WEB FEEDING APPARATUS FOR CARTON BLANK FORMING MECHANISM

3,174,670

United States Patent Office

Patented Mar. 23, 1965

WEB FEEDING APPARATUS FOR CARTON BLANK FORMING MECHANISM

Peter Zernov, Wauwatosa, Wis., assignor to Zerand Corporation, Menomonie Falls, Wis., a corporation of Wisconsin

Filed May 6, 1963, Ser. No. 270,337
6 Claims. (Cl. 226—117)

This invention relates to carton forming mechanism for handling a rapidly running web of paper or paper board, and more particularly relates to the feed rolls for such mechanism for precisely metering the length of web that is fed to the mechanism for each cycle. In this type of mechanism it is extremely important to be able to feed an exact length of web for each cycle in order to insure proper carton formation, or other function being performed on the web, and these cycles occur many times per minute. In machines of this character, a free loop is formed in the web between the pair of metering rolls and a pair of intermittent feed rolls, such a loop being formed and used once for each cycle of the machine which is many time per minute.

It is essential that this loop, which has been precisely metered by the metering feed rolls, is pulled completely into the machine in order that the proper length of web is thereby delivered for each operation of the machine. In order to do this, there must be no impediment to complete and free “take up” of the loop and nothing should occur which would cause the loop to hesitate while finally being pulled into the machine. In other words, machine accuracy is dependent on the position of the web between the nip point of the metering feed rolls and the dies or other part of the machine that is actually performing the operation on the web.

Difficulties have been encountered in prior art machines, and in particular, one has occurred after the loop has formed away from one of the metering rolls and while the web is then again being drawn tightly into the machine. During this time of loop “take up” in which the loop is snapped out and the web is again drawn tightly around the last metering roll, a pocket of air may become trapped between the loop and this last metering roll. This prevents complete and immediate take up of the web, even though of a small dimension, which results in a shorter length of web being delivered to the machine than was measured by the metering rolls.

Accordingly, the present invention provides carton forming mechanism having an improved metering roll construction which overcomes the above difficulty and insures complete and immediate delivery of the entire length of a web loop for each cycle of the machine.

More specifically, the present invention provides a web handling mechanism of the above type and having a grooved metering feed roll which permits immediate and complete escape of any air that would otherwise become trapped between the web and the roll. Thus a definite and constant length of web is fed to the machine for each cycle.

These and other objects and advantages will appear later as this disclosure progresses, reference being had to the drawings, in which:

FIGURE 1 is a side elevational view, in section, of a machine embodying the present invention;

FIGURE 2 is a sectional view taken along line 2—2 in FIGURE 1, but on an enlarged scale; and

FIGURE 3 is a view of a part of the mechanism as shown in FIGURE 1, but showing the brake bar in the open position and the intermittent feed rolls closed.

Referring in greater detail to the drawings, the invention will be shown as used in connection with carton blank forming apparatus, with which it finds great utility. This apparatus includes a cutter-creaser press P having a base 1 which supports the upper fixed platen 2 on the four vertical corner posts 3. A lower platen 4 is vertically reciprocal on these posts by the two pairs of eccentrically driven connecting rods 5 journaled at their lower ends on crankshafts 6.

The platen carry the cutting and creasing die 7 and a base plate 8 which are removably held in place by brackets 9 in the known manner.

The press has a pair of intermittent feed rolls IF, IFU, the lower roll IF being swingable on its pivoted bracket 10 between a closed, feeding position with roll IFU and an open, non-feeding position. This swinging of the lower feed roll is effected by the thrust link 11 which is connected to one end of bracket 10 and is actuated by a cam 12 fixed on the rotary camshaft 13. The upper roll IFU is positively driven, as will appear, while the lower roll is driven through the web. Slippage of the web between the intermittent feed rolls may thus occur when the web is sufficiently taut.

An intermittently actinge brake bar BB is vertically reciprocal through its thrust link 14 by means of a cam 15 also fixed for rotation with camshaft 13. Bar BB is vertically shiftable between a web clamping position as shown in FIGURE 1 wherein it presses the web against the stationary upper brake bar BBU, and a web releasing position away from the upper bar. When the web is clamped by the bar, the intermittent feed roll IF is open, and vice versa.

A pair of metering feed rolls F, FU are provided ahead of the intermittent feed rolls in respect to the direction of web travel. Roll F is positively driven, as will appear, while roll FU receives its drive from the web. These metering rolls continuously feed the web at a constant and precise rate so that exactly the proper length of web will be fed to the machine for each cycle thereof.

The drive for the various parts of the press is furnished from an electric motor (not shown) which drives one of the crankshafts. Crankshafts 6 are connected together by intermeshing gears 20 and 21 fixed thereto; another gear 22 is fixed to one of the crankshafts and through an idler gear 23, drives the gear 24 fixed on one end of the camshaft 13. Thus, the camshaft is driven from the crankshafts. The camshaft in turn has another gear 25 on its other end for continuing the power train to the feed rolls. More specifically, metering feed roll F has a gear 26 fixed on the end of its shaft which is driven from gear 25 through the compound gears 27, 28 and an idler gear 29. Feed roll FU also has another gear 30 fixed therewith which drives the gear 31 on feed roll IFU, through the intervening idler gear 32.

The above mentioned rolls and gears are suitably journaled in the side walls S and S1 of the press in suitable antifriction bearings, and if further reference to this drive mechanism is deemed to be either necessary or desirable, reference may be had to my co-pending U.S. application Serial No. 256,020, filed February 4, 1963, entitled "Drive Mechanism for Carton Blank Forming Press."

As previously mentioned, the metering feed rolls F, FU act to continuously feed the web at an exact rate. During the time the brake bar has clamped and is thus holding the web, the feed rolls F, FU cause a web loop L to be formed.

It should be noted here that other types of intermittent feed rolls may be used with the present invention other than the above type in which one roll moves toward or away from the other to effect web feed or stoppage. For example, intermittent feed rolls of variable speed can be used and in which case when the rolls are stopped they act to stop the web and permit loop formation. With this type of variable speed intermittent feed rolls, the need for a brake bar is eliminated.

In any event, a free loop is formed between the meter-
ing feed and intermittent feed rolls, and this loop formation occurs many times per minute. A curved apron is located just past the metering rolls and the loop L forms just below this apron and between it and the metering feed roll F. When the web loop is taken up by being drawn instantaneously into the machine by the intermittent feed rolls, the web is snapped and pulled tightly over the apron. Stated otherwise, the intermittent feed rolls pull the web into the machine much more rapidly than the continuously active metering feed rolls feed the web. As a result the web loop is quickly pulled up tightly against the metering roll F.

The position of the metering rolls to one another and to that part of the press which feeds the web, is important. With the arrangement shown, where part of the metered web is wrapped around a portion of the last metering feed roll, only a minimum of free length of the web is permitted between the roll and the press, and this holds vibration of the taut web to a minimum. In so pulling the web loop against and around a portion of the roll F, heretofore some air sometimes is trapped between the web and this roll. This pocket of air may exist only for a relatively short period of time, but nevertheless it has the effect of not permitting the metered length of web to be fed into the machine by the intermittent feed rolls.

In accordance with the present invention, the feed roll F is so constructed that any air that would otherwise be trapped as above mentioned, is free to immediately and completely escape, thereby permitting the web to be drawn tightly around the feed roll F and the proper web length thus inserted in the machine. This roll construction takes the form of a series of recesses in the periphery of the tubular, steel roll F. More specifically, to insure that the air can escape from any peripheral portion of the feed roll and to that peripheral portion not intended to be wrapped up by the web, these recesses take the form of a series of circumferential grooves formed around the periphery of the roll. Furthermore, these grooves are located along substantially the entire length of the roll.

The size and spacing of these grooves may of course vary, but experience has indicated very good results with grooves ¼ of an inch wide, ¼ of an inch deep, and spaced ½ inches apart.

With the above feed roll construction, a definite and constant web length is always provided between the nip point of the metering feed rolls and the dies of the press.

Various modes of carrying out the invention are contemplated as being within the scope of the following claims particularly pointing out and distinctly claiming the subject matter which is regarded as the invention:

1. Carton blank forming apparatus comprising, a press into which a web is fed, a pair of intermittent feed rolls adjacent said press for intermittently feeding the web thereto, and a pair of continuously active metering feed rolls for continuously feeding the web to said intermittent feed rolls to thereby form a free loop between said metering feed rolls and adjacent one of said continuously active feed rolls when said intermittent rolls are not feeding the web, said intermittent feed rolls being adapted to feed the web at a faster rate than said metering rolls are not feeding the web, said intermittent feed rolls being adapted to feed the web at a faster rate than said metering rolls, thereby draw up said loop and wrap it around a portion of one of said metering feed rolls, said one metering feed roll having recesses in its periphery to permit air to escape from between said roll and web when the loop is drawn taut against said grooved roll by said intermittent feed rolls.

2. In a carton blank forming press having a pair of intermittent feed rolls for feeding the web thereto, and a pair of metering feed rolls for continuously feeding the web to said intermittent feed rolls to thereby form a free loop between said pairs of rolls and adjacent one of said continuously active feed rolls when said intermittent rolls are not feeding the web, said intermittent feed rolls being adapted to feed the web at a faster rate than said metering rolls are not feeding the web, said intermittent feed rolls being adapted to feed the web at a faster rate than said metering rolls, thereby draw up said loop and wrap it around a portion of one of said metering feed rolls, said one metering feed roll having recesses in its periphery to permit air to escape from between said roll and web when the loop is drawn taut against said grooved roll by said intermittent feed rolls.

3. Carton blank forming apparatus comprising, a press into which a web is fed, a pair of intermittent feed rolls adjacent said press for intermittently feeding the web thereto, a pair of continuously active metering feed rolls for continuously feeding the web to said intermittent feed rolls to thereby form a free loop below said metering rolls when said intermittent rolls are not feeding the web, and a curved apron between said pairs of rolls and having a surface over which said web travels and is guided thereby, one of said metering rolls having its lowermost side below the height of said surface and around which the web is adapted to wrap as it moves toward said apron, said intermittent feed rolls rotating at a speed to feed the web at a faster rate than said metering rolls to thereby draw up said loop and wrap it around said lowermost side of said one metering feed roll, said one metering feed roll having recesses in its periphery to permit air to escape from between said roll and web when the loop is drawn taut against said recessed roll by said intermittent feed rolls.

4. Apparatus as defined in claim 3 further characterized in that said recesses are circumferential grooves around the periphery of said one roll and spaced axially along the length thereof.

5. Carton blank forming apparatus comprising, a press into which a web is fed, a pair of intermittent feed rolls adjacent said press for intermittently feeding the web thereto, and means for continuously feeding the web to said intermittent feed rolls to thereby form a free loop between said pairs of intermittent feed rolls and means when said intermittent rolls are not feeding the web, said intermittent feed rolls being adapted to feed the web at a faster rate than said continuously feeding means, said means including a roll having recesses in its periphery to permit air to escape from between said recessed roll and web when the loop is drawn taut against said recessed roll by said intermittent feed rolls.

6. Carton blank forming apparatus comprising, a press into which a web is fed, a pair of intermittent feed rolls adjacent said press for intermittently feeding the web thereto, and a pair of continuously active metering feed rolls for continuously feeding the web to said intermittent feed rolls, said intermittent feed rolls being adapted to feed the web at a faster rate than said metering rolls to thereby draw up said loop and wrap it tightly around a portion of one of said metering feed rolls, said one metering feed roll having circumferential grooves around its periphery to permit air to escape from between said roll and web when the web is drawn taut against said grooved roll by said intermittent feed rolls.

References Cited in the file of this patent

UNITED STATES PATENTS

1,785,546 Flett December 16, 1930
2,652,247 Kane September 15, 1953
2,717,037 Goodville September 15, 1955
2,952,201 Gibson September 13, 1960
3,098,596 Kulicke et al. July 23, 1963

FOREIGN PATENTS

498,343 Canada December 15, 1953