United States Patent

Peterson

[15] **3,672,551**

[45] **June 27, 1972**

[54] BURSTER WITH INTERRUPTED DRIVE

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[73] Assignee: **Uarco Incorporated**

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[21] Appl. No.: **86,731**

[52] **U.S. Cl.** **225/100**

[51] **Int. Cl.** **B65h 35/10**

[58] **Field of Search** 225/100, 4

[56] **References Cited**

UNITED STATES PATENTS

3,331,543	7/1967	Kezeli	225/100 X
3,338,487	8/1967	Schutz	225/100

Primary Examiner—Frank T. Yost

Attorney—Hofgren, Wegner, Allen, Stellman & McCord

[57] **ABSTRACT**

An improved burster for separating continuous form stationery along transverse lines of weakening wherein the infeed and outfeed rollers are maintained a fixed distance apart, with the outfeed rollers being driven at a faster rate of speed than the infeed rollers. A limited lost motion connection is interposed in the drive to the infeed rollers to allow the infeed rollers to establish an idler relationship relative to the outfeed rollers when the stationery strip is gripped between both sets of rollers so that the infeed rollers rotate at a rate of speed which approaches that of the outfeed rollers. When the limit of the lost motion idler relationship is established the speed of the infeed rollers is rapidly reduced, causing severance of the strip of stationery along the transverse line of weakening.

6 Claims, 13 Drawing Figures

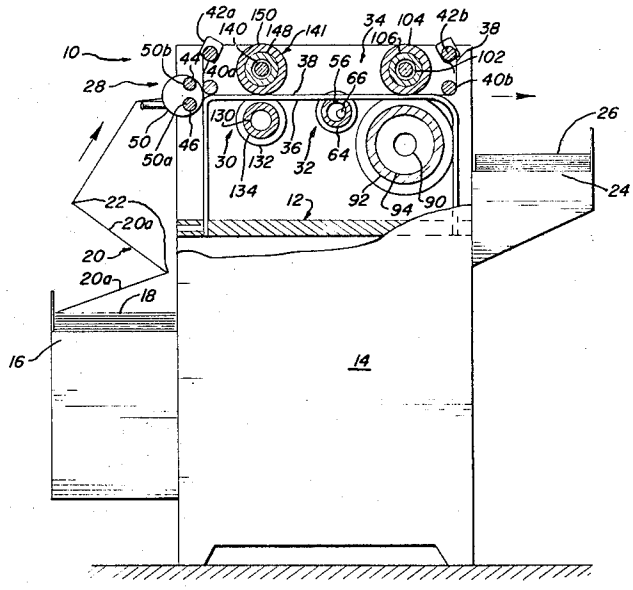


FIG. 1

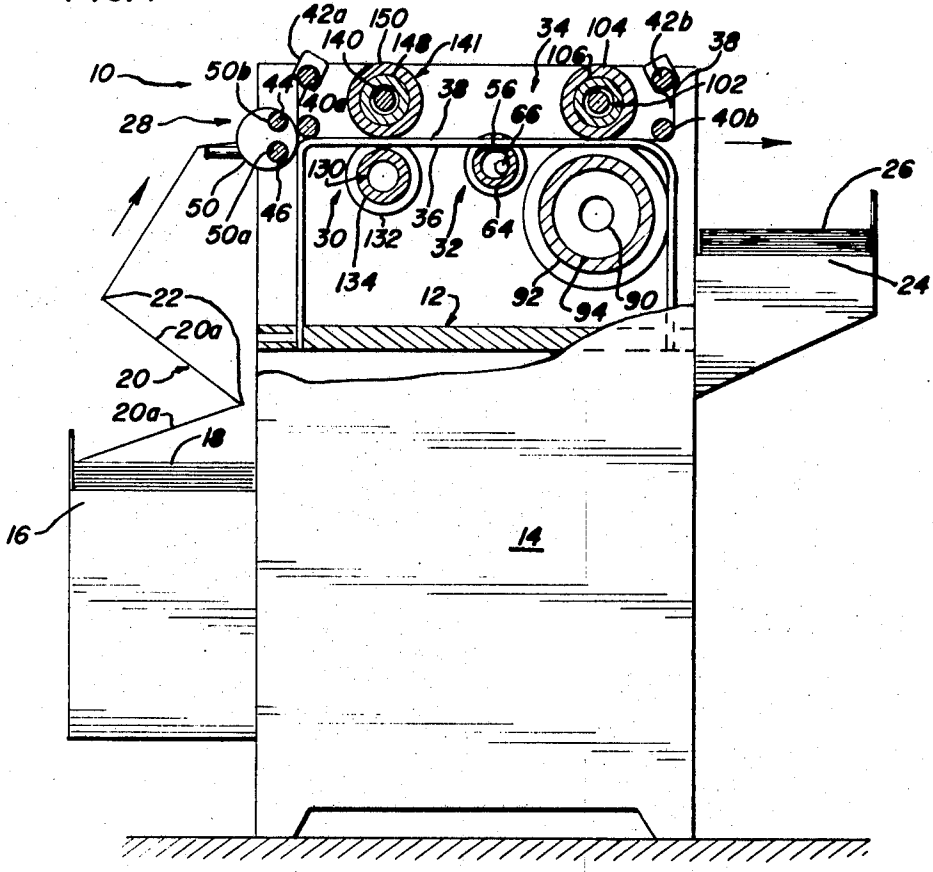


FIG. 9

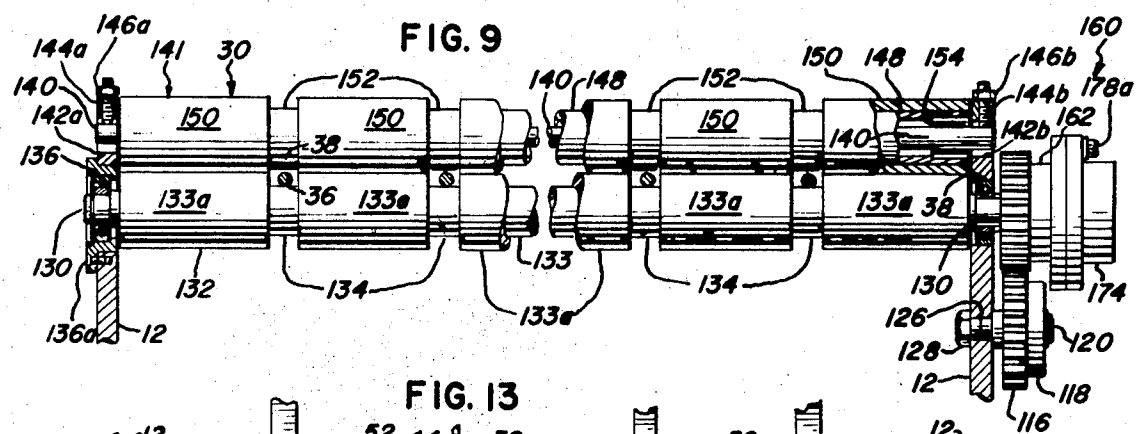
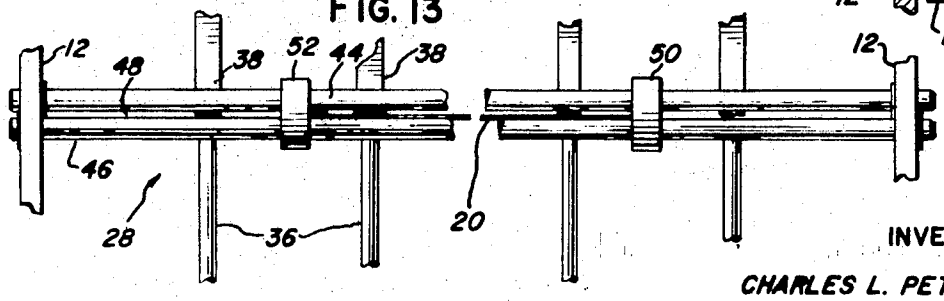


FIG. 13



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ATTORNEYS

FIG. 2

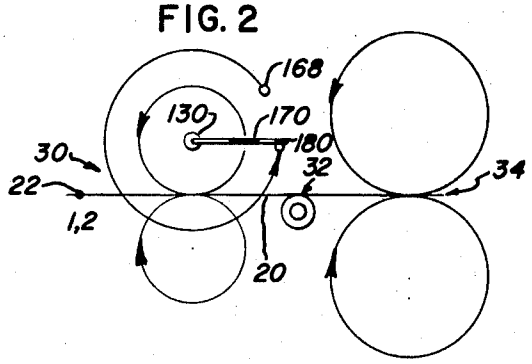

FIG. 3

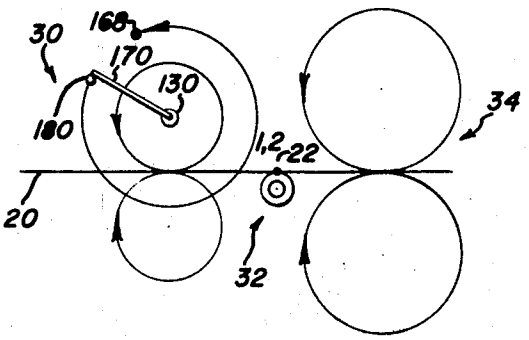

FIG. 4

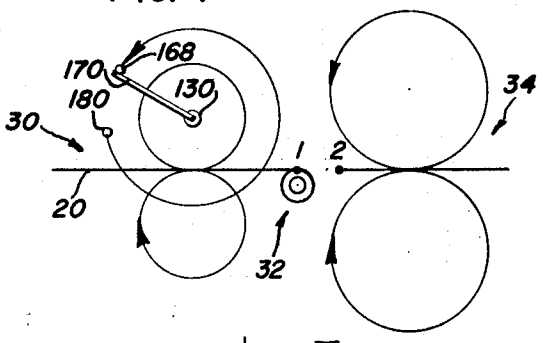

FIG. 5

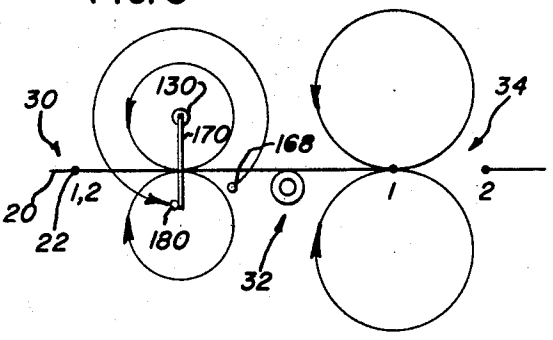

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FIG. 6

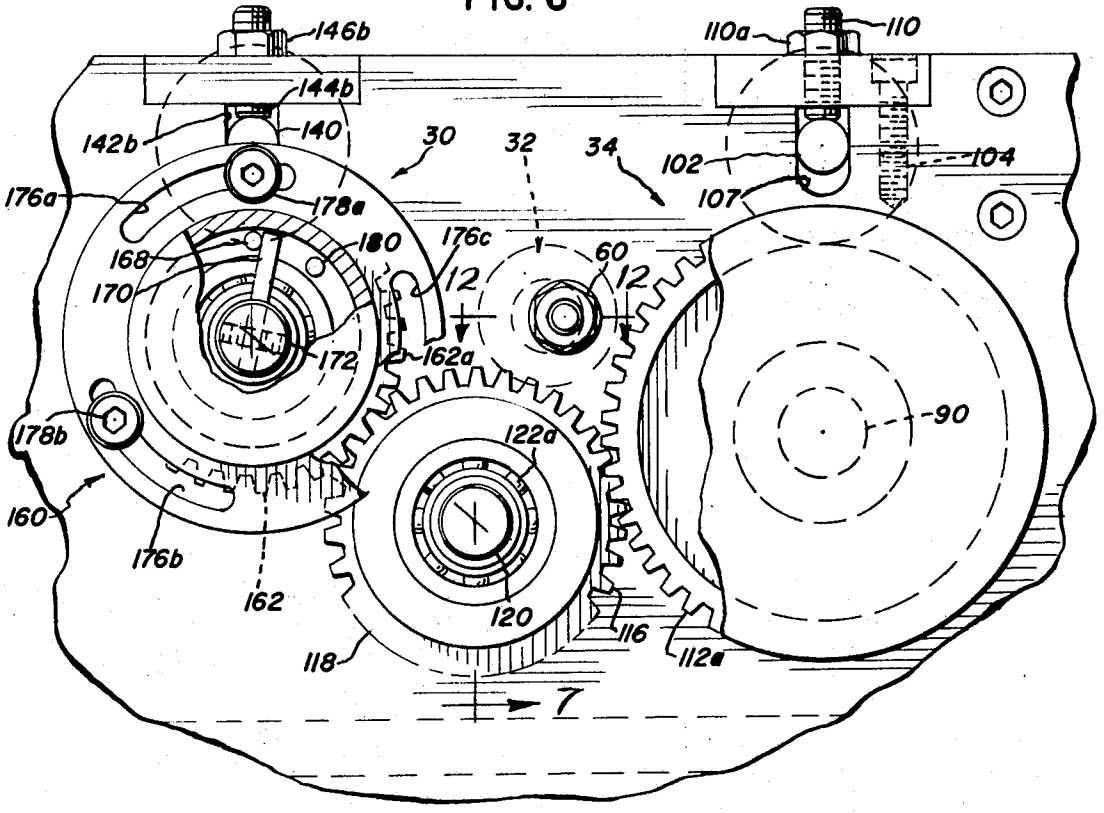


FIG. 8

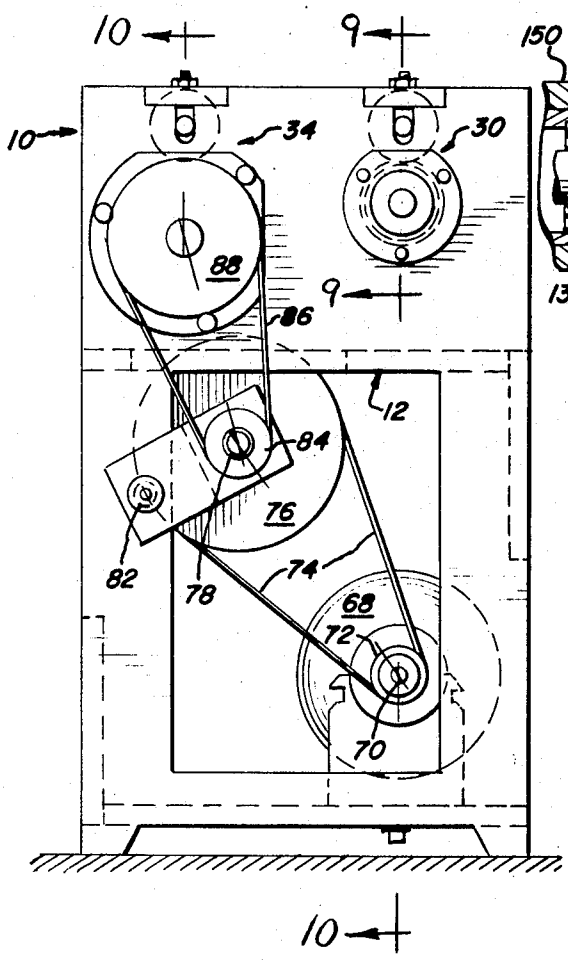


FIG. 7

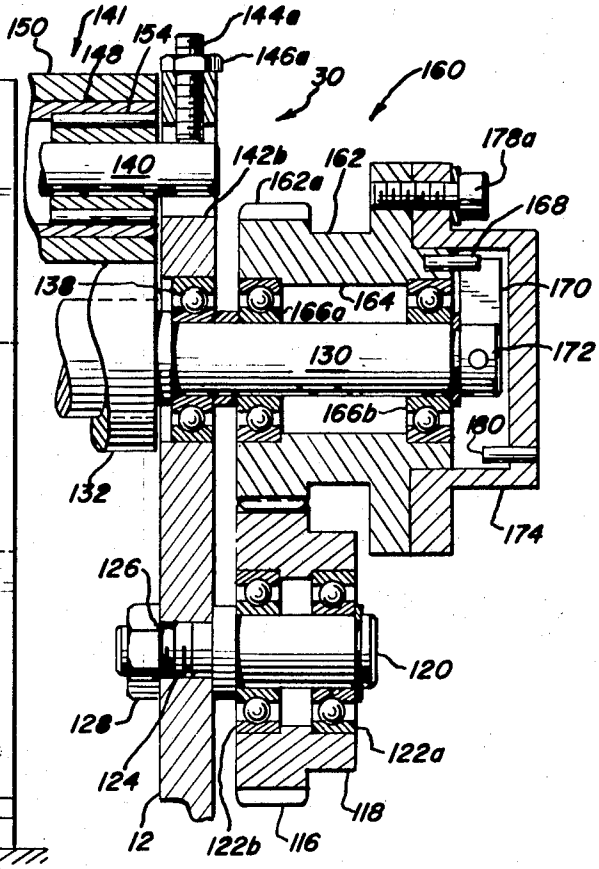
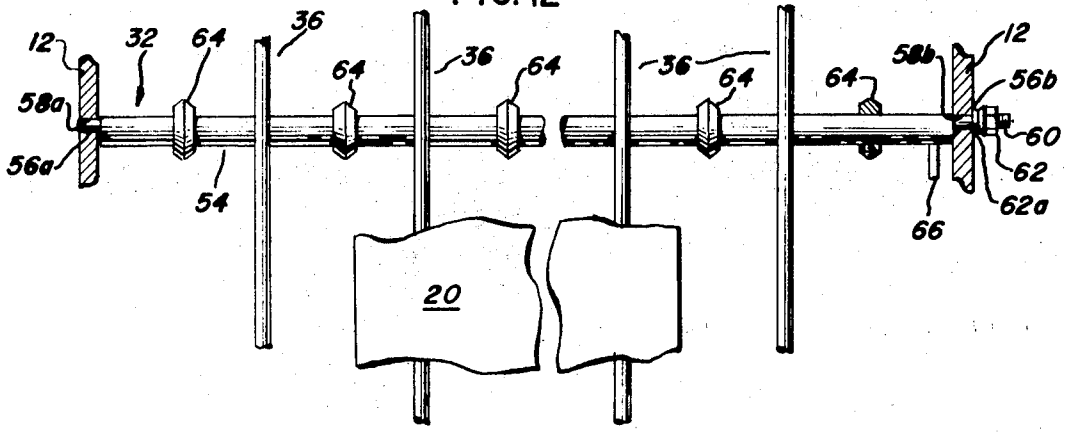


FIG. 12



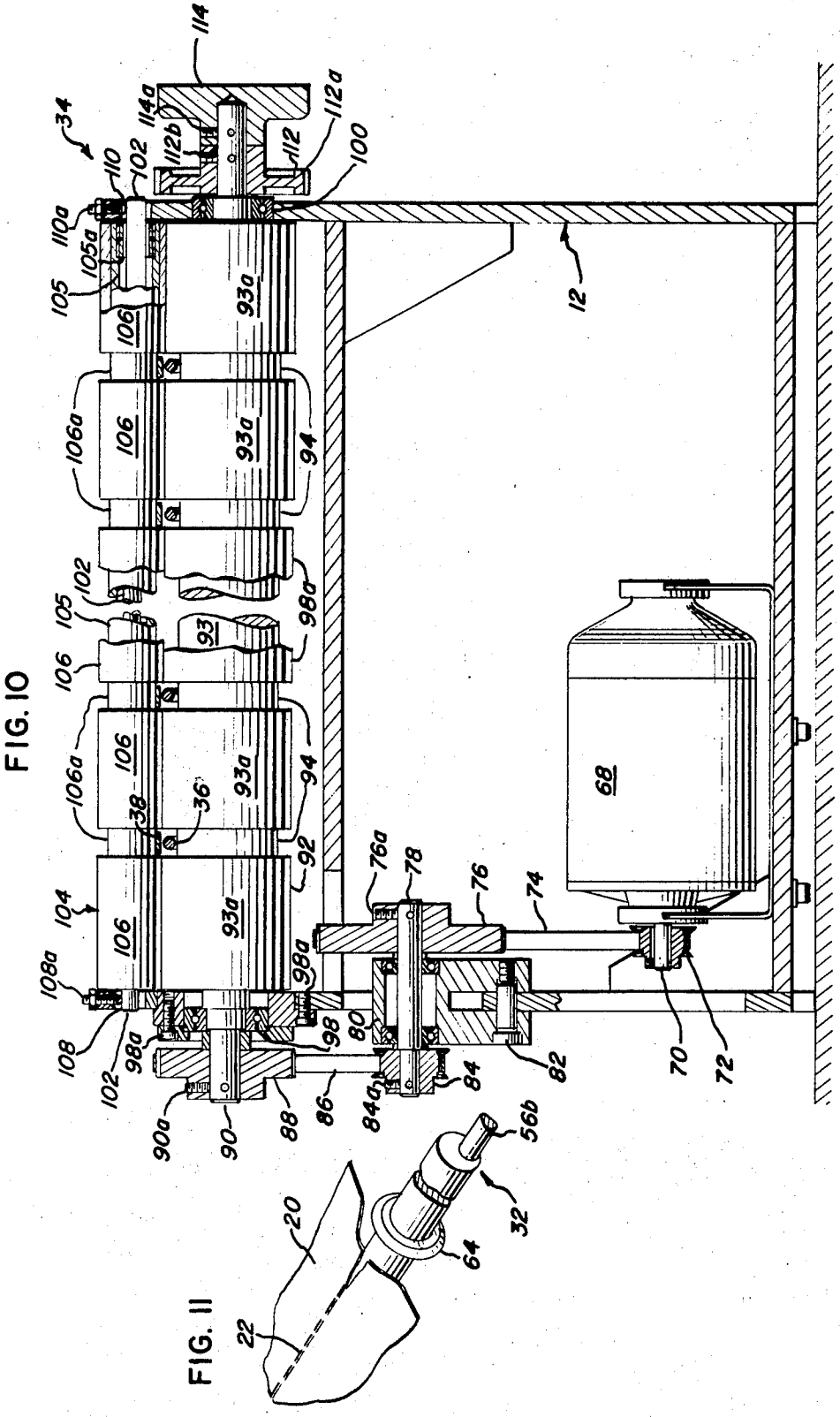

114
114a
112b
112a
112
100
34
110
102
110a
105a
105
106
93a
106a
94
102
105
98a
93
106
106a
38
36
92
104
108a
108
102
98a
90a
90
88
86
84a
84
82
80
98
76a
78
76
74
68
70
72
12
56b
32
64
20
22

FIG. 10

FIG. 11

BURSTER WITH INTERRUPTED DRIVE

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to business machines, and more particularly to an apparatus for bursting stationery into individual form lengths along transverse lines of weakening.

2. Description of the Prior Art

Most so-called burster devices for separating continuous forms stationery along transverse lines of weakening, operate on the common principle of providing infeed and outfeed rollers which are spacially adjustable relative to each other with the infeed rollers being driven at a slower rate of speed than the outfeed rollers. This will create stress in the strip of continuous stationery as it is gripped between both rollers so that the stationery will sever at the weakest point, which is a transverse line of weakening. This conventional burster concept is shown in prior art U.S. Pat. to Absler et al., U.S. Pat. No. 3,493,156; Peterson, U.S. Pat. No. 3,146,927; and Pine et al., U.S. Pat. No. 3,161,335, all of which are assigned to the assignee of this invention. The structures disclosed therein are well suited to bursting large quantities of continuous forms stationery into individual form lengths, and are particularly well suited to application in those instances where there is a high volume of stationery to be processed therethrough.

As is the case with many other fields, there is a desire in the art to provide more compact office equipment, including burster mechanisms. This is particularly true in those instances where such devices may be needed for use in offices of smaller volume where expense cannot justify the outlay necessary to purchase larger equipment, and also, where there is a desire to provide a burster structure which is movable from location to location within the office and yet does not occupy a substantial amount of floor space. A relevant prior art patent which illustrates a compact burster mechanism is the Schutz U.S. Pat. No. 3,338,487, also assigned to the assignee of this invention. The Schutz patent discloses a compact burster mechanism wherein the infeed and outfeed rollers are held stationery a fixed distance apart. The outfeed rollers are driven at a faster rate of speed than the infeed rollers and a slip clutch is associated with the outfeed rollers to continually induce tension in the stationery strip between the sets of rollers so that the paper will separate when the weak point (the perforation) passes over the breaker roller which is located between the infeed and outfeed rollers.

It is desirable, if not necessary, to be able to run burster equipment at different rates of speeds to accommodate paper of different characteristics, or to adapt the mechanism to different environmental conditions of temperature, humidity and the like. It is believed that the Schutz structure cannot be successfully run at different speeds or variable speeds so as to satisfactorily accommodate such paper of different characteristics or adapt to different environmental conditions. Thus, there is still a need and desire in the art to provide a compact burster mechanism which is capable of handling form lengths of stationery of many different sizes and capable of running at different speeds, and this invention is directed towards meeting this need and desire.

SUMMARY OF THE INVENTION

This invention is directed, in brief, to the provision of an improved burster mechanism for separating continuous form stationery along the transverse lines of weakening wherein the infeed and outfeed rollers are maintained a fixed distance apart, closely spaced from each other.

The best mode currently contemplated for carrying out the invention includes the provision of a frame with the infeed and outfeed rollers mounted in the frame in a fixed position, yet very closely spaced from each other, such as on 4 inch centers. The well-known "breaker roller" or bar is positioned intermediate the infeed and outfeed rollers. The outfeed rollers are driven at a constant rate of speed and the infeed rollers are normally driven at a lower rate of speed. However, the drive

connection to the infeed rollers includes an adjustable lost motion arrangement to allow the infeed rollers to establish an idler relationship with respect to the outfeed rollers when the stationery strip is simultaneously gripped by both sets of rollers. At the limit of the lost motion idler connection with the infeed rollers, the speed to the infeed rollers is rapidly reduced, creating a rapid increase in tension in the strip of stationery in timed relationship to the position of the perforation line adjacent the breaker roller, to permit severing of the stationery along the cross perforation line. Adjustment of the amount of lost motion allows "bursting" of various lengths of stationery.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a side elevational view partially broken away in section of the burster mechanism of this invention;

FIGS. **2** through **5** are diagrammatic view illustrating the sequence of operation of the burster of this invention;

FIG. **6** is a fragmentary enlarged section view of a portion of the drive connection with the infeed roller assembly;

FIG. **7** is a section view taken generally along the line **7—7** of FIG. **6**;

FIG. **8** is a side elevational view of the burster mechanism of this invention with the cover panels removed;

FIG. **9** is a broken sectional view taken generally along the line **9—9** of FIG. **8**;

FIG. **10** is a broken sectional view taken generally along the line **10—10** of FIG. **8**;

FIG. **11** is a fragmentary perspective view illustrating the separation of the stationery strip along the transverse lines of weakening adjacent to the breaker roller;

FIG. **12** is a fragmentary top plan view showing the paper supports and breaker rollers utilized in the burster of this invention; and

FIG. **13** is a fragmentary front end elevational view of a portion of the infeed structure for the burster mechanism of this invention.

While this invention is susceptible of embodiment in many different forms, there is shown in the drawings and will herein be described in detail a specific embodiment therefor, with the understanding that the present disclosure is to be considered as an exemplification of the principles of the invention and is not intended to limit the invention to the embodiment illustrated.

BRIEF DESCRIPTION OF THE PREFERRED EMBODIMENT

The burster **10** of this invention includes means **12** defining a frame of generally rectangular or box-like configuration to which the several components of the burster of this invention may be fastened. Decorative cover paneling such as **14** may also be provided for enclosing the framing and mechanical structure of the burster.

As is typical with burster-type office equipment, an infeed shelf **16** may be provided for supporting a zig-zag folded pack **18** of continuous form stationery **20** separable into individual form lengths **20***a* along transverse lines of weakening **22**. An outfeed shelf **24** may be also provided for receiving the individual form lengths **20***a* in a stack **26** after the form lengths having been separated along the transverse lines of weakening **22**.

The front end of the burster is provided with an infeed guide assembly **28** for directing the continuous forms stationery **20** fed into the machine toward infeed roller assembly **30**. Following this, the stationery is fed over a breaker roller assembly **32** and then through the outfeed roller assembly **34**. To assist in feeding the stationery through the burster and through the infeed and outfeed rollers, well-known paper support bars **36** and upper deflector strips **38** are provided. The deflector strips are wrapped about rods **40***a* and **40***b* in front of the infeed rollers and outside of the outfeed rollers, respectively. From there the deflector strips are secured to mounting rods

42*a* and 42*b*. The paper support bars 36 and deflector strips 38 form a paper feeding channel as is well-known in the art for maintaining the strip of continuous form stationery 20 in a generally uniform plane through its path of travel through the burster.

The infeed guide assembly 28 includes a pair of closely vertically spaced apart rods 46 and 44 which span the walls of frame 12 at the infeed end of the burster. This leaves a narrow space 48 between the rods through which the paper 20 may be fed. The support bars 36 and deflector strips 38 defining a paper-feeding channel, are forward in the path of travel of the stationery relative to the infeed assembly 28. Thus, the infeed assembly 28 serves to initially position the stationery 20 for feeding into the machine between the support bars 36 and deflector strips 38. Means are also provided in the infeed guide assembly for laterally guiding the stationery strip 20. For this purpose, edge guides 50 and 52 are provided. These guides have through openings such as 50*a* and 50*b* of a size and shape to snugly slidably mount the guides 50 and 52 relative to the rods 44 and 46. Thus, depending upon the width of the stationery 20 to be processed by the burster 10, the guides 50 and 52 may be laterally adjusted to insure that the stationery will be relatively "centered" with respect to its path of travel through the burster.

The breaker roller assembly 32 extends across the path of travel of the stationery intermediate the infeed roller assembly 30 and outfeed roller assembly 34. As best seen in FIG. 11, the function of the breaker roller assembly 32 is to create an additional stress or tension in the web of paper as it is gripped between the infeed and outfeed rollers by providing a slightly upraised surface in the path of travel of the stationery. When the transverse line of weakening 22 is adjacent to the breaker roller assembly 32, this increased stress in this limited area will initiate a tearing action along the line of weakening 22 to sever one form length of 20*a* of stationery from the remainder of the continuous strip 20.

Breaker roller assembly 32 includes a rod 54 having eccentrically related, reduced ends 56*a* and 56*b* which extend through openings 58*a* and 58*b* in opposite portions of frame 12 to eccentrically, rotatably mount the rod 54 with respect to the frame 12. Reduced end 56*b* of rod 54 further includes a threaded extension 60 for receiving a threaded fastener 62 and pressure washer 62*a* for locking the rod 54 in a selected position of adjustment. The rod 54 further includes discs 64 spaced along the length of the roller which provide protrusions for extending upwardly into the channel of stationery travel between the paper support bars 36 and the deflector strips 38. The extent to which the discs 64 protrude upwardly into the channel of stationery travel can be adjusted by loosening the lock nut 62 and turning the rod 54 relative to its eccentric mounting with the aid of adjustment finger 66. Once the desired protruding elevation of the discs 64 has been attained, then the lock nut 62 may be tightened to lock the rod 54 in the desired adjustment position.

For driving the several components of the burster, a source of power, such as a motor 68, is mounted within the frame. Motor 68 includes the usual output shaft 70 having a pulley 72 thereon which drives a belt 74 that is reeved about the pulley. Belt 74 is also reeved about a vertically superposed idler pulley 76 which is mounted on a shaft 78 by means of set screw 76a. Shaft 78 is rotatably mounted within bearing block 80 fastened to frame 12 by means of fastener 82. Mounted on shaft 78 on the other side of bearing plate 80 is a small idler pulley 84 which is connected thereto by means of set screw 84*a*. A belt 86 is reeved about small idler pulley 84 and is also wrapped about vertically superposed outfeed roller pulley 88 which is associated with the outfeed roller assembly 34.

The outfeed roller assembly 34 includes a lower roller shaft 90 to which the outfeed roller pulley 88 is connected by means such as the set screw 90*a*. Lower roller 92 is mounted on shaft 90 for rotation therewith and includes a core portion 93 and closely spaced apart radially enlarged portions 93*a* defining narrow circumferential grooves 94 therebetween. Bearing race 98 is secured to frame 12 by fastener 98*a* adjacent one end of shaft 90. At the other end of shaft 90 bearing race 100 is also fitted within the frame 12 for rotatably mounting the shaft 90 with respect to the frame 12.

Upper roller shaft 102 also spans the frame directly above the lower roller shaft 90 for rotatably mounting the upper roller 104 in the frame. Upper roller 104 includes a tubular portion 105 rotatably mounted relative to shaft 102 by means of bearings 105*a* interposed between tubular portion 105 and shaft 102 at the opposite ends thereof. Sleeve portions 106 are mounted about tubular portion 105 closely spaced apart from each other affording relative circumferential grooves 106*a* therebetween. The circumferential grooves 106*a* are generally in alignment with the grooves 94 in the lower roller 92 and the paper support bars 36 and the deflector strips 38 extend through the outfeed roller assembly 34 in the area of the vertically superposed grooves 94 and 106*a*. The opposite ends of shaft 102 reside in slots 107 in the opposite sides of frame 12. Set screws 108 and 110 bear against the shaft 102 and are locked in place by means of lock nuts 108 *a* and 110*a* respectively, to hold the shaft 102 in the frame and mount the roller 104 in peripheral engagement with respect to lower roller 92.

A drive gear 112 having a toothed periphery 112*a* is connected to shaft 90 on the end opposite of pulley 80*a* by means of a set screw 112*b* through the hub portion of drive gear 112. A turn knob 114 is also affixed to the shaft 90 by means of a set screw 114*a* adjacent the drive gear 112 to provide a means for manually advancing the roller assembly 34.

The toothed periphery 112*a* of gear 112 is in engagement with the toothed periphery 116 of idler gear 118. Idler gear 118 is mounted for rotation relative to shaft 120 by means of bearings 122*a* and 122*b*. The shaft 120 includes a threaded end 124 which is received within an opening 126 in frame 12 and a suitable fastener, such as nut 128, affixed to the threaded end 124 on the other side of frame member 12 secures the shaft 120 with respect to the frame. The arrangement of the drive gear 112 and the idler gear 118 provided a means for transferring driving force from the motor 68 through the roller assembly 34 to the infeed roller assembly 30.

To this end, the infeed roller assembly includes a lower roller shaft 130 for rotatably mounting roller 132 thereon. Roller 132 includes a core portion 133 similar to roller 92 and closely spaced apart radially enlarged portions 133*a* defining relatively circumferential grooves 134 therebetween. Bearing race 136 at one end of shaft 130 is fixed by fasteners 136*a* to frame 12 and bearing race 138 at the other end of shaft 130 is also received within frame 12 to rotatably mounting the shaft 130 with respect to the frame.

Upper roller shaft 140 is vertically superposed adjacent lower roller shaft 130 and is received within slots 142*a* and 142*b* in the opposite sides of frame 12. Lock screws 144*a* and 144*b* together with lock nuts 146*a* and 146*b* hold the shaft 140 in the slots 142*a* and 142*b* so that the upper roller 141 is in peripheral engagement with the lower roller 132. Upper roller 141 includes a hollow tubular portion 148 having closely spaced apart sleeves 150 thereon defining relatively circumferential grooves 152 between the several sleeves 150. The grooves 152 are in vertical alignment with the grooves 134 of the lower roller 132 so that the paper support bars 36 and deflector strips 38 may extend through the infeed roller assembly 30 in this area. Bearings 154 are interposed between the tubular portion 148 and the shaft 140 at the opposite ends thereof so that the upper roller assembly 141 is rotatably mounted relative to the shaft 140 which is fixed in position in the frame.

The infeed roller assembly 30 includes a lost motion drive connection means 160 between the drive transfer for the outfeed roller assembly so that the driving force imparted through the motor 68 related pulleys and belts outfeed roller assembly 34 and idler gear 118 may be temporarily interrupted. Included in the lost motion drive connection means 160 is a gear 162 having a toothed periphery 162*a* in meshing engagement

with the toothed periphery **116** of idler gear **118**. The hub portion **164** of gear **162** is rotatably journalled in bearings **166***a* and **166***b* which surrounded shaft **130** so that gear **162** is rotatably mounted relative to shaft **130**. A pin **168** extends outwardly from the hub **162** in a position to engage radial finger **170** connected to the end of shaft **130** by means of set screw **172**. A cap **174** encloses the end of shaft **130** and in particular the finger **170** thereof. Cap **174** is provided with a plurality of arcuate slots **176***a* and **176***b* and **176***c* and fasteners such as **178***a* and **178***b* extend through the aforementioned slots into threaded engagement with the hub **164** of gear **162**. A pin **180** extends inwardly from the interior of cap **174** in a position to be engaged by the finger **170**. By this arrangement, as idler gear **118** is rotated responsive to being driven by gear **112** it will drive gear **162** which will cause pin **168** to strike finger **170** and rotate shaft **130** thereby driving the infeed roller assembly. However, the gearing reduction is such that the infeed roller assembly is driven at a slower rate of speed than the outfeed roller assembly.

With particular reference to the diagrammatic illustrations in FIGS. **2** through **5**, when the leading edge of strip **20** is gripped between the bight of the rollers of the outfeed assembly **34**, the finger **170** on shaft **130** is pulled relatively away from the pin **168** on gear **162** so that the infeed roller assembly assumes an idler relationship with the outfeed roller assembly and the speed of the infeed roller assembly increases, approaching that of the outfeed roller assembly. This occurs until such time as the finger **170** engages the pin **180** on cap **174**. This has the effect of braking the infeed roller assembly **30**, causing a rapid decrease in the rate of speed of the infeed roller assembly and thereby placing an immediate surge of tension on the strip of paper. It is desirable that this occur at about the same time that the cross line of perforation **22** is immediately adjacent the breaker assembly **32**. When this occurs this will induce a tearing along the line of weakening **22** to thereby cause severance of the strip of stationery in this area and the separation of an individual form length **20***a* therefrom. The immediate result of this separation is that the separate form length **20***a* is thrust outwardly of the burster while the infeed roller assembly returns to its normal rate of speed in that the strip of paper is only gripped between the infeed roller assembly so that finger **170** may return to engagement with the pin **168**. This occurs until such time as the leading edge of the strip again is gripped between the bight of the outfeed rollers whereupon the entire action is repeated.

The fasteners **178***a* and **178***b* may be loosened to permit adjustment of the relative positioning of pins **168** and **180** so that the burster may accommodate different form lengths of stationery. Exact length calibrations may be shown on this adjustment device to assist easy, accurate burst length set up. By adjusting the spacing between these two pins the burster may be adjusted so that a continuous form assembly of any form length will have its cross line of perforation **22** adjacent the breaker assembly **32** at the time the lost motion drive with the infeed roller assembly is terminated and the rapid braking action is applied thereto.

Thus, it can be seen that the burster of this invention may be extremely compact in configuration with the burster infeed and outfeed rollers closely spaced apart. However, even though the infeed-outfeed rollers are so closely spaced apart, the burster is capable of accommodating an extremely broad range of form lengths. For example, the burster of this invention has operated satisfactorily with form lengths ranging in size from 2½ inches to 23 inches and is believed to have the capability of handling form lengths ranging in dimensions beyond these ranges, especially the maximum dimension. Thus, the desire to provide a compact burster is satisfied by the structure of this invention and the ability to accommodate different form lengths as well as different environmental conditions is also satisfied. Accordingly, it is believed that the burster of this invention provides a significant improvement of the art in meeting the desire for a burster of compact configuration which is of extreme versatility in its use.

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 forms stationery into individual form lengths between transverse lines of weakening comprising: means defining a frame; a first pair of rollers mounted in said frame in the path of stationery travel for gripping and feeding stationery through the burster; a second pair of rollers also mounted in the frame in the path of stationery travel for gripping and feeding stationery; motor means in the frame; drive means operably associated with said first and second set of rollers for driving the same; the drive means associating said motor means with said first set of rollers including reduction means for normally driving the first set of rollers at a slower rate of speed than the second set of rollers when a strip continuous forms stationery is not simultaneously gripped by both set of rollers, and further including a limited lost motion means to allow the first set of rollers to be rotated a faster rate of speed when a strip of continuous forms stationery is simultaneously gripped by both set of rollers; and means limiting the lost motion connection in the drive means to said first set of rollers to cause tension in the strip of stationery when the stationery strip is simultaneously gripped by both sets of rollers to promote severance thereof along the transverse line of weakening when the transverse line of weakening is disposed intermediate the first and second pair of rollers, whereupon the strip of stationery will be gripped by only said first pair of rollers and the first pair of rollers will return to a relatively reduced rate of speed with respect to the second set of rollers.

2. The burster device of claim **1** wherein the means limiting the lost motion connection includes means for abruptly decreasing the speed of the first rollers to thereby initiate separation of the stationery along the transverse lines of weakening.

3. The burster device of claim **1** wherein the drive means connecting the motor means to the first rollers includes a take-off drive from the second rollers to the first rollers.

4. The burster device of claim **3** wherein the lost motion means for said first rollers is associated with the take-off drive from the second rollers to the first rollers.

5. The burster device of claim **1** wherein the first roller assembly includes a roller on a shaft and the lost motion means includes a member freely rotatable on the roller shaft with the roller shaft having a radial extension and the rotatable member having spaced apart axial extensions in a position to be engaged by said shaft radial extension.

6. The burster device of claim **5** wherein one of said spaced apart axial extensions is relatively movable toward and away from the other axial extension to adjust the burster for separating continuous forms stationery of different form lengths.

* * * * *