Aug. 29, 1967 R. W. SCHUTZ 3,338,487

CONTINUOUS FORM STATIONERY BURSTER

Filed Oct. 21, 1965 4 Sheets-Sheet 1

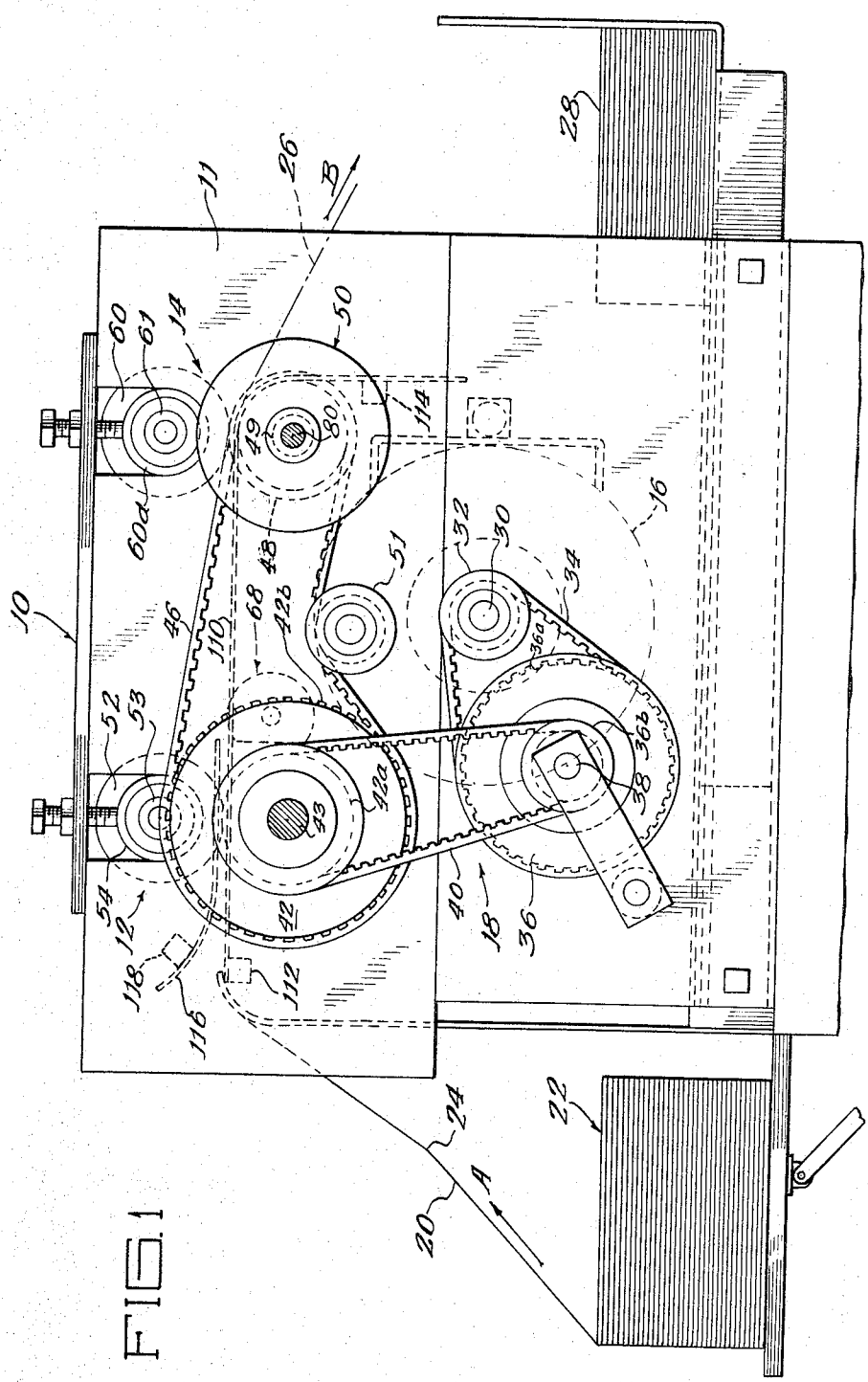


FIG. 1

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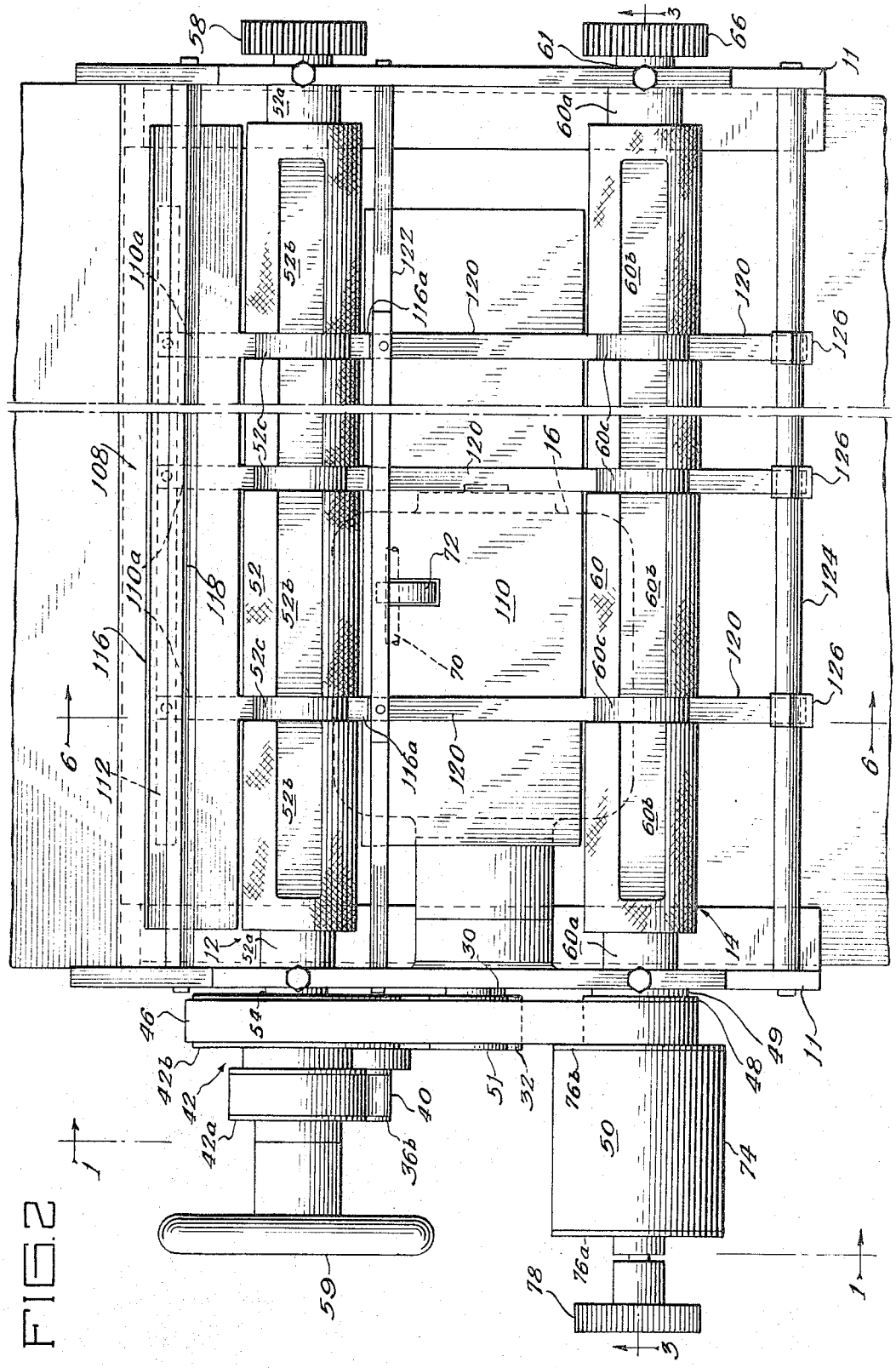


FIG. 2

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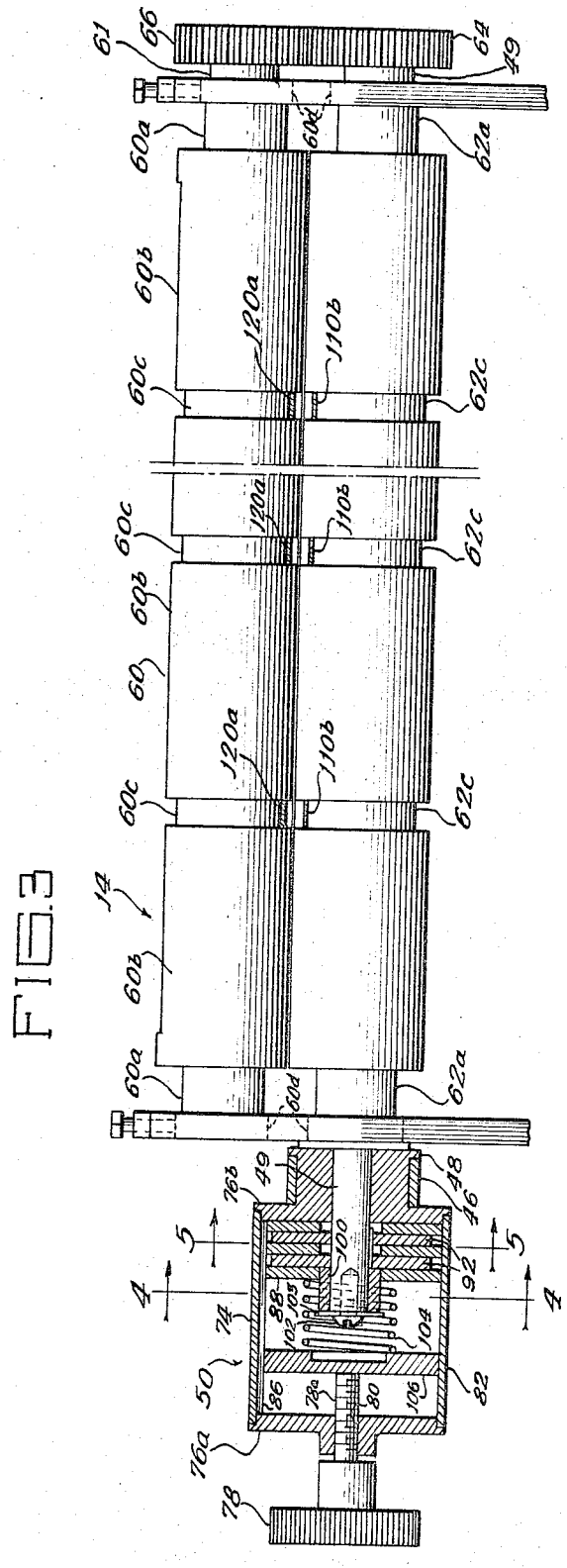


FIG. 3

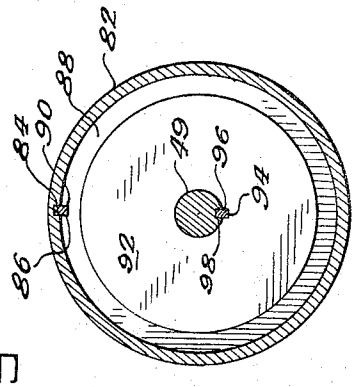


FIG. 5

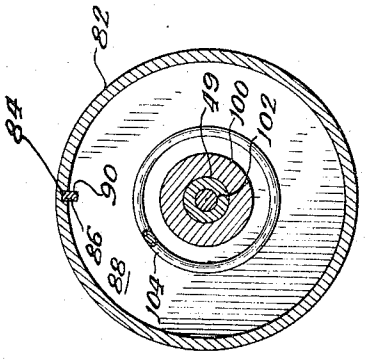


FIG. 4

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FIG. 6

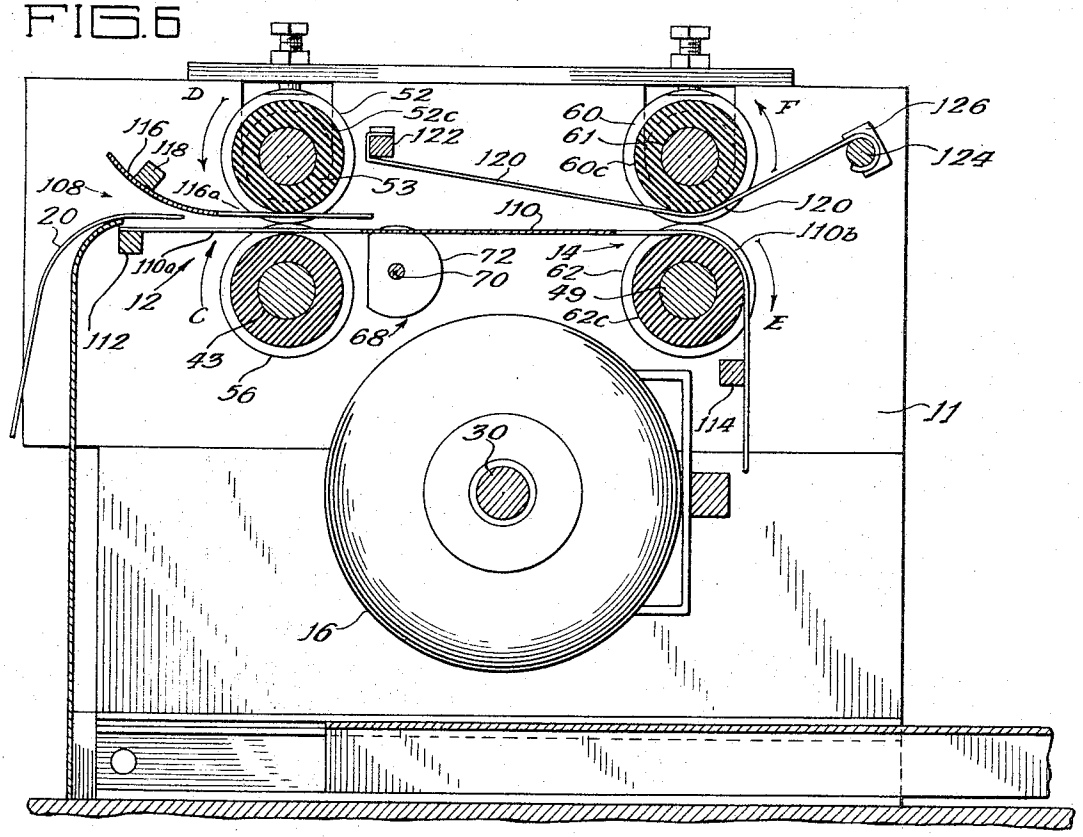


FIG. 7

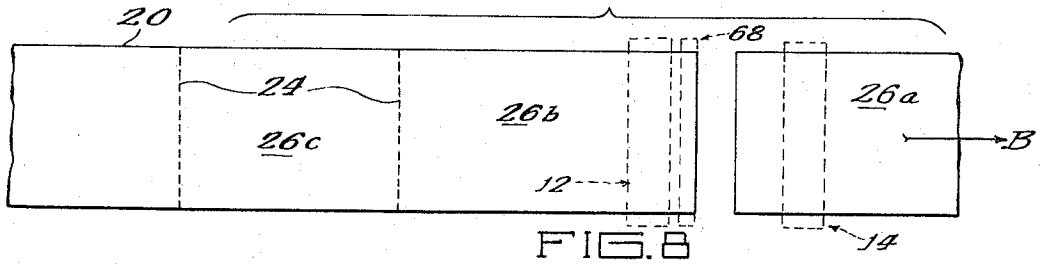


FIG. 8

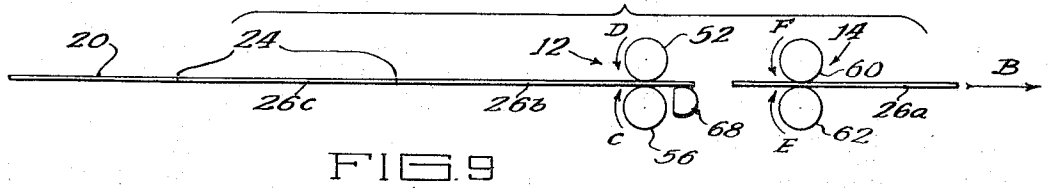
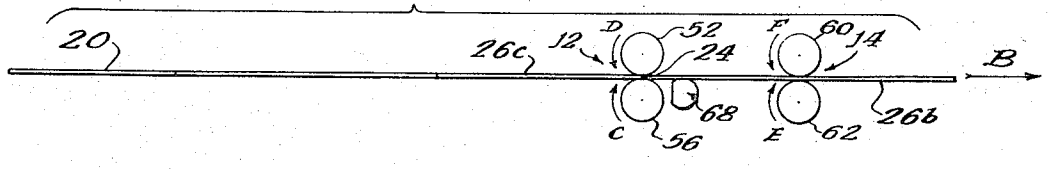


FIG. 9



United States Patent Office 3,338,487 Patented Aug. 29, 1967

3,338,487

CONTINUOUS FORM STATIONERY BURSTER

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5 Claims. (Cl. 225—100)

ABSTRACT OF THE DISCLOSURE

A continuous form stationery burster having two pairs of driven rollers spaced a fixed distance apart, one pair of which is normally driven at a greater speed than the other pair with slip clutch means interposed in the drive of the one pair of rollers to reduce the speed of the one pair of rollers and increase the torque thereof responsive to simultaneous gripping of said stationery by both pairs of rollers to increase tension in the stationery and cause the stationery to break on transverse lines of weakening.

This invention relates to a mechanism for separating continuous form stationery along transverse lines of weakening and more particularly to a new and improved burster wherein the front and rear set of bursting rollers is maintained at a fixed distance relative to each other.

Continuous form stationery is typically zig-zag folded about transverse lines of weakening which separate or "burst" the continuous form into individual form lengths. For separating the forms, some previous bursters have operated on the principle of setting the front and rear rollers a distance apart which was equal to or slightly greater than one form length with the rear outfeed rollers traveling at a faster rate than the front rollers to pull the forms apart. Another method of bursting stationery is to use sets of rollers that are mounted a fixed distance apart wherein the rear set of rollers is movable in and out of frictional contact with the upper in timed relation to the length of paper fed through the machine. In these former bursting devices, adjustment would necessarily have to be made for bursting different strips of continuous form stationery wherein the individual form lengths were of different dimensions. With the former type of burster, a change in individual form lengths required a change in the distance between the sets of rollers. In the latter case, a change in the form lengths required a change in the timing mechanism which moved the rear rollers in and out of contact with each other. Moreover, it was not possible to burst continuous form stationery wherein each form length or ticket within the strip might have a different length than others in the strip.

It is therefore a general object of this invention to provide a new and improved burster for separating continuous form stationery into individual form lengths.

A primary object of this invention is to provide a new and improved stationery burster which does not require an adjustment in the distance between the rollers for bursting continuous form stationery of different individual form lengths.

Another object of this invention is to provide a new and improved burster for continuous form stationery which is capable of separating continuous form stationery into individual form lengths wherein the dimensions of the form lengths in each strip of stationery may differ one from the other.

Another object of this invention is to provide a new and improved burster for continuous form stationery wherein the front and rear outfeed bursting rollers are mounted in the burster so as to continually maintain a fixed distance between the rollers.

Yet another object of this invention is to provide a new and improved burster wherein the rear outfeed bursting rollers are normally associated with the drive means to be driven at a faster rate than the front set of bursting rollers but slow substantially to the speed of the front bursting rollers during those periods of burster operation when both sets of rollers are gripping the continuous stationery strip.

Other objects, features and advantages of the present invention will be apparent from the following description of the preferred embodiment illustrated in the accompanying drawings, in which:

FIGURE 1 is a section view (generally in side elevation) of the burster of this invention taken along the line 1—1 of FIGURE 2;

FIGURE 2 is a top plan view of the burster shown in FIGURE 1;

FIGURE 3 is a section view through the rear outfeed rollers of the burster of this invention taken along the line 3—3 of FIGURE 2;

FIGURE 4 is a section view of the clutch mechanism associated with the rear outfeed set of burster rollers taken along the line 4—4 of FIGURE 3;

FIGURE 5 is another section view of the clutch mechanism taken along the line 5—5 of FIGURE 3;

FIGURE 6 is a section view of the burster taken along the line 6—6 of FIGURE 2;

FIGURE 7 is a top diagrammatic view of the separation of a form length from the continuous strip by means of the burster of this invention;

FIGURE 8 is a side diagrammatic view showing the function illustrated in FIGURE 7; and

FIGURE 9 is a diagrammatic view similar to FIGURE 8 showing the front and rear outfeed bursting rollers simultaneously gripping a portion of the continuous stationery strip.

The burster **10** of this invention includes a front set of bursting rollers **12** and a rear or outfeed set of bursting rollers **14** driven by a motor **16** through suitable drive means **18**. The function of the burster is to drive a continuous strip of stationery **20** which may be folded in a zig-zag stack **22** in the direction indicated by the arrow A in FIGURE 1 and to separate the continuous strip along the transverse lines of weakening **24** into individual tickets or form lengths **26**. The form lengths are ejected from the machine in the direction indicated by the arrow B and stacked in a stack **28**.

The drive means **18** includes a system of belts and pulleys interconnecting the motor and the bursting rollers. Motor **16** rotates a drive shaft **30** which has a pulley wheel **32** mounted on its free end. Belt **34** is wrapped about pulley **32** and also about the enlarged portion **36***a* of pulley **36**. Pulley **36** is mounted for rotation on a rotatable shaft **38** and has a reduced pulley portion **36***b* which carries belt **40**. Belt **40**, in turn, is wrapped about reduced portion **42***a* of pulley **42** which is mounted on front lower roller shaft 43. Pulley **42** also has an enlarged peripheral portion **42***b* about which the belt **46** is wrapped. Belt **46** is in turn also wrapped about pulley **48** which is operably associated with rear lower outfeed roller shaft **49** by means of clutch **50**. In addition, belt **46** engages idler **51** in a portion of its path of travel to provide suitable tension in belt **46**.

Front roller unit **12** includes a pair of front bursting rollers mounted in vertical tandem such as upper roller **52** and lower roller **56**. The rollers have reduced end portions **52***a* which are adjacent the opposite sides of the frame and longitudinally extending relieved portions or flats such as **52***b*. In addition, the rollers are provided with spaced annular recesses **52***c*. The upper roller is mounted on the upper roller shaft **53** which is held in the frame in a bearing block **54** to permit free rotation of the roller. Lower roller **56** is mounted on shaft **43** which may similarly be rotatably mounted in a bearing

block (not shown). The upper and lower roller shafts are provided with meshing gears at the side opposite from the pulleys and belts, such as gear **58** on upper roller shaft **53**, so that rotation of the lower roller shaft **43** by the drive means will be transmitted to the upper roller shaft to drive the lower roller in a clockwise direction and the upper roller in a counterclockwise direction (as indicated by the arrows C and D, respectively, in FIGURES 6, 8 and 9) and propel paper fed therebetween toward the rear of the burster. A handle **59** may be mounted on the one end of the lower roller shaft **43** for manual rotation of the rollers, if desired.

The rear or outfeed roller unit also includes a pair of upper and lower rollers **60** and **62** mounted in vertical tandem on shafts **61** and **49**, respectively. These rollers also have reduced end portions such as **60***a* near the sides of the frame. Each of these rollers is similarly provided with two longitudinally extending relieved portions or flats **60***b*, 180° apart, as well as annular recesses **60***c* and **62***c*, respectively. In addition, these rollers may be mounted for rotation in bearing blocks **60***d* positioned in the side walls of the frame. The lower rear outfeed roller shaft **49** is provided with a gear **64** at the end thereof opposite from clutch **50** which meshes with gear **66** on the upper roller shaft **61** so that the lower roller is driven in a clockwise direction and the upper roller is driven in a counterclockwise direction (as indicated by the arrows E and F in FIGURES 6, 8 and 9) to similarly feed the stationery out of the rear of the burster in the direction indicated by the arrow B in FIGURES 1, 7, 8 and 9.

Through the several pulleys and belts of the drive system, the drive ratio is such that the rear rollers are to be normally driven at an increased speed relative to the front rollers.

A breaker unit **68** may be mounted in the frame between the front and rear burster rollers, preferably slightly behind the front rollers. Breaker unit **68** includes a shaft **70** which extends across the frame and which supports disc segments **72**. Preferably the shaft is at least mounted so that a portion of the periphery of the disc segment **72** projects slightly above the normal path of travel of stationery through the burster to cause the stationery to "ride over" the breaker unit **68** and encourage stationery to tear along the line of weakening as the line of weakening passes the peripheral projection of segment **72**. It is to be understood that either the segments **72** or the shaft **70** could be mounted in the burster in such a manner as to provide for the vertical adjustment of the breaker unit **68** for optimum bursting conditions.

Clutch means **50** which is mounted about shaft **49** of the lower rear bursting roller provides an adjustable means for automatically changing the speed of the rear burster rollers responsive to load conditions imposed thereon. Clutch **50** includes a housing **74** having front and rear generally disc-like upstanding walls **76***a* and **76***b*, respectively. Rear wall **76***b* is an integral extension of pulley **48** and rotates therewith. Front wall **76***a* supports an adjustment knob **78** which has a threaded shank **78***a* threadably received in opening **80** in the front wall to provide a means for adjusting the clutch.

The clutch housing also includes a circular cylindrical wall **82** which is secured to and extends between the front and rear walls. The interior of the circular cylindrical wall is provided with a longitudinally extending keyway **84** which receives an elongate key **86**. The interior of the clutch is provided with a plurality of first dics **88** positioned on shaft **49**. Discs **88** have an inner diameter substantially larger than the outer diameter of shaft **49** and further have an outer diameter generally coextensive with the inner diameter of the cylindrical wall **82**. These discs **88** are notched at a portion of the periphery to provide a keyway **90** for receiving key **86** which is positioned within keyway **84** of the wall **82** so that rotation of housing **82** will in turn cause rotation of discs **88**.

The clutch also includes second discs **92** positioned on shaft **49** between discs **88**. Discs **92** have an outer diameter substantially smaller than the inner diameter of the housing wall **82** but have an inner diameter substantially coextensive with the outer diameter of shaft **49**. Moreover, these discs **92** are provided with a notched inner diameter portion **94** for receiving a key **96** which is also positioned in the keyway **98** in shaft **49** so that rotation of discs **92** in turn causes rotation of shaft **49**.

A collar **100** is positioned over the free end of shaft **49** and is held in place by means of a screw **102** and washer **103**. A spring **104** bears against the face of the outermost disc **88** and also against the face of an adjusting disc **106** which abuts the threaded end **78***a* of adjustment knob **78**. By turning knob **78** and threading shank **78***a* inwardly and outwardly, disc **106** will move inwardly and outwardly to adjust the pressure exerted by the spring on the several discs **88** and **92**. As the discs are more tightly urged into facial engagement with each other, there is more direct drive from housing **74** to shaft **49**; whereas, when the tension in the spring is reduced, there is more slippage between the discs. However, a load or pull on the rear rollers will induce a greater slippage in the clutch which causes the clutch to transmit maximum torque to shaft **49**. In this manner, the output of the clutch changes as different load conditions are encountered without necessitating an adjustment in the drive system.

The burster may further be provided with a paper guiding means including a sheet-like lower guide **110** having finger-like portions **110***a* and **110***b* which extend through the annular recesses in the front and rear lower rollers **56** and **62**, respectively. The fingers **110***a* may be secured to a bar **112** which extends across the forward end of the burster ahead of the front bursting rollers and fingers **110***b* may be secured to a bar **114** which extends across the rear of the burster to mount the lower guide **110** in the burster and provide a supporting platform for stationery fed therethrough.

A front upper paper guide **116** having forwardly extending fingers **116***a* which extend through the annular recess **52***c* of front upper roller **52** is secured to a bar **118** which extends across the front of the machine ahead of the front bursting rollers. This guide **116** facilitates initial infeed of stationery into the burster. Intermediate paper guide **120** is preferably a grid or finger-like structure secured at one end to a bar **122** which extends across the burster slightly behind the front bursting rollers and secured at its other end to a bar **124** which extends across the rear of the burster behind the rear bursting rollers by means of clamp **126**. The intermediate paper guide **120** serves to guide the leading edge of the stationery into the rear bursting rollers.

A significant feature of this invention is that the front and rear sets of rollers **12** and **14** are mounted in the frame a fixed distance apart and are not movable relative to each other as has been common in this type of mechanism. This is made possible by driving the rear roller unit at a faster speed than the front roller unit through the medium of the adjustable clutch. When no loads are present on the roller units, the rear roller unit will be driven at its normal increased rate of speed resultant from the ratio of the belts and pulleys of the drive system. However, as paper is fed through the burster and simultaneously grasped by the front and rear rollers, the drag on the rear roller unit caused by the front roller unit grasping the same piece of paper and driving it at a lower rate of speed will cause the rear roller unit to slow down and induce tension in the paper. When the line of weakening or perforations in the paper passes the front roller unit and is substantially in alignment with the breaker means **68**, the increased tension or pull produced by the rear roller unit will separate the paper along the line of weakening. The paper does not tear in the portions intermediate the lines of weakening because the full strength

of paper is present at these points and is sufficient to overcome the pull.

For example, typically continuous form stationery of .003 inch in thickness has a strength of about 10 lbs. per inch of width. If the strip of stationery is 14 inches wide, it would take about 140 lbs. of pull to tear this strip. It is common that in the line of perforation **24** there are six ties (the portions of paper which are not perforated) per each inch of width of the stationery, and each tie is generally .040 inch in width. Thus in each one inch of stationery width, the total paper area holding the stationery together along the line of perforation is 6 (each tie) x .040 (the width of each tie) or .240 inch. Therefore, it would take approximately only 2.4 lbs. of pull along one inch width of a line of perforation to separate the paper as opposed to the 10 lbs. it would take to separate the paper along one inch width of the paper itself.

The adjustment knob **78** permits the clutch to be adjusted for different paper weights, strengths, and widths so that tearing will not take place between the line of perforation but will only take place at the line of perforation. By turning the knob to thread the shaft in and out and therefore change the pressure of the spring against the several discs of the clutch, the amount of tension produced in the paper while it is simultaneously grasped by the front and rear rollers can be changed to accommodate the specific paper being threaded through the burster and insure that separation will only take place along the lines of weakening.

FIGURES 7, 8 and 9 diagrammatically illustrate the operation of the burster. The continuous strip of stationery **20** shown in FIGURE 7 has form lengths of different dimensions **26***a*, **26***b*, and **26***c*. In FIGURES 7 and 8, form length **26***a* has just been separated from the remainder of the strip as the line of weakening passed over the breaker means **68**. As soon as the separation is accomplished, the rear set of rollers **14** accelerate to their normal increased speed to advance the separated ticket **26** at an increased rate and eject the ticket out of the burster in the direction indicated by the arrow B. In FIGURE 9, form length **26***b* is between both sets of rollers **12** and **14** and therefore the rear set of rollers **14** slows down and produces a tension in the strip between the rollers. As soon as the line of weakening **24** between form lengths **26***b* and **26***c* advances to a point generally above breaker means **68**, the tension in the stationery will cause it to break along the line of weakening. Form length **26***b* will then be advanced at an increased rate of speed similar to that shown in FIGURE 8 with respect to form length **26***b*.

Thus the burster of this invention provides a novel means for separating continuous form stationery without the necessity for adjustment of the distance between the bursting rollers. This permits, first of all, a more compact bursting device. Secondly, it reduces the complex components necessary when the adjustable sets of rollers are being driven by the same drive means. Furthermore, the burster is not only capable of bursting different strips of stationery without adjustment between the rollers, but is also capable of bursting stationery which has individual forms or tickets of different lengths within the same strip.

The foregoing detailed description has been given for clearness of understanding only, and no unnecessary limitations should be understood therefrom, as some modifications may be obvious to those skilled in the art.

I claim:

1. A burster mechanism for separating continuous form stationery into individual form lengths between transverse lines of weakening, comprising: a frame; drive means mounted in said frame; a first pair of rollers mounted in said frame in the path of stationery travel for gripping and feeding stationery through the burster, said first pair of rollers being driven by said drive means; a second pair of rollers mounted in said frame in the path of stationery travel for gripping and feeding stationery through the burster; and slip means connecting said drive means to said second pair of rollers, said slip means responsive to paper feeding to normally drive said second pair of rollers at a faster rate of speed than said first pair of rollers and to drive said second pair of rollers at a reduced rate of speed responsive to simultaneous gripping of paper by said first and second pairs of rollers to thereby create tension in the stationery between said first and second pairs of rollers of sufficient force to separate the stationery along a transverse line of weakening.

2. A burster mechanism for separating continuous form stationery into individual form lengths between transverse lines of weakening, comprising: a frame; a first pair of driven rollers mounted in said frame in the path of stationery travel for gripping and feeding stationery through the burster; a second pair of rollers mounted in said frame in the path of stationery travel for gripping and feeding the stationery through the burster, said second pair of rollers positioned in the frame a fixed distance from said first pair of rollers; drive means mounted in said frame, said drive means connected to said first and second rollers for driving said rollers; and clutch means interconnecting said drive means to said second pair of rollers for normally driving said second pair of rollers at a faster rate than said first pair of rollers, said clutch means responsive to the simultaneous gripping of paper by said first and second pair of rollers to reduce the speed and increase the torque of the second pair of rollers to thereby increase the tension in the stationery between the first and second rollers to cause separation of the stationery along a transverse line of weakening when the stationery is advanced to a point where the line of weakening is between the pairs of rollers.

3. The device of claim **2** wherein a single source of power is used to drive said first and second pairs of rollers.

4. The device of claim **3** wherein said clutch includes a housing driven by said drive means, said housing being positioned about the drive shaft for the second pair of rollers and a plurality of first discs in the housing rotatable with the housing and a plurality of second discs in the housing rotatable with the shaft, said discs juxtaposed for sliding facial engagement with each other, rotation of said housing by said drive means causing said first discs to rotate said second discs and thereby rotate said second roller drive shaft.

5. The device of claim **4** wherein said clutch is provided with a biasing member normally urging said discs into facial engagement with each other and wherein said clutch is further provided with an element for changing the amount of force produced by said biasing member to thereby selectively increase or decrease the facial engagement between said discs to adjust the burster for operation with stationery of different characteristics.

References Cited

UNITED STATES PATENTS

2,429,944	10/1947	Rayburn et al.	225—4
2,513,093	6/1950	Hageman	225—100
2,862,554	12/1958	Davidson	225—100

FOREIGN PATENTS

808,379	1/1956	Great Britain.

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J. M. MEISTER, *Assistant Examiner.*

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,338,487 August 29, 1967

Rudolph W. Schutz

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

In the heading to the printed specification, line 4, for "Varco Incorporated" read -- Uarco Incorporated --.

Signed and sealed this 24th day of September 1968.

(SEAL)
Attest:

Edward M. Fletcher, Jr.
Attesting Officer

EDWARD J. BRENNER
Commissioner of Patents