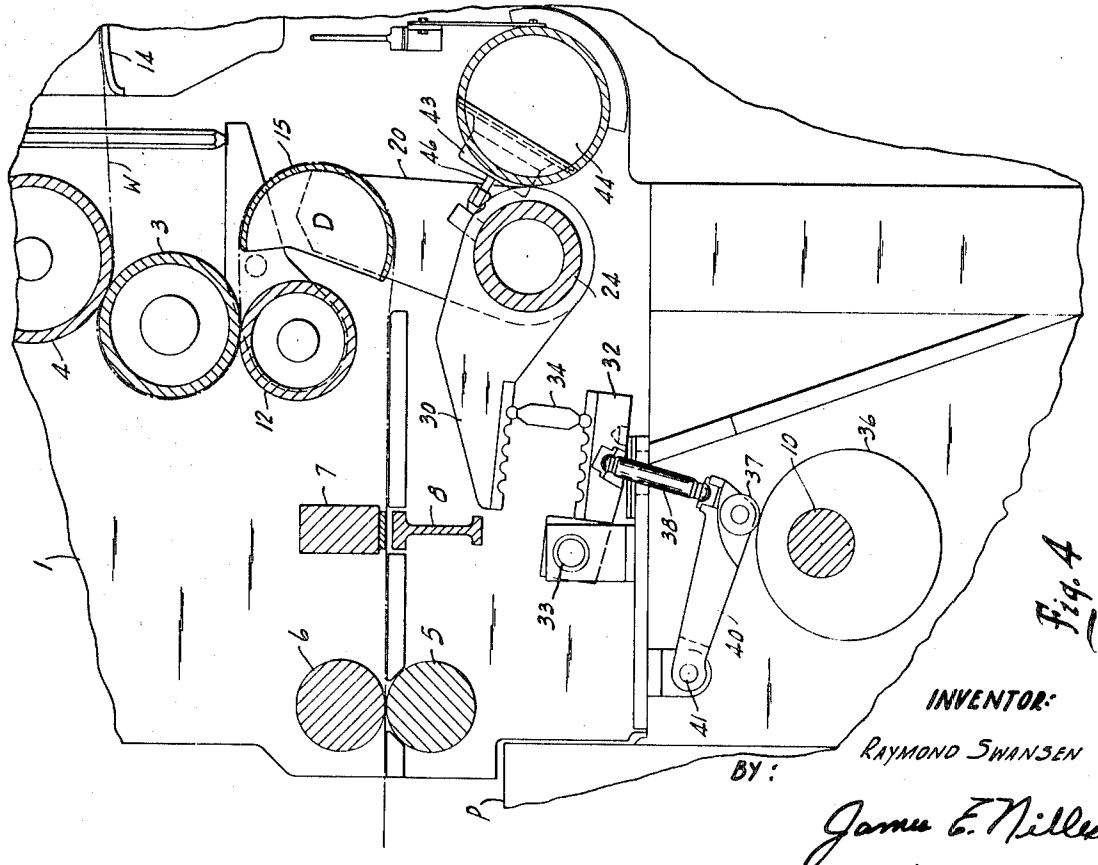

Fig. 4

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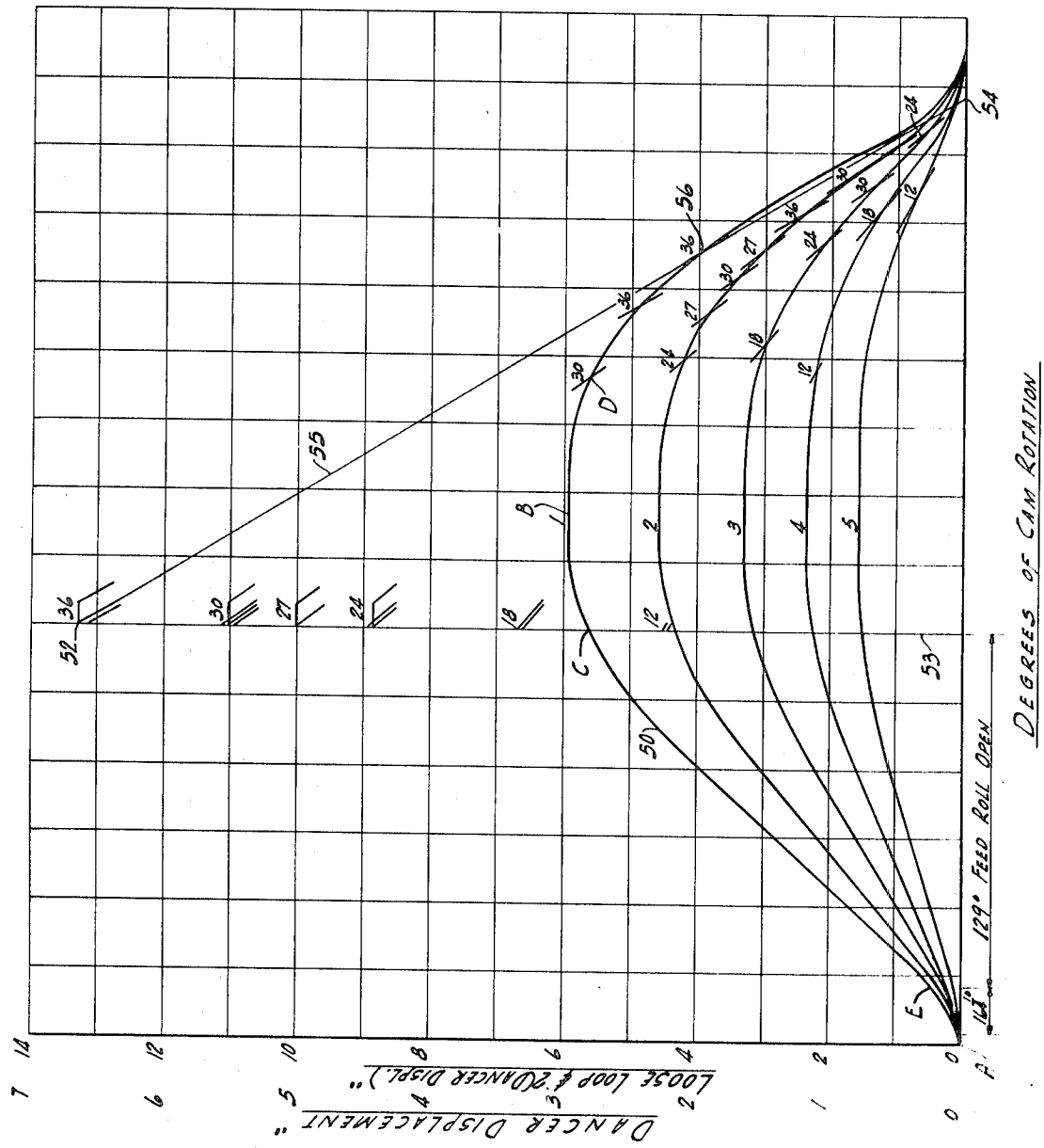
Fig. 5



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WEB HANDLING MECHANISM FOR CARTON-BLANK-FORMING APPARATUS OR THE LIKE

BACKGROUND OF THE INVENTION

Carton-blank-forming presses operate intermittently and a web is fed thereto for intermittent operation on the web. As a result, the web must be started and stopped at the entry side of the press so as to feed successive lengths of web to the press. The carton-blank-handling apparatus located at the entry side of the press usually consists of a set of metering rolls which act continuously on the web to precisely feed the web at a measured rate. After the web passes through the metering rolls, it then passes between a brake bar which can periodically clamp the web to stop its movement, and then passes through intermittently acting feed rolls which periodically engage the web and feed a length into the press. The web periodically forms into a loop when the brake bar is clamped down because the metering rolls continue to feed the web, and then when the brake bar is released and the feed rolls again act on the web, the loop is drawn out and the web is again under tension.

Such a prior art web-handling apparatus is shown in the U.S. Pat. No. 3,385,178, issued May 28, 1968 to P. Zernov and entitled "Drive Mechanism for Carton-Blank-Forming Press." That mechanism discloses a web-handling apparatus at the entry end of the press, and which apparatus permits the formation of a free loop at the discharge side of the metering rolls. When the loop of that device was pulled or snapped out by the action of the intermittently acting feed rolls, the loop was pulled tightly or snapped against certain parts of the apparatus causing noise, slapping, or a violent thump, and because of little available settling time misregistry or misfeeding of precise lengths of web resulted.

SUMMARY OF THE PRESENT INVENTION

The present invention provides a web-handling apparatus including a set of metering rolls, a pair of intermittently acting feed rolls and a releasable brake bar located between the pairs of rolls for periodically stopping movement of the web. The apparatus furthermore has a movable dancer which generally follows the loop of the web as it is being formed at a location between the metering rolls and the brake bar, and the timing of the dancer with respect to movement of the loop when the latter is being snapped out is such that the dancer is moving in the same direction as the loop being pulled out and ultimately, the loop makes contact with the dancer as it is moving in the same direction. The result is to eliminate the violent slapping or snapping action of the loop as it is being pulled taut by the feed rolls, and also provides greater settling time in the cycle.

These and other objectives and advantages of the present invention will appear hereinafter as this disclosure progresses, reference being made to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a vertical, cross-sectional view through the web-handling apparatus embodying the present invention;

FIG. 2 is a view taken generally along the line 2–2 in FIG. 1;

FIG. 3 is a view similar to FIG. 1, but showing the web in a loop-forming position;

FIG. 4 is a view similar to the view in FIG. 3, but showing the dancer when the loop makes contact with it when moving to the left as viewed in the drawing;

FIG. 5 is a graph showing the position of the dancer and also of the loop relative to the degree of cam rotation of the apparatus; and

FIG. 6 is a schematic diagram of various positions of the dancer.

DESCRIPTION OF A PREFERRED EMBODIMENT

The apparatus shown in FIG. 1 is similar in many respects to that shown in the said U.S. Pat. No. 3,385,178 and such apparatus includes two heavy side members 1 and 2 which are fabricated from heavy plate steel and which form the frame of the machine. A set of metering rolls 3, 4, and 12 are located in the frame and roll 3 can be driven in the manner of that shown in the said U.S. Pat. No. 3,385,178. It is believed sufficient to say for purposes of this disclosure that these metering rolls are driven in such a manner so that they precisely feed the web W. A pair of intermittently acting feed rolls 5 and 6 are also located in the machine and as shown in FIG. 1 are closed together to provide a nip for feeding the web into the press P. As the press P is conventional and as the means for intermittently opening and closing the feed rolls is conventional, it is not believed necessary to describe such in detail, but if further detail is believed to be either necessary or desirable in respect to the press or means for driving the feed rolls, reference may be had to the said U.S. Pat. No. 3,385,178.

A brake bar is also provided in the frame and this includes a stationary upper portion 7 and a reciprocable lower brake bar 8. The brake bar has been shown in FIG. 1 as being open and, generally, when the brake bar is closed, the feed rolls 5 and 6 are open, and conversely, when the feed rolls 5 and 6 are closed to feed the web, the brake bar is opened. This means for periodically opening the brake bar is also shown in the said U.S. Pat. No. 3,385,178 and it will be noted that the drives for both the feed rolls 5 and 6 and the brake bar 8 are from the cam shaft 10 mounted in the machine. In respect to the brake bars, it is believed sufficient to say that the lower bar is periodically moved in a vertical direction to open and close the brake bar in timed relation with the feed rolls 5 and 6.

An apron 14 is provided at the entry side of the metering rolls to guide the web into the metering rolls.

In operation, the metering rolls constantly feed the web, whereas the feed rolls 5 and 6 only intermittently feed the web. Consequently, a loop L (FIG. 3) is developed between the pairs of rolls whenever the feed rolls are open (not feeding) and the brake bar is closed to clamp the web. When the brake bar is opened and the feed rolls engaged, the latter quickly pull the loop out of the web and heretofore, this snapping movement of the web has caused misfeeding of the precise lengths of the web at high speeds.

In accordance with the present invention, a movable dancer 15 has been provided for moving in timed relationship to the formation and pulling out of the web. This dancer takes the form of a generally semicircular in cross section tube which is mounted at either end on a pair of arms 20, which arms in turn are rigidly fixed to the tubular shaft 24. The shaft 24 is journaled on appropriate antifriction bearings 25 (FIG. 2) in the sidewalls 1 and 2, and can be oscillated so as to swing the dancer 15 between the positions shown in FIGS. 1 and 4 and in a timed manner in relationship to the web loop being formed and pulled out. An arm 30 is rigidly secured to the central portion of shaft 24 and this arm is urged in a clockwise direction (as viewed in FIG. 1) by a cam-driven pivoted arm 32. Arm 32 is pivoted at 33 and an adjustable connecting link 34 is positioned between arms 30 and 32 in any one of a number of adjusted positions, as by being inserted in any one of a pair of aligned notches 35 formed in arms 30 and 32. The position of the link determines the amount of "feedup" that is to say, it determines the amount of swinging movement of the dancer in accordance with the length of "feedup" of the web provided by the metering rolls 3 and 4. The arm 32 in turn is oscillated about its pivot point 33 by the action of the cam 36 which is rotatable with the camshaft 10, and which cam causes the follower 37 and its associated link 38 to swing the arm 32. The follower 37 is mounted on an arm 40 which is pivoted at 41 on the frame.

The shaft 24 is urged to the counterclockwise position (FIG. 1) by means of the pair of air cylinders 43, one located adjacent each end of the shaft 24 (FIG. 2). A compressed air chamber 44 is provided for both of the air cylinders 43 and acts on the diaphragm 45 of the cylinder 43 to shift the plungers 46. Thus, elongated chamber 44, located transversely of the web, acts as an accumulator so that rapid and positive biasing of shaft 24 is provided by the cylinders 43 and this biasing is accomplished without any lost motion or delay

because of the relatively large volume of pressure action in chamber **44** and acting on the diaphragm **45** of each of the cylinders **43**.

As mentioned, the cam **36** is driven from the same camshaft **10** that drives similar cams (not shown) for actuating the feed rolls **5** and **6** and the brake bar **8** and these drive means are clearly shown in the said U.S. Pat. No. 3,385,178.

Thus, the feed roll, the brake bar and the dancer are all moved in precise timed relation with the formation and pulling out of the web, as will now be described.

As shown in FIG. **1**, the position of the dancer **15** is shown at the extreme left position, the web has been tightly drawn around the dancer by the feed rolls **5** and **6**, the feed rolls are slipping, and the brake bar **8** is open. This position of the dancer will be referred to as position A, that is the extreme left-hand position, when viewed in the figures.

As shown in FIG. **3**, the dancer has almost moved to its extreme right-hand position which will be referred to as position B. Just as the dancer moves to the extreme right position, the feed rolls **5** and **6** will then close and the brake bar opens. It will be noted when the dancer is in the position shown in FIG. **3**, the loop L of the web is positioned considerably to the right of the dancer, in other words, the displacement of the web is considerably more than the displacement of the dancer from its original position A.

In FIG. **4**, the dancer is shown as moving to the left and the web which is being pulled by the closed feed rolls **5** and **6** has just engaged the dancer. It is at this point, which will be referred to as location D, that the velocity of the moving web closely matches the velocity of the dancer and consequently, reduced noise and slap is obtained.

As shown in FIG. **6**, the relative positions of the dancer are indicated by numerals A, B, C, D, and E. Position C is that position of the dancer as it is moving from left to right and at which point the feed rolls **5** and **6** close. Position E is the position when the dancer is moving from left to right and the brake bar closes. As previously indicated, position C is where the feed rolls close as the dancer is moving from left to the right, position A is the extreme left position of the dancer and position B is the extreme right-hand position of the dancer.

The sequential positions for the dancer are as follows. From the starting position A, (FIG. **1**) the dancer then moves to the right to position C where the feed rolls close and the dancer continues to position B (FIG. **3**), the extreme right-hand position. The dancer then reverses its direction and moves to position D (FIG. **4**) where the loop L catches up to the dancer **15** which is the position where both are moving at practically the same relative velocity. When the dancer reaches point A, (FIG. **1**) the extreme left-hand position has been reached and the dancer then reverses direction again and begins to move to the right. The dancer then reaches position E where the brake bar closes and it continues its right-hand movement to position C, and the cycle continues in this manner.

Referring to FIG. **5**, the vertical axis of the graph shows the displacement, in inches, of both the dancer **15** and the loop L. It will be noted the loop is displaced twice the distance as the dancer because there are two sides of the loop that surrounds the dancer. Curve **50** represents the equivalent displacement of the dancer **15** for that particular setting of the link **34** shown in FIG. **1**. The positions A, B, C, D, and E have also been located on this curve. Position B, at the top of the curve, is the right-hand most position of the dancer, and is the top dead center point of the cam **36**. The point **52** represents the maximum repeat length, say 36 inches, for the web being handled and is located along an ordinate **53** which is the point at which time feed rolls close. Point **54** is the point at which the feed rolls would pull the web to touch the dancer if the dancer was a stationary dancer located in position A. Therefore, point **54** must be located so that the displacement line **55** can be drawn between point **52** and **54**.

The displacement line **55** is the displacement line of the web and the slope of this line is the web velocity. It is desired to match the web velocity with the equivalent velocity of the dancer and therefore, the point of intersection of line **55** and curve **50**, namely at **56**, is the point of impact with the web with the moving dancer. It will be noted that the slope of the two lines very closely match at the point **56** and therefore, there will be minimum noise or slap between the web and dancer. Stated otherwise, the curve **50** represents the displacement of the dancer while the line **55** represents the web displacement and it is desired to match slopes, namely the velocity of these two curves. Thus, it is possible to determine the point of web contact with the dancer at which they have a closely matched velocity.

Point **52** may need to be shifted slightly to the right as viewed in the graph because it takes a small period of time for the feed rolls **5** and **6** to bring the web up to its velocity, after the rolls close.

By means of the present invention, a shiftable and timed dancer is located between the metering and feed rolls so that the loop L can abut against the dancer moving in the same direction as the loop is being pulled out, the velocity of the web and dancer at this point being matched. Thus, slapping, noise and misalignment of the parts is minimized.

In addition, by closing the brake bar on the web at a time when the dancer is moving from right to left (FIG. **1**), the absolute velocity of the web under the bar is minimized, resulting in greater stability and repeatability of repeat lengths being fed into the machine.

I claim:

1. Web-handling apparatus comprising a set of continuously metering rolls for a web, a pair of intermittent feed rolls for said web, a brake bar located between said pairs of rolls and shiftable between web-clamping and web release positions; whereby a web passing through said pair of metering rolls is repeatedly formed into a loop and the loop then pulled out, and a shiftable dancer located on the discharge side of said metering rolls for engagement by said loop and means for shifting said dancer in timed relationship with said loop whereby when the loop is being pulled out said loop contacts said dancer at a relatively closely matched velocity and when moving in the same direction.

2. The apparatus set forth in claim **1** further characterized in that said means for shifting said dancer comprises an adjustable linkage for varying the displacement of said dancer to accommodate different repeat lengths of the web.

3. The apparatus of claim **2** including a cam for actuating said linkage in timed relationship with the feeding of said web.

4. The apparatus as described in claim **2** including air-loaded cylinder means for biasing said linkage against said cam and said dancer in one direction.

5. The apparatus set out in claim **4** further characterized in that said cylinder means includes a closed cylinder extending transversely in respect to the web, and a shiftable plunger is located at each end of said cylinder and biased by air pressure therein for said biasing of said linkage.

6. Web-handling apparatus comprising a set of continuously feeding web-metering rolls for precisely metering the speed of the web, a pair of intermittent feed rolls at the discharge side of said metering rolls and for intermittently feeding the web, a brake bar located between said pairs of rolls and adapted to shift between web-clamping and web release positions; whereby a web passing through said pair of metering rolls is formed into a loop when said brake bar is in said web-clamping position, and said loop is then pulled out of said web when said intermittent feed rolls are feeding and said brake bar is in the web-releasing position; and a shiftable dancer located between said metering rolls and said brake bar for shifting movement generally with said loop, and means for shifting said dancer in timed relationship with movement of said loop whereby when said feed rolls are pulling said loop out of said web, said loop contacts said dancer at a relatively closely matched velocity.

7. The apparatus set forth in claim **6** further characterized in that said means for shifting said dancer comprises an adjustable linkage for varying the displacement of said dancer to accommodate different repeat lengths of web.

8. The apparatus of claim 7 including a cam for actuating said linkage in timed relationship with the feeding of said web.

9. The apparatus as described in claim 7 including air-loaded cylinder means for biasing said linkage against said cam and said dancer in one direction.

10. The apparatus set out in claim 9 further characterized in that said cylinder means includes a closed cylinder extending transversely in respect to the web, and a shiftable plunger is located at each end of said cylinder and biased by air pressure therein for said biasing of said linkage.