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Phillips

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[54] **ROTARY CUTTER-SLITTER FOR HIGH SPEED BURSTING APPARATUS**

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[52] **U.S. Cl.** **83/481,** 83/665, 83/676

[51] **Int. Cl.** **B23d 19/06**

[58] **Field of Search** ..... 83/481, 491, 492, 493, 83/494, 504, 505, 506, 676, 665, 666; 30/347; 76/101 A

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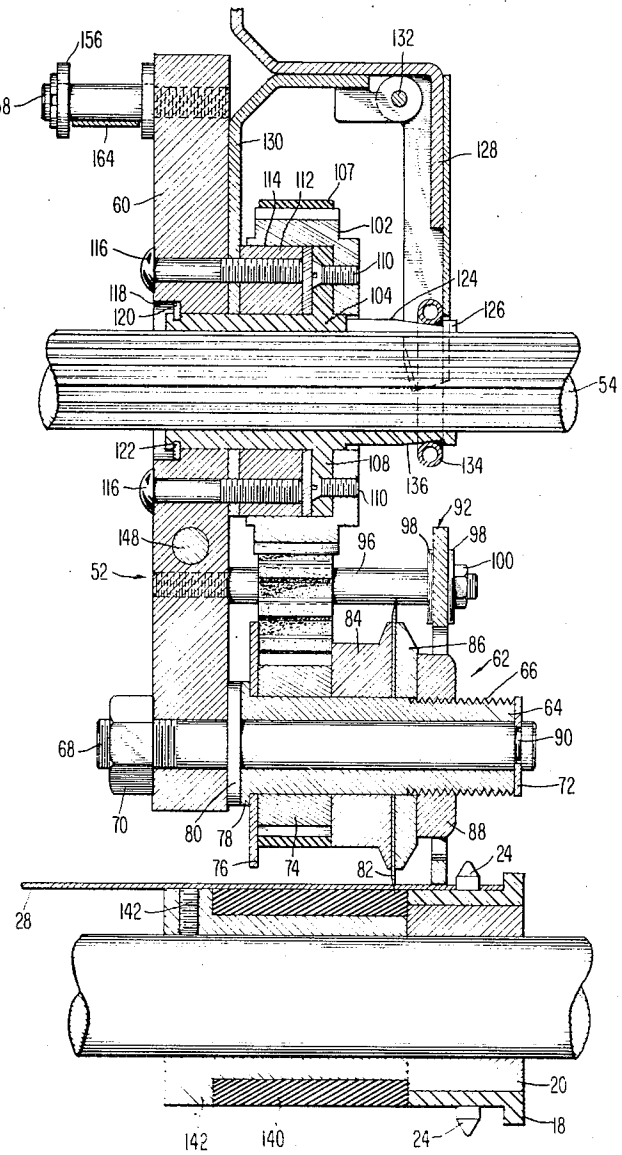
Primary Examiner—J. M. Meister

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[57] **ABSTRACT**

The invention relates to a demountably replaceable rotary cutter-slitter provided with a demountable, circular blade of the so-called throw-away, disposable type permitting a dull blade to be quickly and easily replaced with a sharp blade. The cutter-slitter device can be positioned to accommodate varying widths items and the location of the cutter relative to the edges of the item may be adjusted according to the desired dimensions by the simple expedient of sliding the cutter normal to the path of movement of the item web avoiding unnececcary downtime of the associated apparatus, e.g., burster.

4 Claims, 11 Drawing Figures



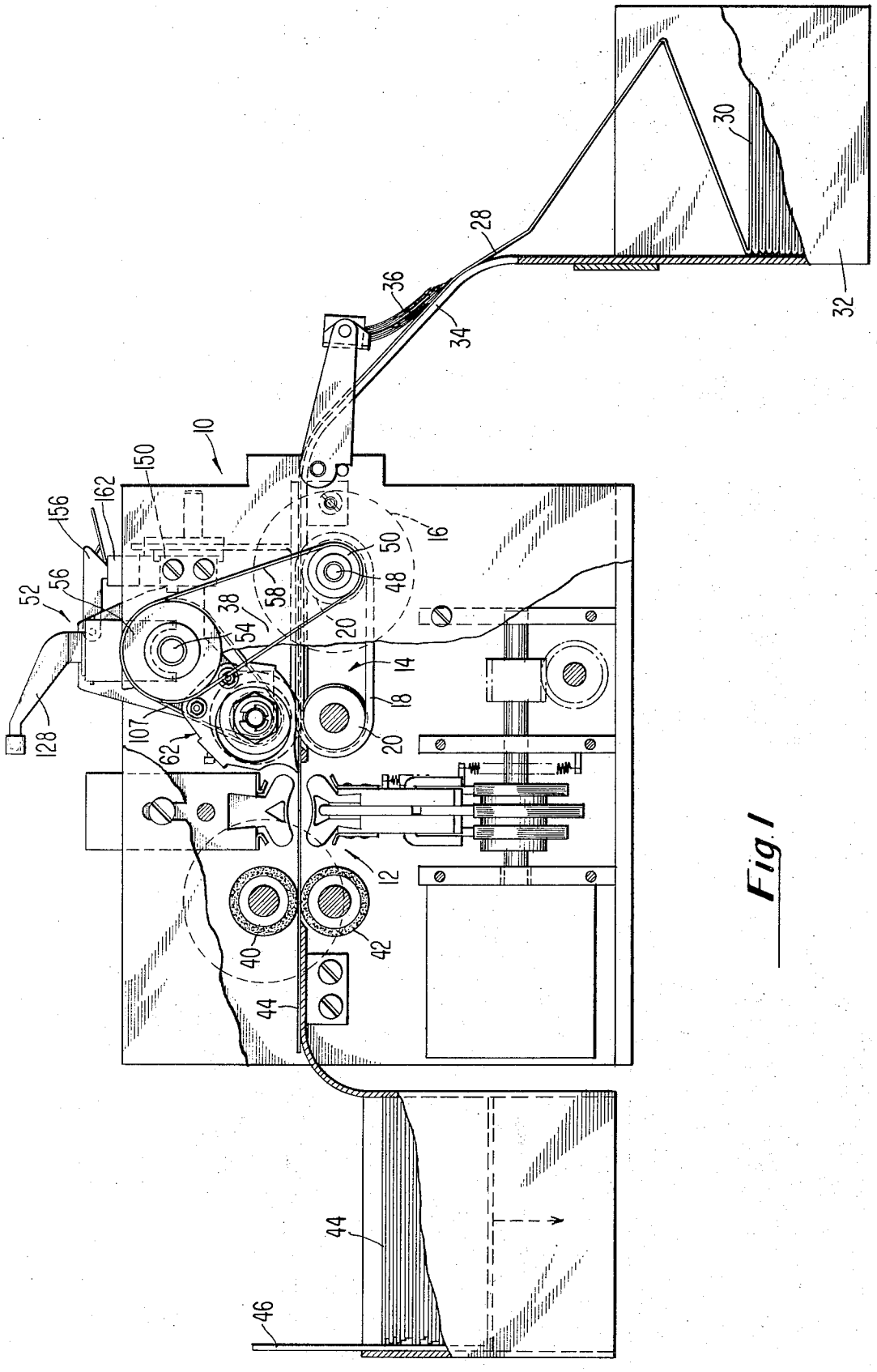

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Fig. 1

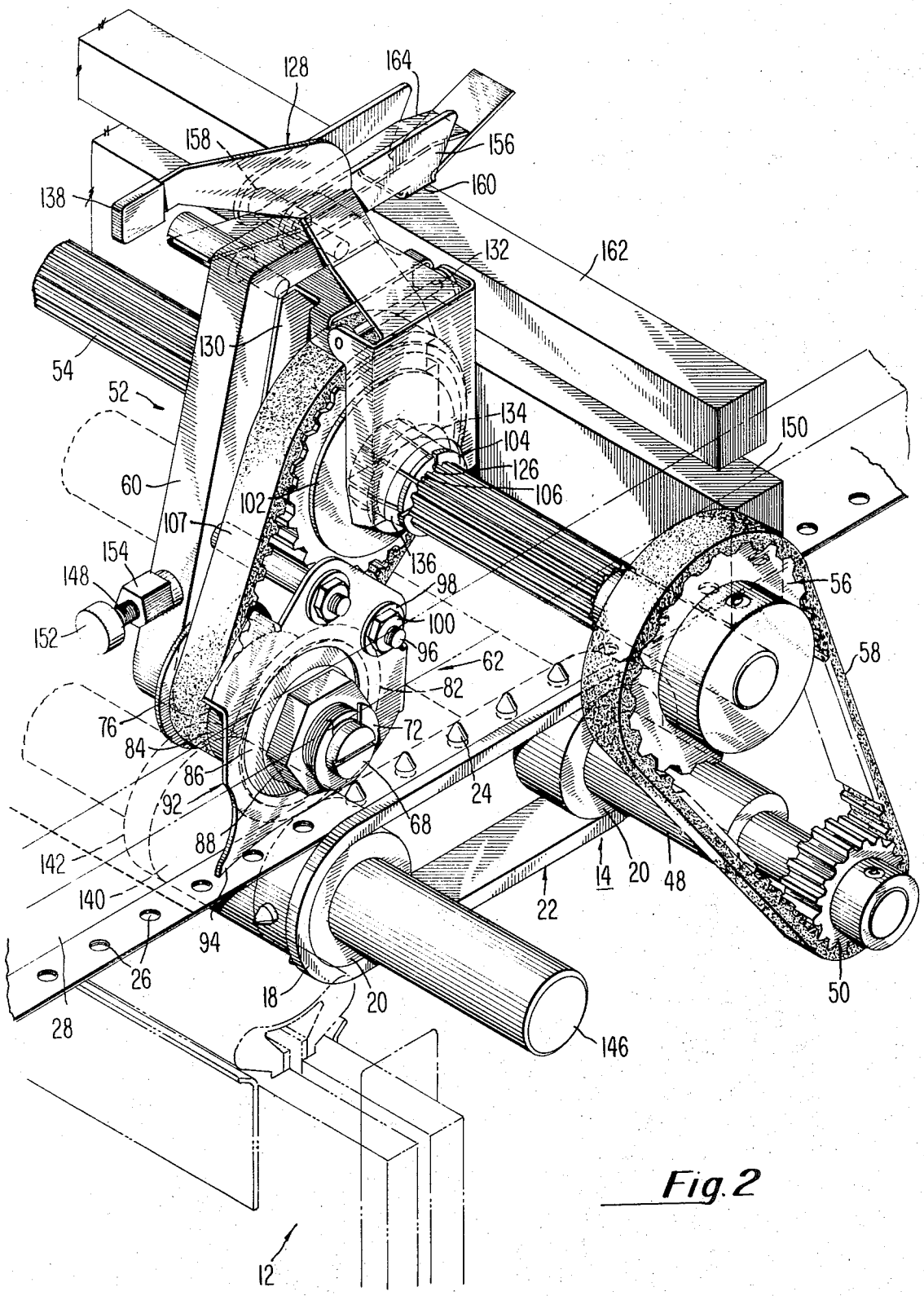

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Fig. 2

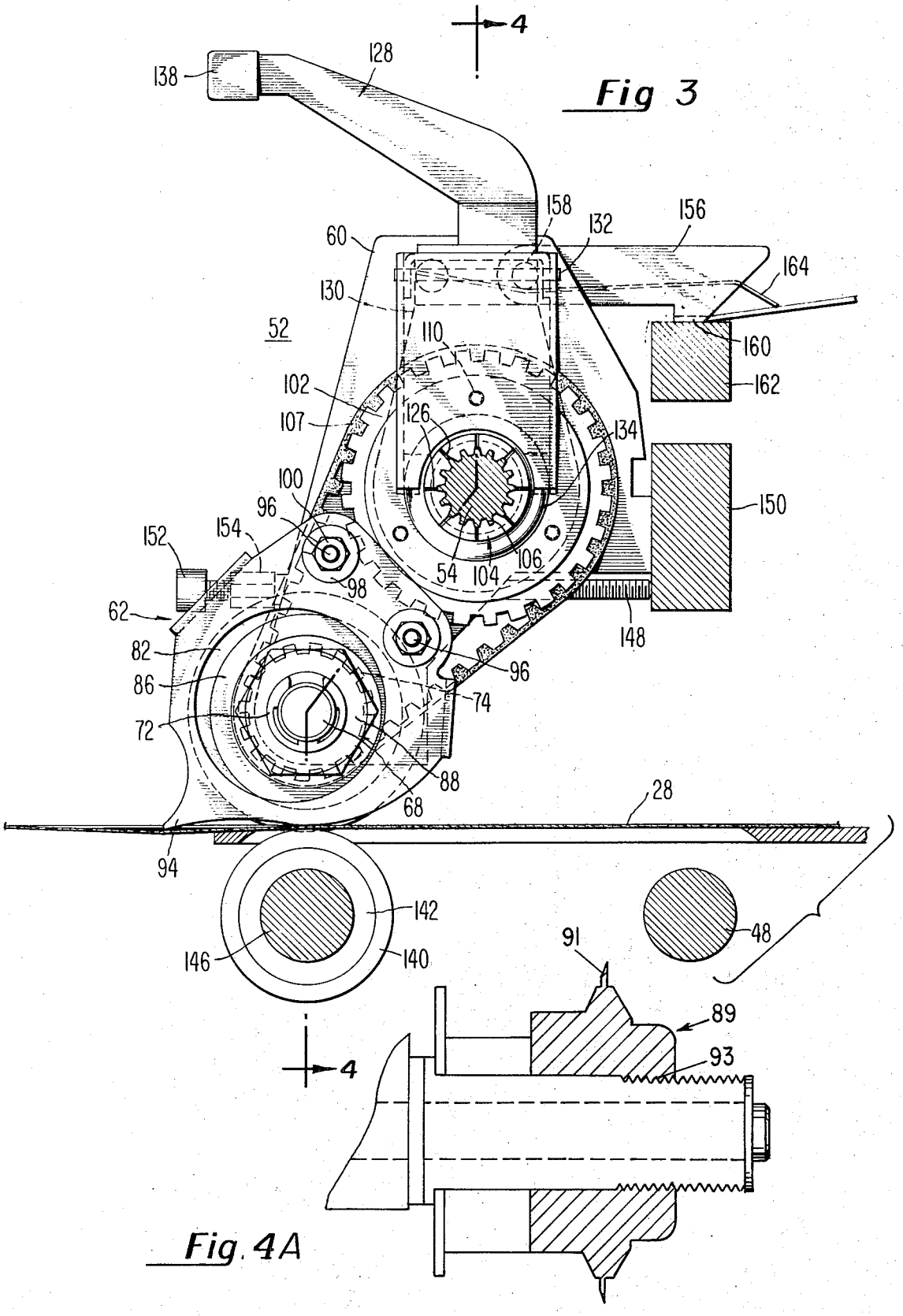
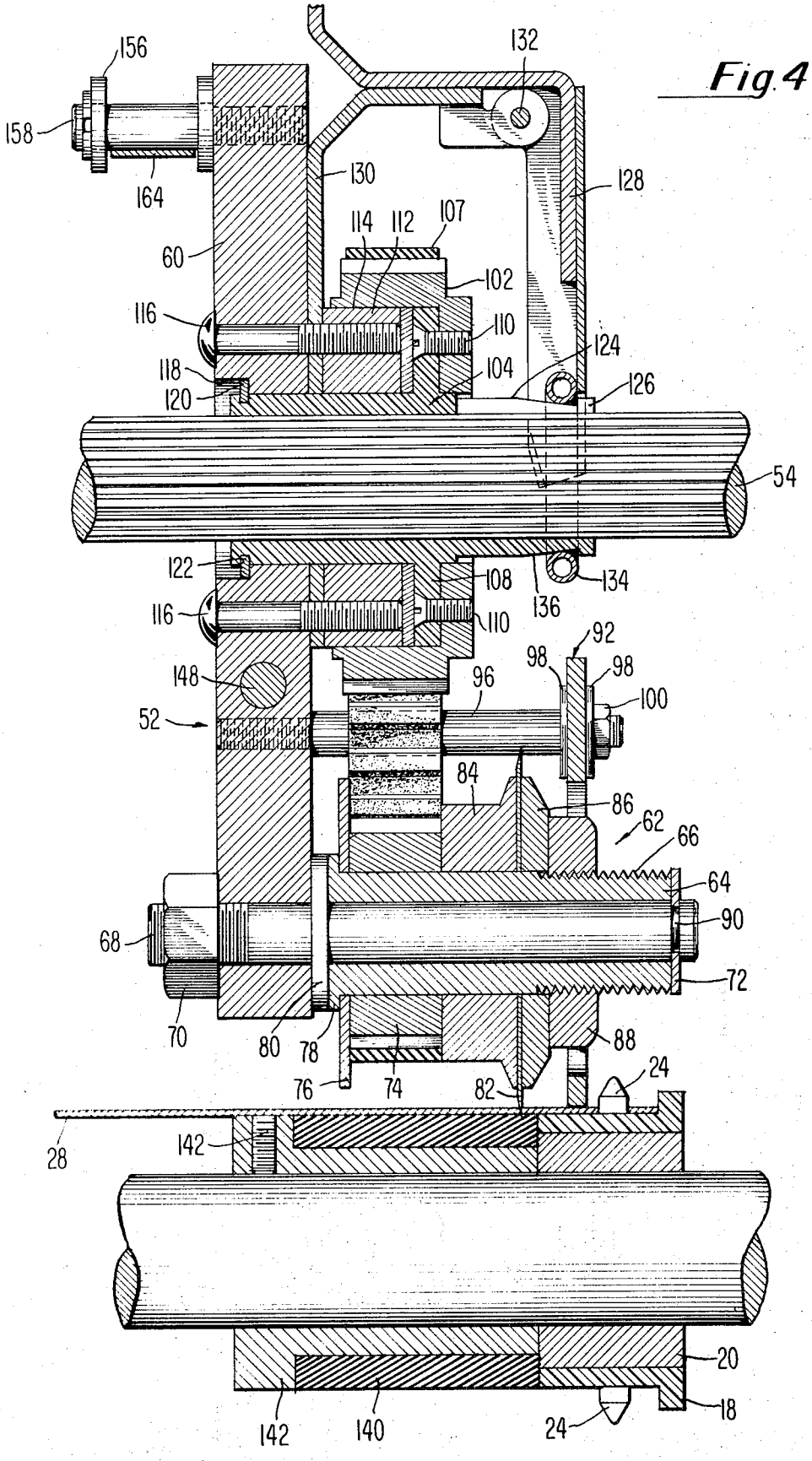

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Fig 3

Fig. 4A

Fig. 4


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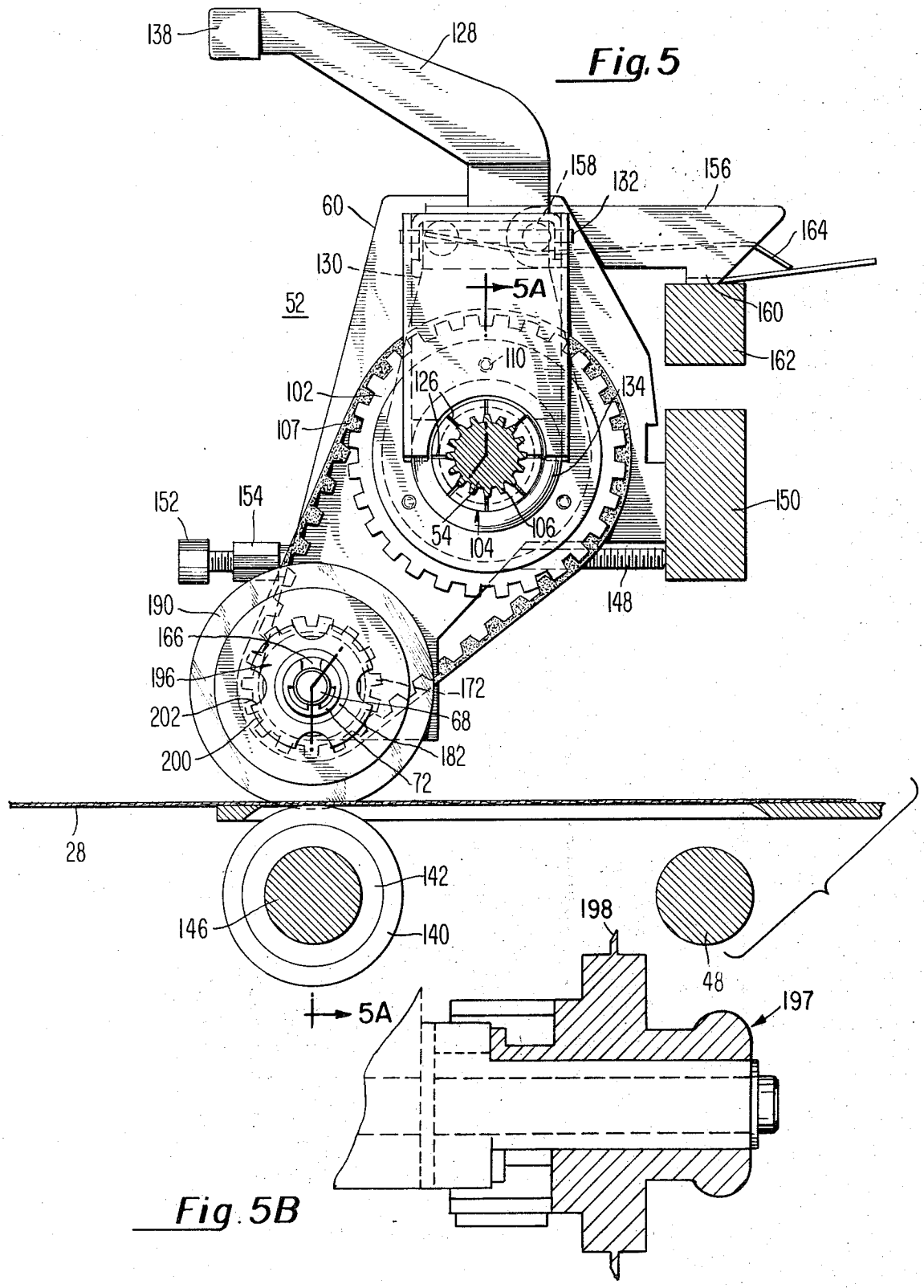

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Fig. 5

Fig. 5B

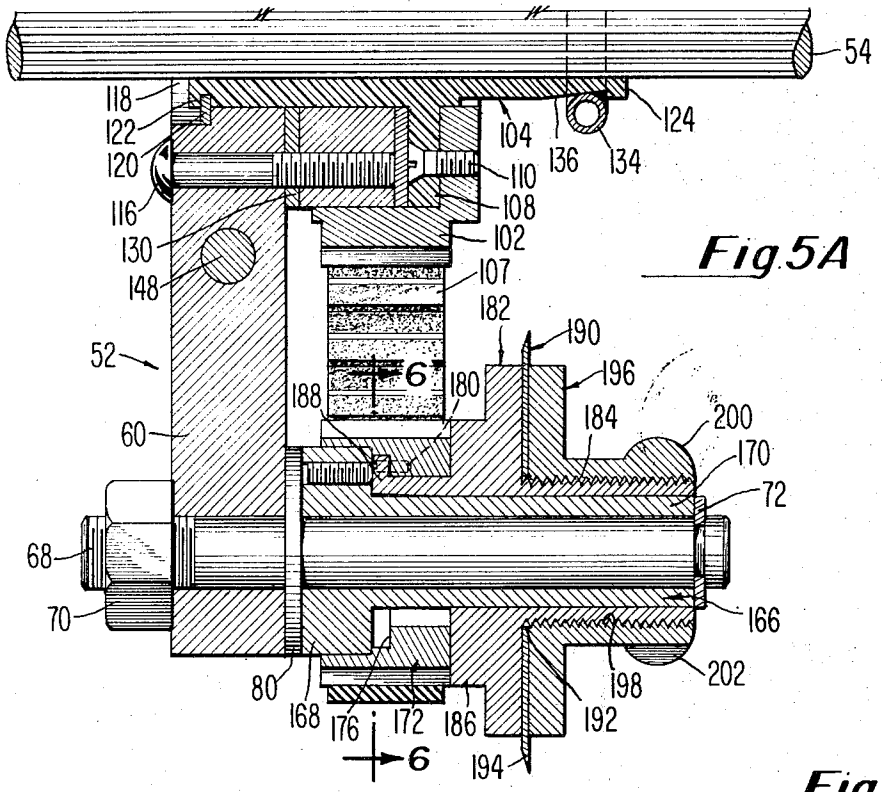


Fig.5A

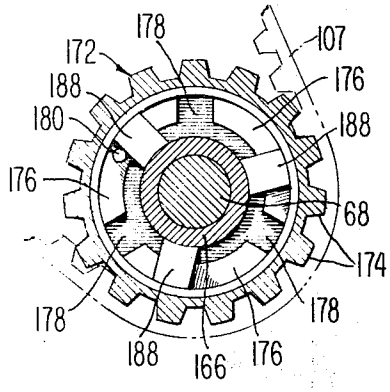


Fig.6

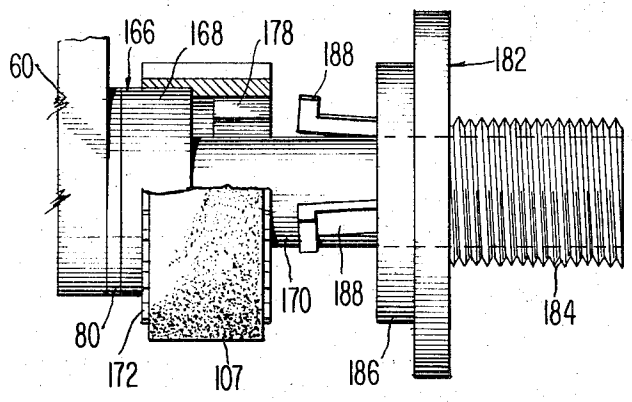


Fig.7

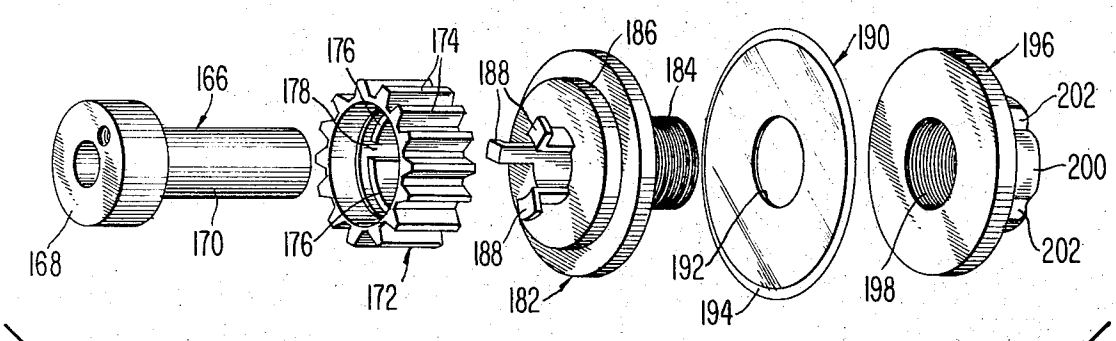


Fig.8

ROTARY CUTTER-SLITTER FOR HIGH SPEED BURSTING APPARATUS

BACKGROUND OF THE INVENTION

This invention relates generally to means for cutting, i.e., slitting, along the long dimension a rapidly moving web of material in such fashion as to separate the web into one or more longitudinally parallel, independent webs or to cut and remove the parallel edge portion of a web that includes portions carrying pin feed holes for advancing the web through its apparatus.

More often than not such apparatus involves the use of circular cutter blades which are mounted for rotation against a metal backup anvil or which permit the peripheral portions of the cutter blade to move within a circular groove disposed in the backup member or anvil depressing and thereby cutting the item therebetween.

In many if not most instances such cutter blades are fixedly mounted for rotation on opposite sides of the apparatus frame supporting the same or in a fixed, intermediate location midway between the side frames of the machine. Changing the blades is a considerable chore and requires, generally speaking, a longer than need be downtime or time when the machine is completely stopped to permit dismounting and remounting of the old, dull blade for the new, sharp blade. Wrenches or other special tools are usually required and a more than modest amount of skill and finger dexterity may be needed to accomplish the changeover without injury to the operator or to the blade assembly.

SUMMARY OF THE INVENTION

The prime object of the present invention is to obviate the aforementioned disadvantages and to provide certain desirable features which will presently become apparent.

It is an object of the present invention to provide a slitter-cutter mechanism having a removable throw-away blade which is easily changed.

Another object of the invention is to provide a rotary cutter-slitter mechanism for use with a high speed burster which can easily be adjusted to accommodate varying document size requirements.

Still another object of the invention is to provide a plastic cutter mechanism removable from the cutter drive by a simple tab-lock device so that the dull blade may be thrown away and replaced by a fresh, sharp blade.

Still a further object of the invention is to provide as an assembly, a cutter-slitter wherein the slitter blade is integrally cast into the plastic hub and wherein the blade and hub are plastic with the blade metal plated, ground and honed sharp.

BRIEF DESCRIPTION OF THE DRAWINGS

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

FIG. 1 is a side elevational view in diagrammatic form illustrating the environment of the invention as it might be incorporated into a continuous form burster mechanism;

FIG. 2 is an isometric view of the cutter-slitter mechanism illustrating the drive and mounting arrangement therefore;

FIG. 3 is a side elevational view of the slitter-cutter as mounted in a burster apparatus with portions cut away to reveal certain details of the drive and mounting arrangement;

FIG. 4 is a sectional view along the line 4—4 of FIG. 3 illustrating further details of the construction of the apparatus;

FIG. 4A is a sectional view of the cutter-slitter apparatus of FIG. 4 fabricated as a one-piece unitary assembly;

FIG. 5 is an enlarged sectional view of a portion of the apparatus similar to FIG. 4 illustrating other and additional structural details of the invention;

FIG. 5A is a view along the line 5A—5A of FIG. 5;

FIG. 5B is a sectional view of the cutter-slitter apparatus of FIG. 5A fabricated as a one-piece unitary assembly;

FIG. 6 is a detail view taken along the line 6—6 of FIG. 5A;

FIG. 7 is a detail view of the apparatus of FIG. 5A partially dismounted; and

FIG. 8 is an exploded isometric view of the complete cutter-slitter assembly of the invention.

DETAILED DESCRIPTION OF THE INVENTION

Referring first to FIG. 1 of the drawings, it is assumed for the sake of the initial description that it is desired to burst continuous item forms along preweakened portions therein, and also to remove thereafter the edge portions of the form which carries the tractor holes which are employed to advance the forms through the burster, etc. The burster **10** may be part of a modularized signer-protector-burster apparatus, which apparatus is designed to include a number of features not herein described in detail but which enables the apparatus to perform other and additional functions to that of paper separating and bursting as set forth in more detail and particularity in copending U.S. Pat. application Ser. No. 210,737, filed Dec. 22, 1971, now U.S. Pat. No. 3,794,228, entitled "Bursting and Separating Apparatus for Continuous Forms." A bursting mechanism **12** as described in the aforementioned application is or may be disposed centrally of the main machine assembly **10,** as shown. An item moving device such as a pin feed tractor mechanism **14** is driven by electric motor **16** through a belt **18** and pin wheel pulleys **20.** As seen more clearly in FIG. **2,** the pin feed tractor includes a movable pin carrying belt mechanism **22** provided with projecting conically shaped pins **24.** Pins **24** are engageable with line holes or perforations **26** located on opposite, parallel edges of continuous item forms **28.** Item forms **28** are generally, although not necessarily, manifolded as shown at **30,** FIG. **1,** and may be fed vertically, upwardly from supply bin **32** by the pins of feed tractor **14.** In the present arrangement, as a result of the novel construction to be described presently, items varying in width from 2 5/6 inches to 24 inches may be accommodated without alteration of the bursting mechanism **12.**

As seen in FIG. **1** of the drawing, the continuous forms **28** are adapted to be fed slantingly, vertically, upwardly over smoothing and retarding means such as the arcuately curved guiding member **34** under a

smoothing brush assembly **36** into feed area **38.** Individual pin feed tractors **14** are arranged on opposite sides of the apparatus, and each tractor is adapted for horizontal, slidable movement toward and away from the other such mechanism along a helically threaded member (not shown), permitting the tractors **14** to be operator-adjusted for varying size and width documents. The continuous form item **28** is then fed by the tractors **14** into the bursting mechanism **12,** and therebeyond into the bight of upper and lower ejection rollers **40** and **42,** respectively. The individually burst item hereinafter identified at **44** once separated from the continuous form **28** is moved at high speed leftwardly in FIG. **1** into a stacker hopper **46** where such items are stacked one on top of the other for further handling and processing.

Drive motor **16** carries an elongated, driving shaft **48,** FIGS. **1** and **2,** extending outboard of the side frame of the machine as shown in broken line form in FIG. **2.** Carried on the exposed outboard end of motor shaft **48** is a timing belt type pulley wheel **50** fixed to the shaft and rotatable therewith. Slitter-cutter assembly **52** is demountably disposed between the side frames of the apparatus and arranged to be slidably movable along a splined or fluted shaft **54** rotatably mounted between the side frames for purposes now to be described. Shaft **54** projects through the side frame and carries on its exposed end timing belt type pulley wheel **56** fixedly attached thereto as shown. A notched timing type drive belt **58** is arranged to transmit rotary power from shaft **48** via pulley **50** to shaft **54** via pulley **56.**

The slitter-cutter mechanism **52** includes a rigid subframe **60** and is capable as will be hereinafter described of being pivotally, rockably moved arcuately, upwardly as viewed in FIG. **2** away from the plane of the paper item or continuous form **28.** The cutter-slitter subassembly **62** as seen most clearly in FIG. **4** of the drawings comprises a hollow, elongated, cylindrical bushing **64** threaded as at **66** and secured to the subframe **60** by means of a bolt **68** and nut **70** at one end and a C-ring **72** at the opposite end. A grooved timing belt drive pulley **74,** including a belt retaining washer **76,** is mounted on bushing **66** so that washer **76** abuts the integral flange **78** of member **64.** A spacer **80** locates the bushing **64** relative to subframe **60.** A demountably removable cutter blade **82** of circular cross section is mounted between the confronting faces of hub member **84** and finger lock nut **86.** These three latter members **82, 84** and **86** are retained in place on bushing **64** by means of a hex nut **88** threaded onto member **64** pressing the assembly tightly against the pulley **74.** C-ring **70** disposed in groove **90** of member **64** retains the bolt **68** within the bushing **64** and on the frame **60.**

Adjacent the outboard end of the cutter assembly **62** is an item parting guide member **92,** the elongated, pointed end portion **94** of which is adapted to press against the upper surface of the item **28** as it is being slit or cut. The pointed end of member **92** forces the cut away portion of each item to be guided downwardly out of the path of movement of the incoming items. Member **92** is secured as by thread mounted supporting shafts **96** to the subframe **60** by means of washers **98** and nuts **100** in conventional fashion.

Located directly above the pulley **74** is an input drive pulley **102** mounted adjacent the subframe **60** on a hollow, plastic, cylindrical supporting member **104.** The inner surface portion of member **104** is provided with grooves or flutes **106** seen most clearly in FIG. **3** (and also in FIG. **2**). Member **104** is adapted to be received in mating driving engagement with the grooved drive shaft **54.** Pulley **102** is cup shaped and is secured to an upstanding circular ridge **108** on bushing **104** by means of bolts **110.** Member **112** which together with ridge **108** forms a bearing surface, as at **114,** for pulley **102,** is mounted to subframe **60** by bolts **116.** Bushing **104** is retained within opening **118** in subframe **60** by means of a C-ring **120** located in groove **122** in the leftward end thereof (as viewed in FIG. **4**). Input driving motion from shaft **48** transmitted to shaft **54** via belt **58** thus causes pulley **102** to rotate. This rotative motion is transmitted to pulley **74** via drive belt **107,** causing the rotary cutter to rotate at high speed.

The rightwardly extending portion **124** of member **104** is provided with a series of tensioning slots **126** as seen most clearly in FIGS. **2** and **3.** A crank shaped lever arm **128** carried by support **130** secured to the side of frame **60** by the bolts **116** is pivoted thereto by means of pivot pin **132** and carries a circular, ring-like spring member **134** surrounding the end thereof. Member **134** is slidably, rockably movable along the tapered portion **136** of member **104.** As viewed in FIG. **4,** movement of the lever **128** by moving the handle **138,** FIG. **3,** rightwardly will cause the lower extending portion carrying the member **130** to move leftwardly along the inclined tapered portion **136** of member **104** which, due to release of the circular tension on the slots **126** therein, will release member **104** from engagement with the splines of shaft **54.** Thereafter the complete subframe **60** and the cutter-slitter assembly carried thereby can be slidably moved leftwardly or rightwardly between the side frames of the machine enabling width of cut adjustment as desired.

As seen in FIG. **4,** the edge of cutter blade **84** rides against a deformable backup member **104** carried by bushing **142** secured by set screw **144** to shaft **146.** Member **140** provides slightly resilient backup anvil for the cutter wheel. The continuous item forms are arranged to ride over this member being driven by the tractor pins **24** of the tractor assembly **14.** Member **140** is arranged to be demountable from shaft **146** so that it can be renewed and/or replaced as occasion demands due to wear and use.

The item web **28** may vary both in width as well as in thickness. For example, where multiple plies of items are to be handled by the apparatus, the cutter-slitter assembly may be obliged to cut through as many as 10 plies of paper and associated carbon paper or carbon films. In order to adapt the mechanism to this latter variable, a depth of cut adjustment is provided. As seen most clearly in FIG. **3** and also in the isometric view of FIG. **2,** this adjustment is provided by means of an elongated, threaded shaft **148** threaded into and through the subframe **60** and extending rearwardly thereof into abutting engagement with rear frame cross member **150.** Rotative adjustment of the knurled screw head **152** arcuately raises and lowers the assembly carrying the cutter blade, thereby varying the depth of cut as desired or required. A hex-lock nut **154** secures the adjustment against accidental dislodgment. Member **156** pivotably mounted at **158** to frame **60** provided with depending nose portion **160** is adapted to seat behind the cross frame member **162** so as to latch the assembly in place against the tension of spring **164** once the ad-

justments for width and depth of cut have been made.

In order to provide for extreme ease in mounting and dismounting the cutter-slitter assembly from the subframe **60** and arrangement illustrated in FIGS. **5–8** inclusive of the invention is utilized. In this construction, as will become readily apparent as the description proceeds, the main portions of the assembly are disposable and may be cast, formed or molded as a uniting assembly from plastic such as "DELRIN" or other similar material. As seen most clearly in the exploded isometric view of FIG. **8**, the disposable, plastic cutter-slitter includes a bushing **166** of cast plastic provided with an enlarged boss **168** and an undercut elongate shank portion **170.** Bushing **166** is mounted on bolt **68** (on frame **60**) with the boss **168** against the spacer **80.** A plastic cast or formed timing belt pulley gear **172** having timing belt engaging teeth or flutes **174** thereon is provided with a series of arcuate, spaced, inclined segments **176** arranged circularly around the internal open bore thereof as seen in FIG. **6.** The segments **176** are separated by equi-distant slots **178** providing an entry guideway as will be described for engagement with associated elements of the combination. A stop pin **180** for purposes to be explained presently is arranged to project outwardly perpendicularly away from one of the inclined segments **176** (FIG. **6**). This timing belt pulley gear **172** is press fitted over the portion **168** of the member **166.**

A hub member **182** of circular cross section includes a threaded projecting portion **184** extending from one side thereof while the opposite side of member **182** is undercut slightly as at **186** and is provided with three equi-angularly disposed L-shaped tangs **188** which project outwardly away from the side thereof. Members **188** are arranged for mating engagement with the slots **178** in a manner which will become clear shortly.

A cutting element **190** of circular cross section provided with an enlarged central opening **192** and a peripheral sharpened edge portion **194** is adapted to be mounted on and to be dismounted from the threaded portion **184** of the hub **182.** A thumb lock nut **196** also of circular cross section provided with an internally threaded bore **198** and a finger and thumb engaging projecting portion **200,** ribbed or notched as at **202,** is threadedly engagable over threads **198** so as to secure the cutting element **190** to the hub **182.**

As shown in FIGS. **5–8** inclusive, the slitter-cutter subassembly is assembled by mounting the cutter blade **190** onto the threaded extension **184** of hub **182** and thereafter tightening the thumb lock nut **196** thereon to secure the blade **190** in place in the position shown in FIG. **5.** The pulley gear **172** is mounted to the subframe **60** by means of the supporting bushing **166** on which it rotates, the latter member being retained against accidental dislodgement or removal by means of the hex nut **70** at one end adjacent the lower depending portion of subframe **60** and at opposite projecting end by the C-ring **72.**

The assembled disposable cutter-slitter is mounted on the bushing **166,** FIG. **7,** and thereafter moved leftwardly so as to introduce the tangs **188** into mating slots **178** in the internal bore of gear **172.** Thereafter, rotating the entire slitter assembly a slight amount causes the L-shaped ends of the tangs **188** to ride up on the inclined surfaces of arcuate members **176** until one of the tangs **188** abuts. This pin may be cast in as part of a unitary assembly, as hereinafter described. The clearances involved between the inclined surfaces **176** and the ends of the tangs **188** are such that the assembly as shown in FIG. **5** is tightly press fitted together but still demountably removable by means of finger pressure.

All of the previously described parts of the slitter-cutter assembly of the present invention can be fabricated from metal. However, as pointed out earlier herein, it is an important object of the present invention to reduce the cost of producing and fabricating parts and to lower the cost of suitable replacements for worn or broken parts as well as dull cutter blades. To this end, as seen with reference to FIG. **4A** the blade **82,** hub member **84,** finger locknut **86** and hex nut **88** all may be fabricated as a one-piece cast or molded unitary plastic assembly **89.** The blade edge **91** can be coated with or molded or cast with a hardened metallized portion which is capable of being sharpened or honed to provide a fine cutting edge. Internal threads **93** permit the assembly **89** to be quickly and easily replaced as the cutting edge wears or dulls in use. The cutter-slitter subassembly FIG. **8** including the hub **182,** the blade **190** and the thumb lock nut **196** are fabricated of plastic, e.g., cast or formed of "DELRIN" or hard polyurethane. These parts may be cast or extruded, whichever process lends itself more efficiently to the shapes shown. The hub **182,** cutter blade **190** and thumb lock nut **196** can be a one-piece encapsulated or extruded plastic assembly **197,** FIG. **5B** after which the blade edge **198** can be metallized with chromium, etc., and ground sharp, e.g., by honing and polishing. If the disposable one-piece assembly is employed, then the threads **184** are not used for obvious reasons. Where cost is of major or paramount importance, fabricating all three parts **182, 190** and **196** from one piece of plastic material enables the production of the true throw-away cutter-slitter subassembly. The throw-away aspect of the subassembly coupled with the simplified mounting and demounting arrangement afford an ease of use not heretofore available. In addition, the ultra simple mechanical coupling construction permits the assembly to be attended by a relatively unskilled or untrained operator avoiding the necessity or requirement for trained service personnel to change blades or adjust the depth and/or width of cut of the mechanism.

While a particular embodiment of the invention has been shown, it will be understood, of course, that it is not desired that the invention be limited thereto since modifications may be made, and it is, therefore, contemplated by the appended claims to cover any such modifications as fall within the true spirit and scope of the invention.

What is claimed is:

1. A cutter-slitter apparatus comprising

a plastic bearing member,

a plastic gear member rotatably mounted on said bearing member,

said gear member having a hollow internal bore and a plurality of inclined grooves therein, and

a plastic metal coated cutting member including means receivable in said grooves for detachably coupling said cutting member to said gear member for conjoint rotation therewith.

2. The invention of claim 1 wherein said gear member is press fitted to said bearing member and rotatable conjointly therewith.

3. Cutter-slitter apparatus comprising a one-piece molded plastic cutter member,

the peripheral surface of said member being coated with a material capable of being provided with a sharp cutting edge thereon,

means mounting said cutter member for rotation adjacent a surface providing a back up anvil for said cutter member, and

drive means for said cutter member for rotating said member at a desired cutting speed relative to said anvil.

4. The invention in accordance with claim 3 wherein said last named means includes a threaded portion operably engageable with a threaded portion on said bearing member, permitting said cutter member to be replaced at will.

* * * * *