May 28, 1968 P. ZERNOV 3,385,178

DRIVE MECHANISM FOR CARTON BLANK FORMING PRESS

Filed Nov. 23, 1966 4 Sheets-Sheet 1

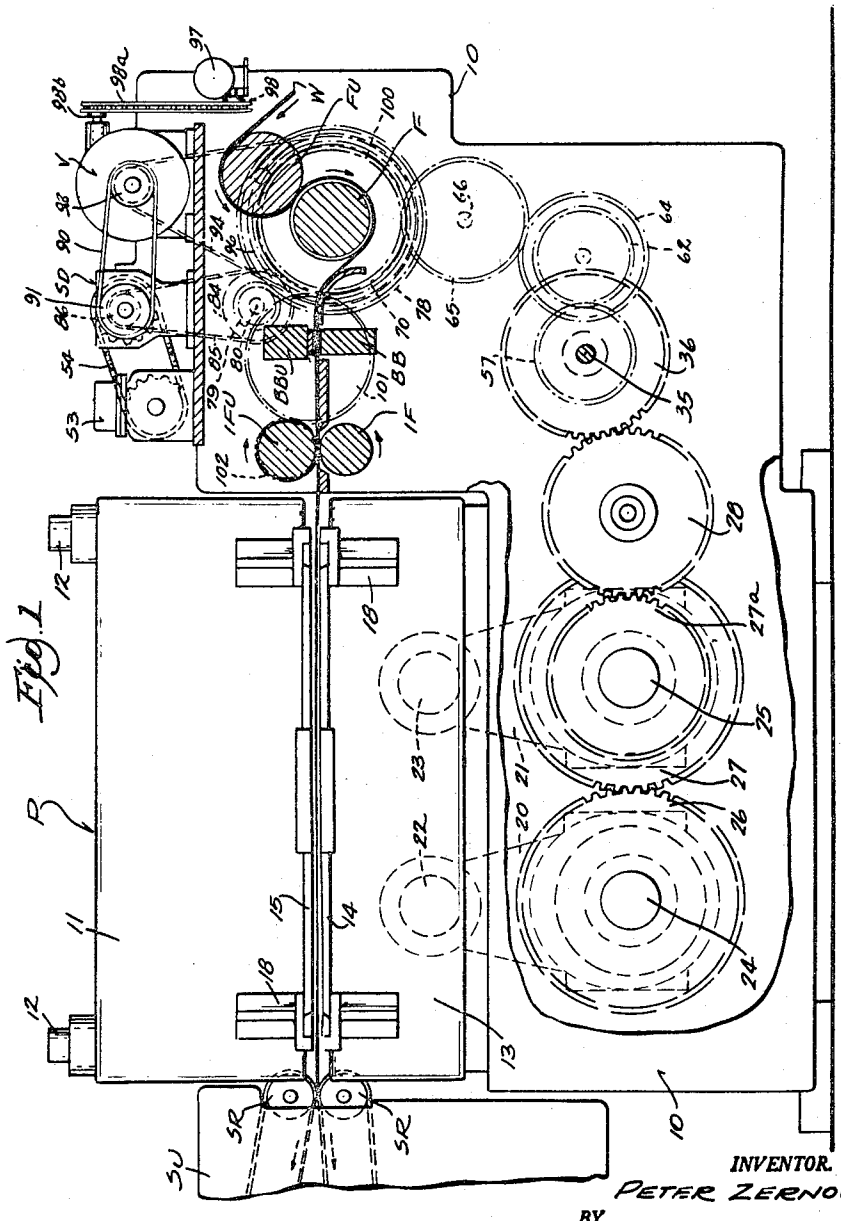


Fig. 1

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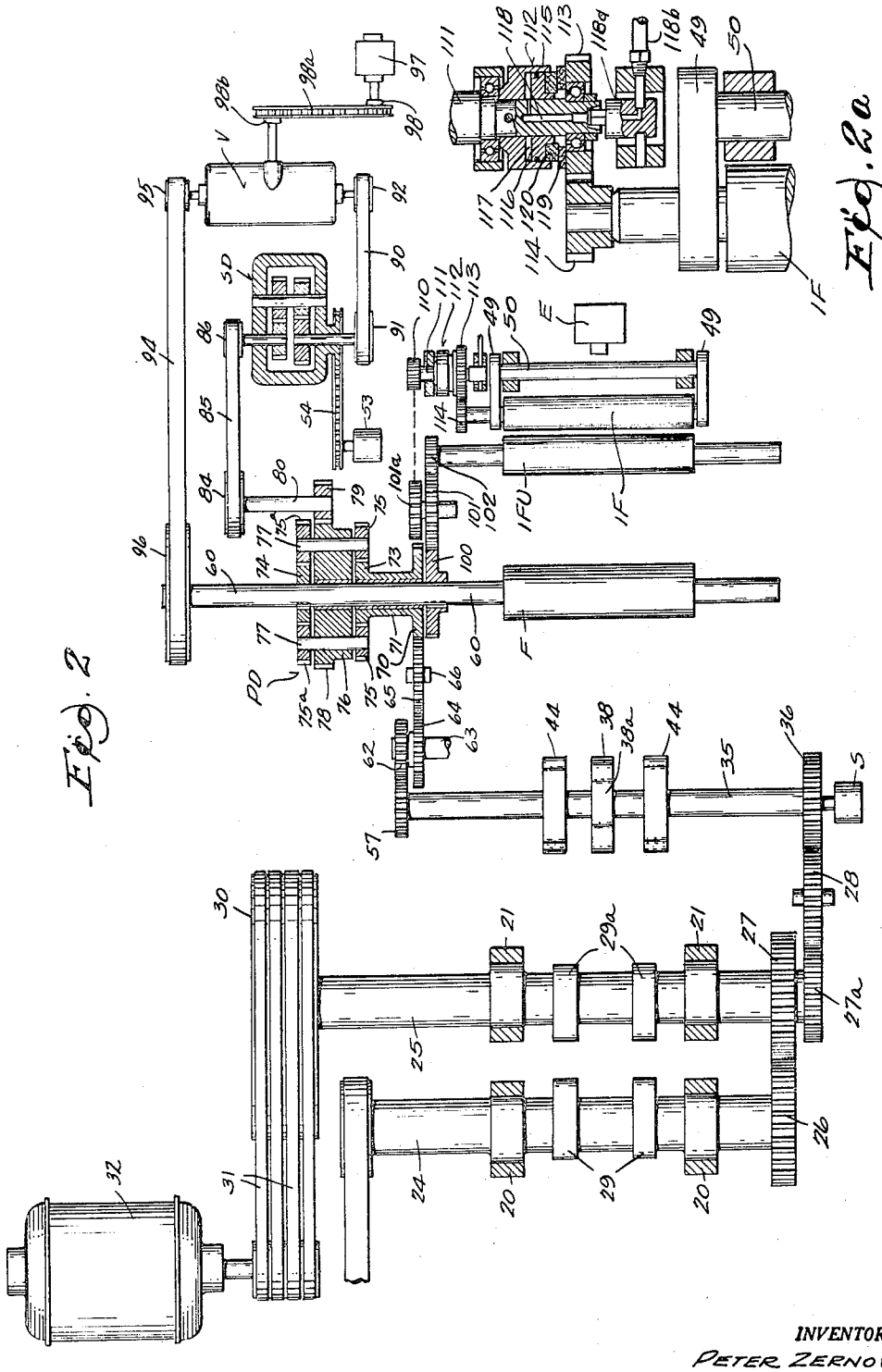


Fig. 2

Fig. 2a

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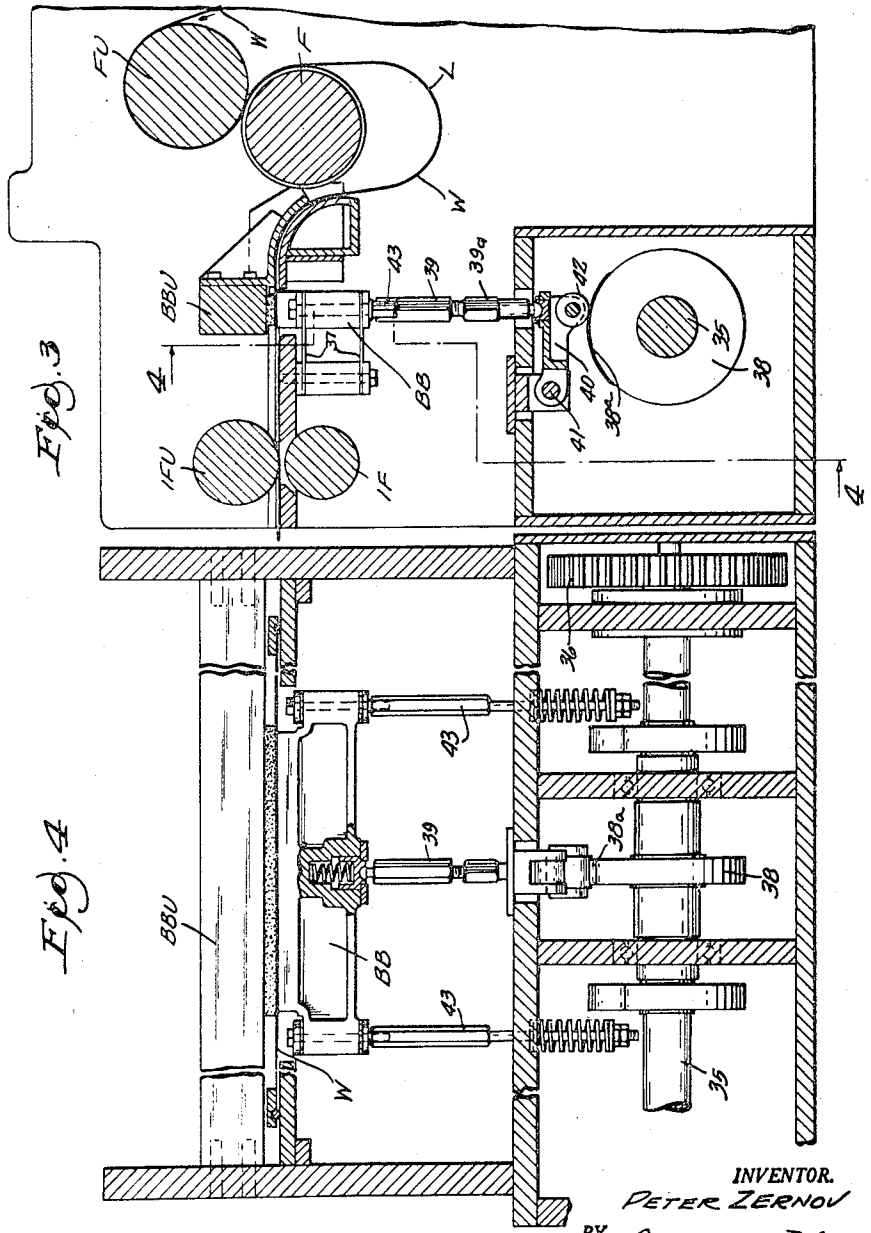


Fig. 3

Fig. 4

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DRIVE MECHANISM FOR CARTON BLANK FORMING PRESS

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Fig. 5

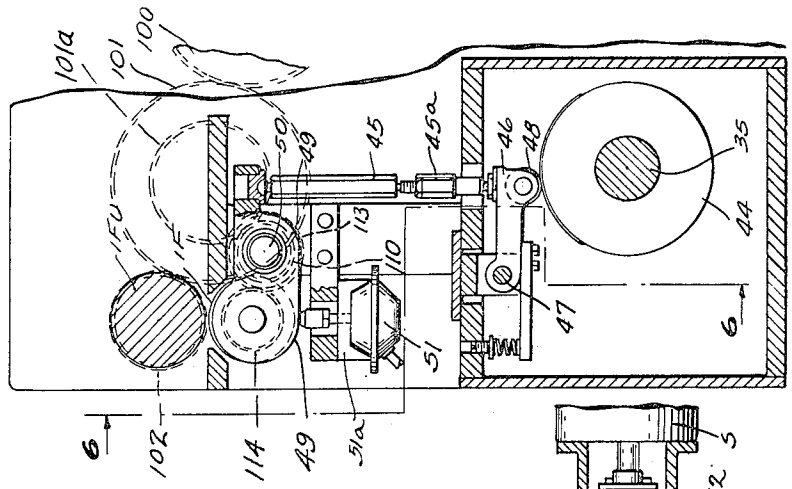
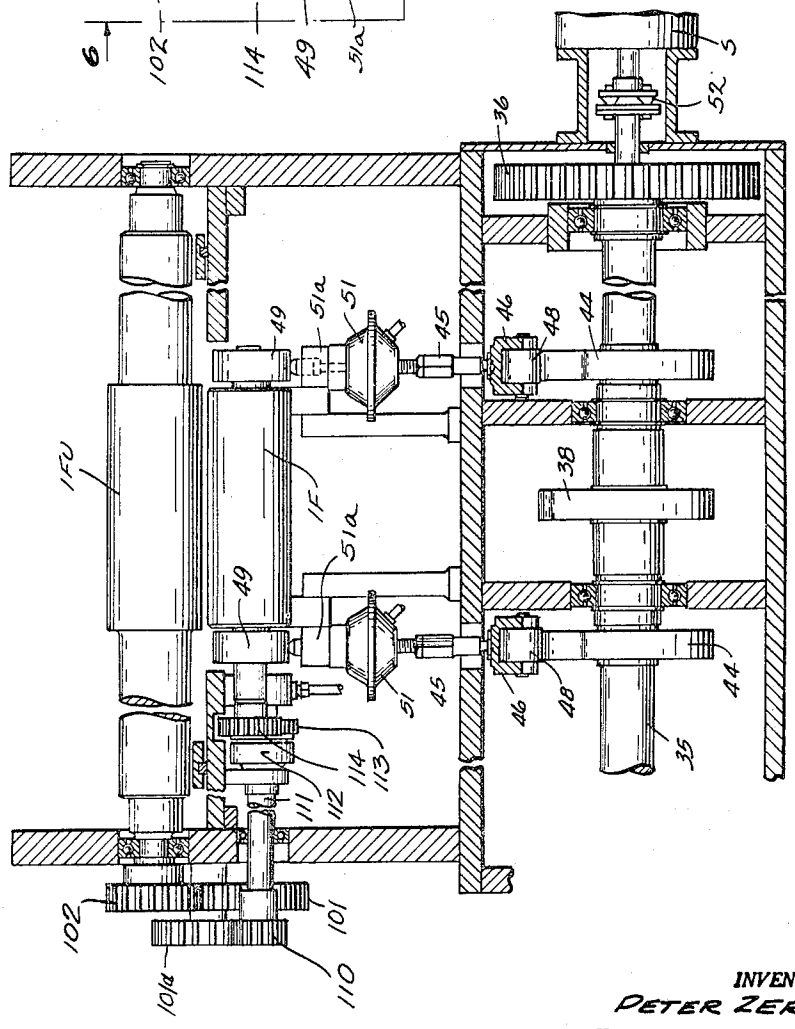


Fig. 6



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3,385,178

DRIVE MECHANISM FOR CARTON BLANK FORMING PRESS

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5 Claims. (Cl. 93—58.3)

ABSTRACT OF THE DISCLOSURE

Carton blank forming presses in which a web is intermittently fed into and out of a blank forming press having a pair of continuously active metering feed rolls, a pair of positively driven and intermittently active feed rolls, a brake bar between the pairs of feed rolls to arrest the travel of the web and build up a loop therein between the two pairs of rolls during each carton forming stroke of the press.

Background of the invention

The present invention is in the nature of an improvement over the drive mechanism shown in my U.S. Patent 3,169,456, issued February 16, 1965, entitled "Drive Mechanism For Carton Forming Press," and in which the lower intermittent feed roll IF was not positively driven, but instead depended on the web to bring it back up to speed after the intermittent feed rolls had been open and they were again closed. That is to say, after the web loop L had been used up, and these intermittent feed rolls were again closed for further feeding, under some circumstances, due to the inertia effects of the undriven lower intermittent feed roll IF, the latter was not sufficiently quickly brought up to the speed of the positively driven upper intermittent feed roll IFU and the web W. The result was excessive slipping of the intermittent feed rolls relative to the web, improper pull up of the loop and misregistry, particularly at high impression speeds.

Summary of the invention

Accordingly, the present invention provides a drive mechanism which overcomes the above difficulty. More specifically, the present invention provides a positive drive for the lower intermittent feed roll which accelerates it and brings it back to synchronization with the upper intermittent feed roll, the web and the speed of the continually feeding metering rolls.

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

FIGURE 1 is a side elevational view, taken from the operator's side, of a carton blank press made in accordance with the present invention, certain parts being shown as broken away, removed, or in section;

FIGURE 2 is a schematic and "spread out" view of the drive means between the various parts; FIGURE 2*a* is an enlarged detail view of a portion of the drive shown in FIGURE 2;

FIGURE 3 is a longitudinal sectional view of part of the press shown in FIGURE 1, but on an enlarged scale, and showing, inter alia, the mechanical connection between the common cam shaft and the brake bar;

FIGURE 4 is a transverse and vertical sectional view taken generally along the line 4—4 in FIGURE 3;

FIGURE 5 is another longitudinal sectional view of a portion of the press shown in FIGURE 1, but on an enlarged scale, and showing, inter alia, the actuating mechanism between the common cam shaft and intermittent feed rolls;

FIGURE 6 is an elevational view, partially in section and taken generally along the line 6—6 in FIGURE 5.

GENERAL

Before a detailed explanation of the mechanism is commenced, a statement as to the very general organization may be helpful. The web W passes through the cutter and creaser press P in the direction indicated by the arrow in FIGURE 1. The web comes from preliminary equipment (not shown), such as a decurl unit, hot melt applicator or other mechanism. As the web enters the press, it passes through the metering feed rolls F and FU, only the roll F being positively driven. These rolls are continuously active to feed the web at a precise and constant rate.

The web next passes through a pair of brake bars BB and BBU, the lower bar BB being vertically reciprocal for intermittent clamping engagement with the fixed upper bar BBU to thereby alternately stop the web when the cutting and creasing of the web occurs, and then release the web for another length of feed by the intermittently acting feed rolls IF and IFU.

The lower feed roll IF is mounted for swinging into and out of nipping engagement with the upper roll IFU. This upper roll is positively driven, and in accordance with the present invention, the lower roll is also positively driven, and as a result, a very accurate feed is provided, as will appear.

A loop L (FIG. 3) in the web is formed, during each operation of the press, between the continuously acting feed rolls and the brake bar, as when the brake bar is holding the web.

As they leave the press, the blanks are engaged by the stripper nip rolls SR (FIG. 1) for conveyance by the stripper unit SU.

PRESS IN GENERAL

Referring in greater detail to FIGURE 1, the base frame structure **10** supports the upper, fixed platen **11** on the four vertical corner supports **12** and the lower platen **13** which is vertically reciprocal on these vertical supports. One of the platens carries the cutting and creasing dies while the other carries a base plate, these parts being referred to by numeral **14** and **15**, and held in place by brackets **18**.

The vertically movable platen **13** is reciprocated by two pairs of eccentrically driven connecting rods **20** and **21** which are journalled at their upper ends on shafts **22** and **23**, respectively, carried by the platen **13**. The lower ends of these rods are mounted on crankshafts **24** and **25** mounted in the base structure and drivingly connected together by their respective gears **26** and **27**. Another gear **27***a* is fixed to gear **27** and meshes with an idler gear **28** secured to the base structure at the operator's side. Pairs of counterweights **29** and **29***a* (FIG. 2) are secured to crankshafts **24** and **25**, respectively.

A large pulley **30** is fixed to one end of crankshaft **25** and is driven by multiple belts **31** from an electric motor **32**, and shaft **25** constitutes the main drive shaft of the machine.

CAM SHAFT

The base structure **10** of the apparatus also rotatably supports a common cam shaft **35** having a gear **36** fixed to its end which meshes with idler gear **28**. Means are connected directly with the cam shaft for shifting the brake bar into clamping engagement with the web while the press forms the blank and the intermittent feed rolls are inactive as follows.

BRAKE BAR ACTUATING MEANS

A single center ram **38** (FIGURES 3 and 4) is secured to shaft **35** and has a rise **38***a* of about .045 of an inch

for about 90 degrees. This cam is for raising the brake bar BB which is shiftably mounted by a pair of leaf springs **37**. More specifically, the cam operates through a rigid push rod **39**, which is adjustable in length by its threaded portion **39***a*. The lower end of the push rod is seated in the free end of a bracket **40** pivoted at **41** and which bracket has a cam follower **42** in engagement with the peripheral edge of the cam **38**.

The upper end of the push rod **39** is seated against the underside of the vertically shiftable bar BB to urge it into clamping engagement with the upper, fixed bar BBU. Adjustable spring-strut units **43** act to resiliently bias the lower bar downwardly to the web unclamped position.

INTERMITTENT FEED ROLL ACTUATING MEANS

Second means are connected directly to the cam shaft for rendering the intermittent feed rolls inactive while a loop is built up in the web, as follows.

A pair of cams **44** (FIGURES 5 and 6) is also secured at spaced locations on the cam shaft **35** and act through their respective push rods **45** to urge the lower intermittent feed roll IF away from its fixed upper intermittent feed roll IFU. Rods **45** are adjustable in length by means of their threaded sleeves **45***a* to insure even nipping pressure across the width of the web. The lower ends of rods **45** are seated in their brackets **46** which are pivotally mounted on pins **47** and which carry a cam follower **48** on their free end for engagement by cams **44**. Cams **44** have a rise for about one-third of their circumference, the maximum rise of which occurs at the same time in the cycle as does the maximum rise on cam **38**.

The movable feed roll IF is mounted on two spaced brackets **49** secured intermediate their length to the ends of pivot shaft **50**. The upper ends of the push rods **45** bear against one end of these brackets, and the roll IF is mounted in the other ends.

Air Cylinder units **51** mounted on stationary brackets **51***a* act on the brackets to bias the roll IF into the feeding position.

Thus, the intermittent action of the brake bar and the intermittent feed rolls IF and IFU are timed with and connected directly to the cam shaft **35**.

SELECTOR SWITCH

A selector switch S (FIGURES 2 and 6) is connected directly to the cam shaft at the operator's side of the machine by means of a coupling **52**. In other words, the shaft **35** operates the selector switch which is thereby timed to the cutter creaser press. The selector switch is synchronized with an electric eye scanning head E which scans the preprinted web W and together actuate a correction motor **53** which is connected by an endless flexible drive chain **54** to a secondary differential gear unit SD. The selector switch gives a signal at a given rotary position of the cam shaft and this signal is compared with another signal which is given by the electric eye scanning head as a mark goes by on the web. If these two signals are in phase, then no correction occurs. If the signals are out of phase, a correction impulse is sent to the correction motor **53** in the direction and in proportion to the amount the signals are out of phase. This control system will be referred to more fully hereinafter.

DRIVE FROM CAM SHAFT

As shown clearly in FIGURES 1 and 2, at the other end of the cam shaft **35**, a change gear **57** is secured which meshes with another change gear **62** mounted on a shaft **63** extending from the drive side of the machine, that is the side opposite to the operator's side. The change gears **57** and **63** are mounted on fixed center, and they can be replaced with other pairs having different ratios, and in this manner the ratio between the feed rolls and the crankshaft if effected. In order to make the ratio between the feed rolls and crankshaft infinitely variable, the "gap" between any set of change gears is bridged by a variator V, to be described.

Also fixed to shaft **63** is a gear **64** which meshes with an idler gear **65** fixed on shaft **66** at the drive side. Gear **65** feeds a primary planetary differential PD that is mounted on the metering roll shaft **60** of the lower metering roll F. More specifically, idler gear **65** meshes with gear element **70** of the compound gear **71** rotatably mounted on the shaft **60**. Compound gear **71** also has a smaller gear element **73** which meshes with the circumferentially spaced planetary gears **75** mounted on the rotatable housing **76** by means of the shafts **77** on the housing. Fixed to the other ends of shaft **77** are gears **75***a* which mesh with the sun gear **74** that is keyed to shaft **60**. Housing **76** is rotatable on the shaft **60** and has a large peripheral ring gear **78**.

Gear **78** drives the gear **79** on the correction shaft **80** of the primary differential PD. Shaft **80** is rotatably mounted in its frame (not shown) fixed to the main frame **10**, and this primary differential correction shaft drives the entire planetary unit. A timing pulley **84** on the other end of shaft **80** is connected by timing belt **85** to one side of the timing pulley **86** of the secondary differential SD.

The other side of the secondary differential is connected by a timing belt **90** and timing pulley **91** and **92**, to one side of the conventional variator V, of the "Cleveland" type. The other side of the variator V is driven by the metering roll shaft **60** through timing belt **94** and its pulleys **95** and **96**.

The correction motor **53** can drive the entire secondary differential by the chain **54**. Thus, the selector switch S and electric eye E, through the correction motor **53**, secondary differential SD, and variator V, are effective to actuate metering roll. This electric eye E and correction motor **53** provide a correction which is proportional to the error that the electric eye E sees.

Another correction motor **97** feeds the variator V through gears **98** and **98***a* and **98***b*. The electric eye E also operates this correction motor. This second correction motor **97** thus corrects the variator ratio and acts to continuously trim the error. For example, for every five corrections, or any other predetermined number of corrections, called for by the correction motor **53**, the second correction motor **97** then changes the variator setting and in this manner causes the variator to continuously trim the error and set itself to the exact repeat length of the printing.

The above described control arrangement provides two separate yet combined corrections, namely, one through the electric eye correction motor in to the secondary differential, and the other as a correction setting in the variator ratio which continuously trims the error.

The metering roll shaft **60** is connected to the upper intermittent feed roll IFU for driving the latter, by means of gear **100** fixed to shaft **60**, idler gear **101**, and gear **102** fixed to the end of the shaft of roll IFU.

In accordance with the present invention, the lower intermittent feed roll IF is positively driven from gear **101***a* through a constant meshing gear **110** which is fixed on one end of shaft **111**, an air actuated slip clutch **112** connected to the other end of shaft **111**, and a gear **113** connected to the clutch **112**, which gear is in constantly meshing relationship with a gear **114** fixed to the lower roll IF.

The slip clutch **112** includes a cylinder **115** in which the piston **116** slides when chamber **117** is pressurized by air from passage **118**, rotary seal **118***a* and supply conduit **118***b*. When the chamber is pressurized, the friction surfaces **119** and **120** of the gear **113** and piston **116**, respectively, engage to drive the lower roll. The air pressure is adjustable in the known manner to vary the loading of the clutch.

The lower roll IF is rubber covered and the intermittent feeds rolls IF and IFU are driven faster than the metering rolls F and FU. Therefore, when the loop has

been taken up by the intermittent feed rolls, no slipping can be tolerated between the lower rubber covered intermittent feed roll IF and the web. The slip clutch **112** is set to prevent this slipping.

Gears **113** and **114** are in constant mesh and the lower roll IF is swung about the center of gear **113** (concentric with shaft **50**) between open and closed positions.

RÉSUMÉ

The drive is from the cam shaft and first through the metering rolls and then directly to both intermittently feed rolls to positively drive both of them. The lower intermittent food roll is thus accurately controlled as is the web for all conditions of operation, and registry thereof is assured. Nevertheless, the lower intermittent feed roll can slip after the web loop is used up to prevent damage thereto or feeding inaccuracies thereof.

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 in the invention.

1. Carton blank forming apparatus comprising a cutting and creasing press into which a web is fed, a pair of continuously active metering rolls and a pair of intermittent feed rolls for said web, a shiftable brake bar located between said pairs of metering and intermittent feed rolls for intermittently engaging said web, a driven cam shaft, means connected with said cam shaft for shifting said brake bar into clamping engagement with said web to build up a web loop between said pairs of rolls and while said press forms a blank, other means connected with said cam shaft for rendering said intermittent feed rolls inactive while said loop is built up, gear drive mechanism directly from said cam shaft to one of said metering rolls, and gear means for positively driving both of said intermittent feed rolls from and at a higher speed than said metering roll, said gear means including a slip clutch for one of said intermittent feed rolls.

2. Apparatus as defined in claim **1** further characterized in that said intermittent feed rolls comprise an upper roll and a lower roll, said lower roll is swingably mounted between a feeding position with said upper roll and a non-feeding position away from said upper roll; said other means includes a thrust connection between said lower roll and said cam shaft for swinging said lower roll; and said slip clutch is arranged to permit said lower roll to slip.

3. Apparatus as defined in claim **2** further characterized in that said gear means includes a first gear which is located on the same axis of swinging of the lower roll, and a second gear which is fixed to said lower roll and swingable therewith, said first and second gears being in constant mesh.

4. Apparatus as set out in claim **3** further characterized in that said first gear is fixed to part of said slip clutch.

5. Apparatus as defined in claim **1** further characterized in that said intermittent feed rolls include a lower feed roll which has a resilient covering.

References Cited

UNITED STATES PATENTS

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BERNARD STICKNEY, *Primary Examiner.*