United States Patent

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[54] **TRIMMER AND STACKER**
13 Claims, 8 Drawing Figs.

[52] **U.S. Cl.** **83/91,** 83/94, 83/158, 83/426, 83/925
[51] **Int. Cl.** **B26d 7/06**
[50] **Field of Search** 83/91, 90, 94, 158, 426, 92, 985BT; 271/71, 68, 61, 9

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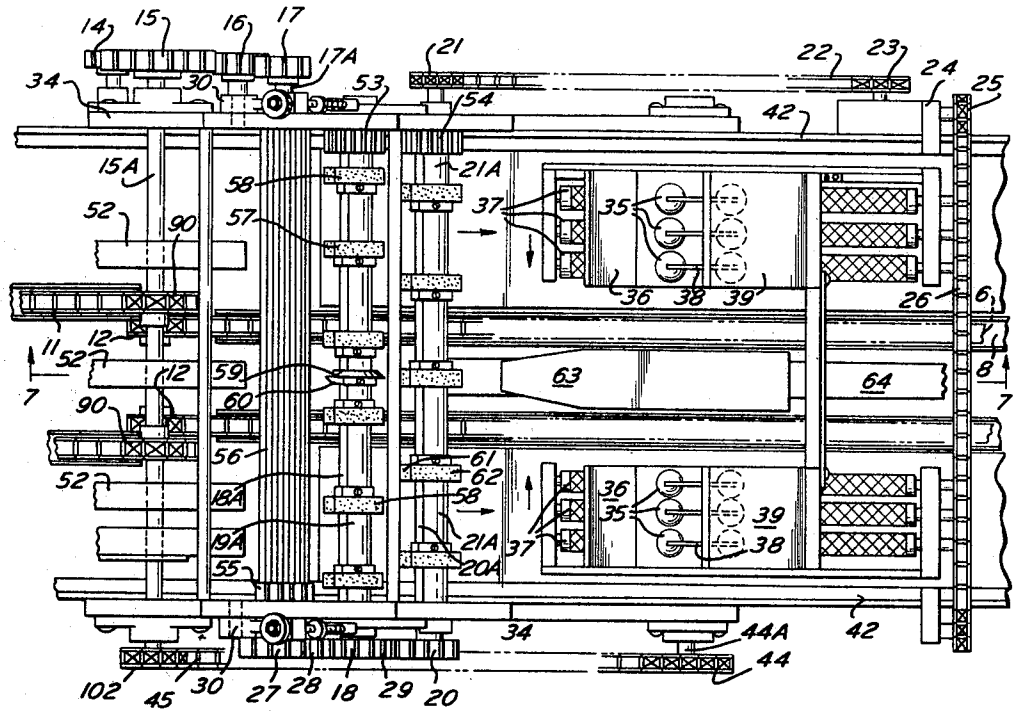
ABSTRACT: There is provided a book trimmer for continuously trimming and separating individual signatures in multiple signature printing, stacking the separated signatures, and trimming the stacked signatures to provide finished edges therefore.



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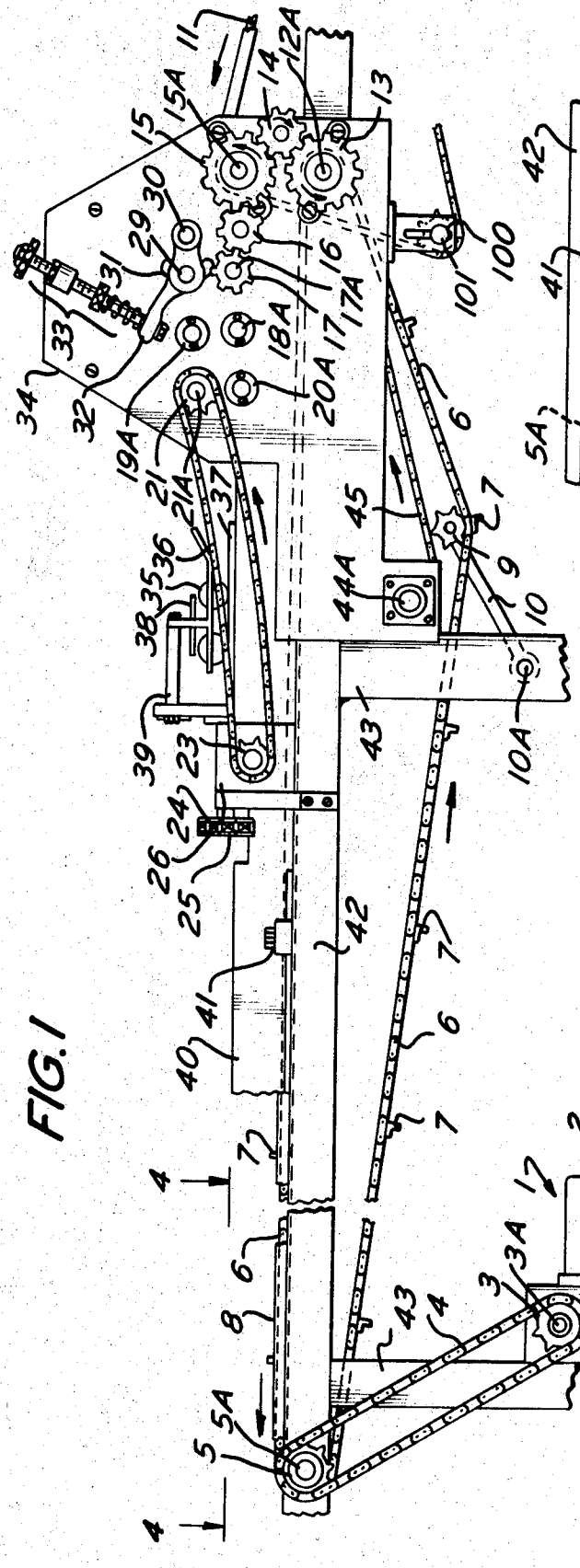

FIG. 1

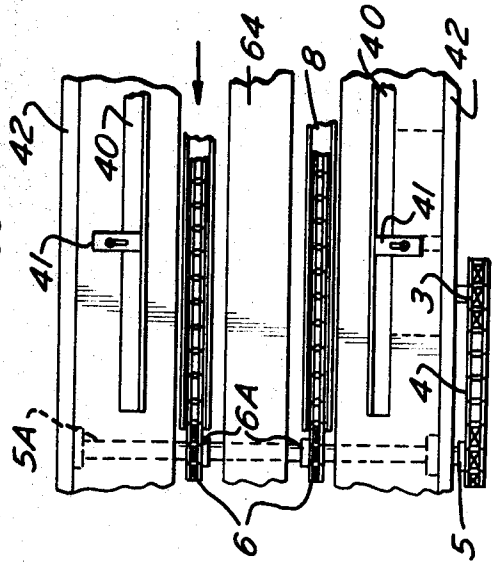

FIG. 4

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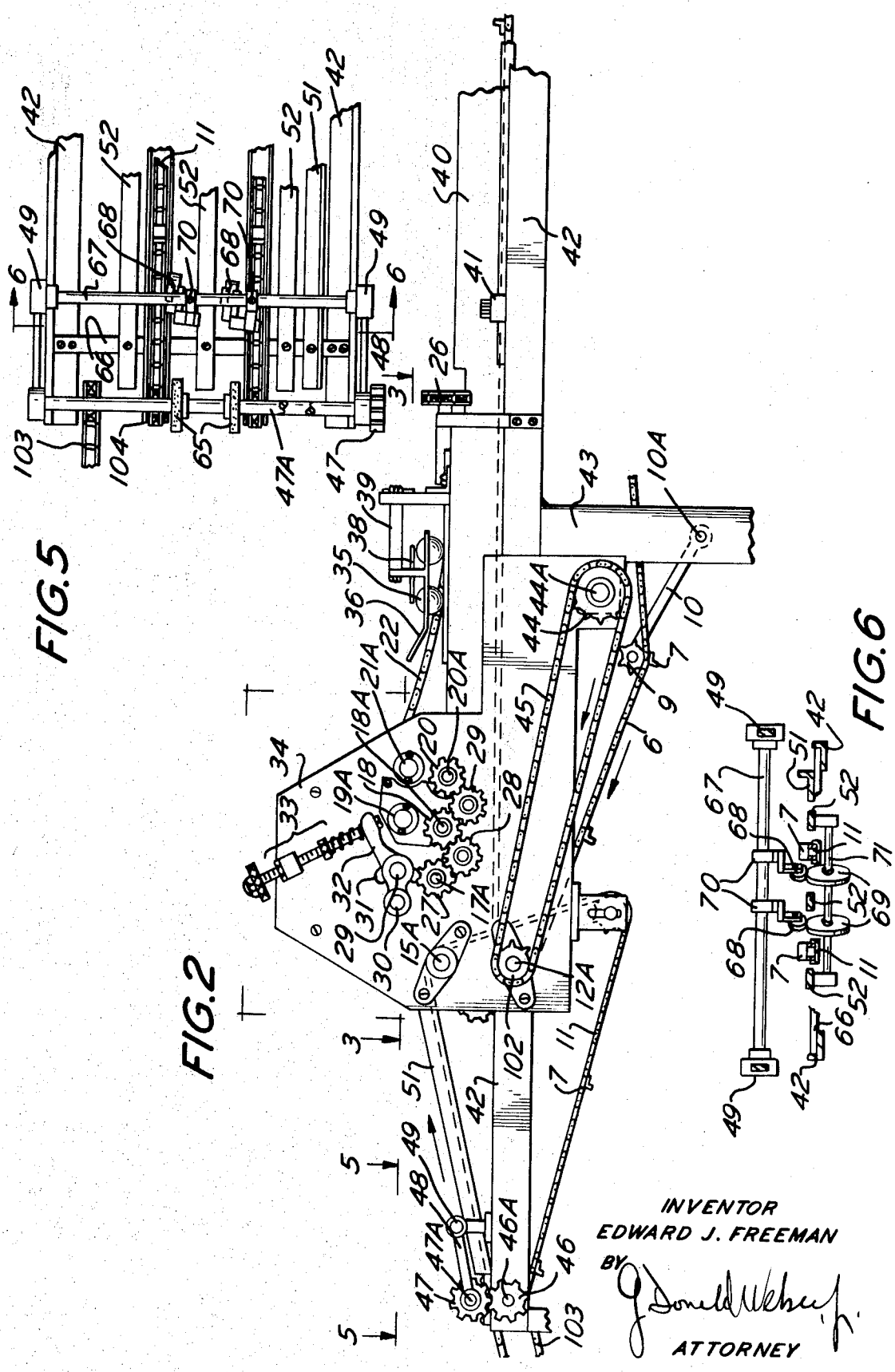

FIG. 5

FIG. 2

FIG. 6

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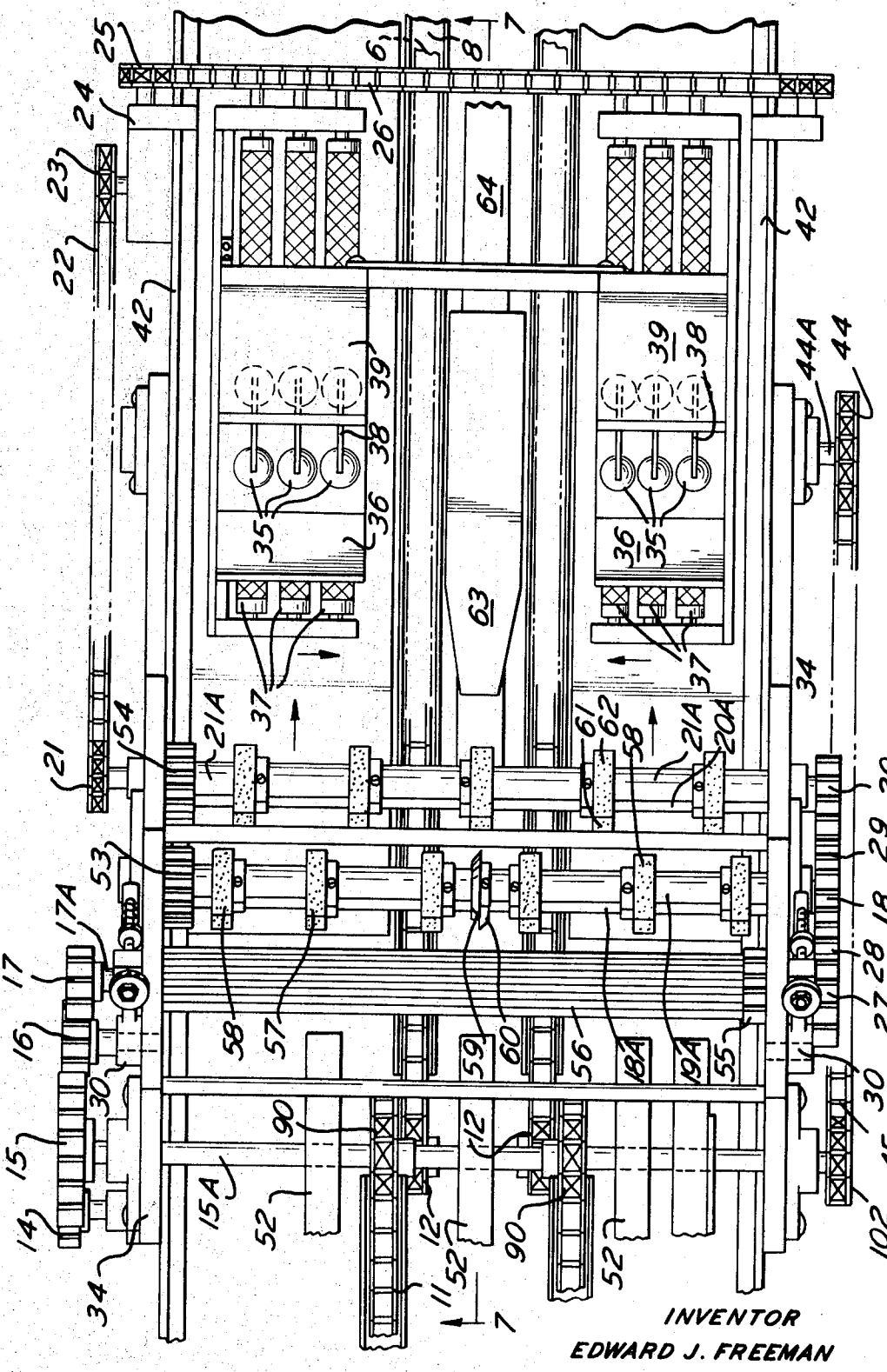

FIG. 3

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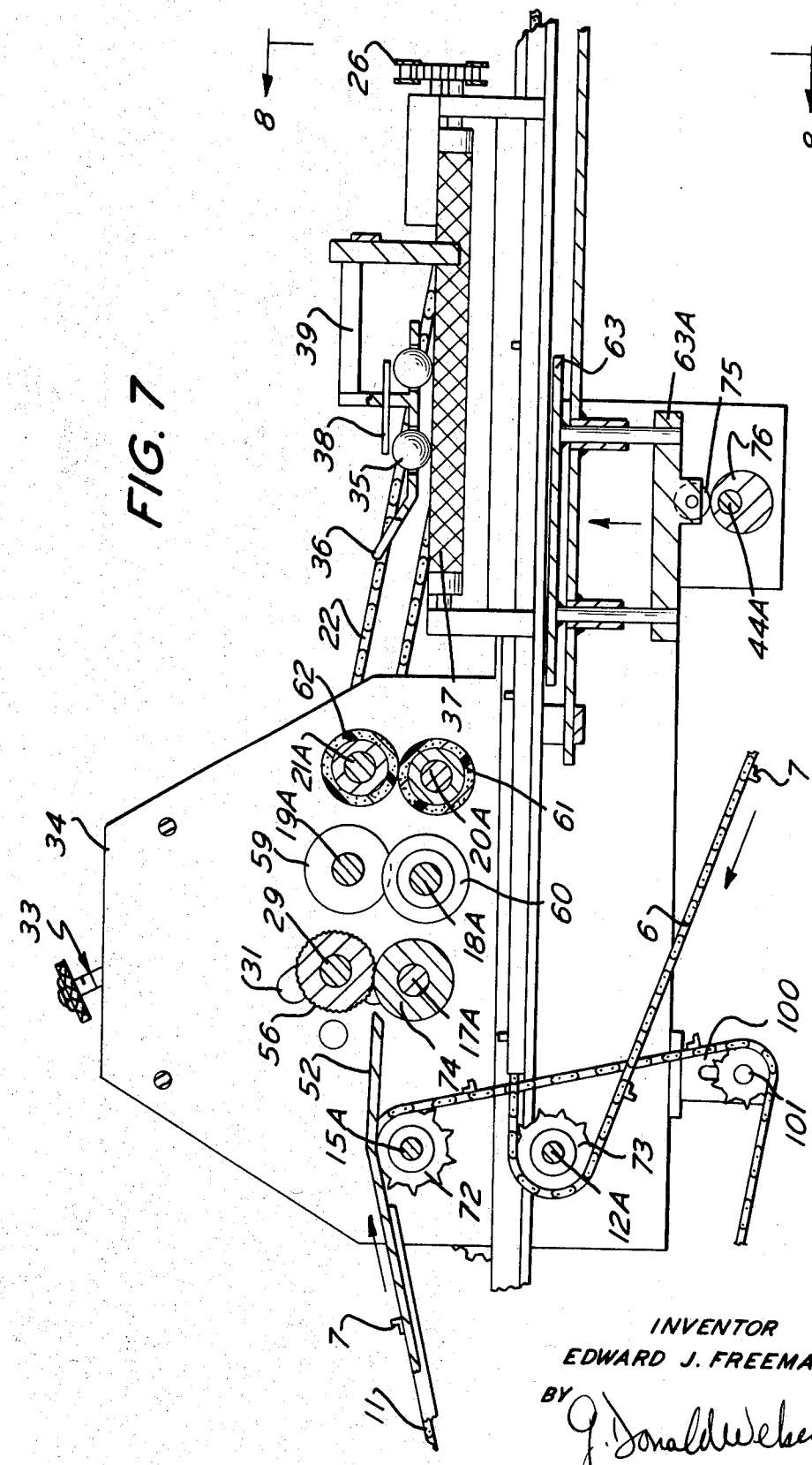
FIG. 7



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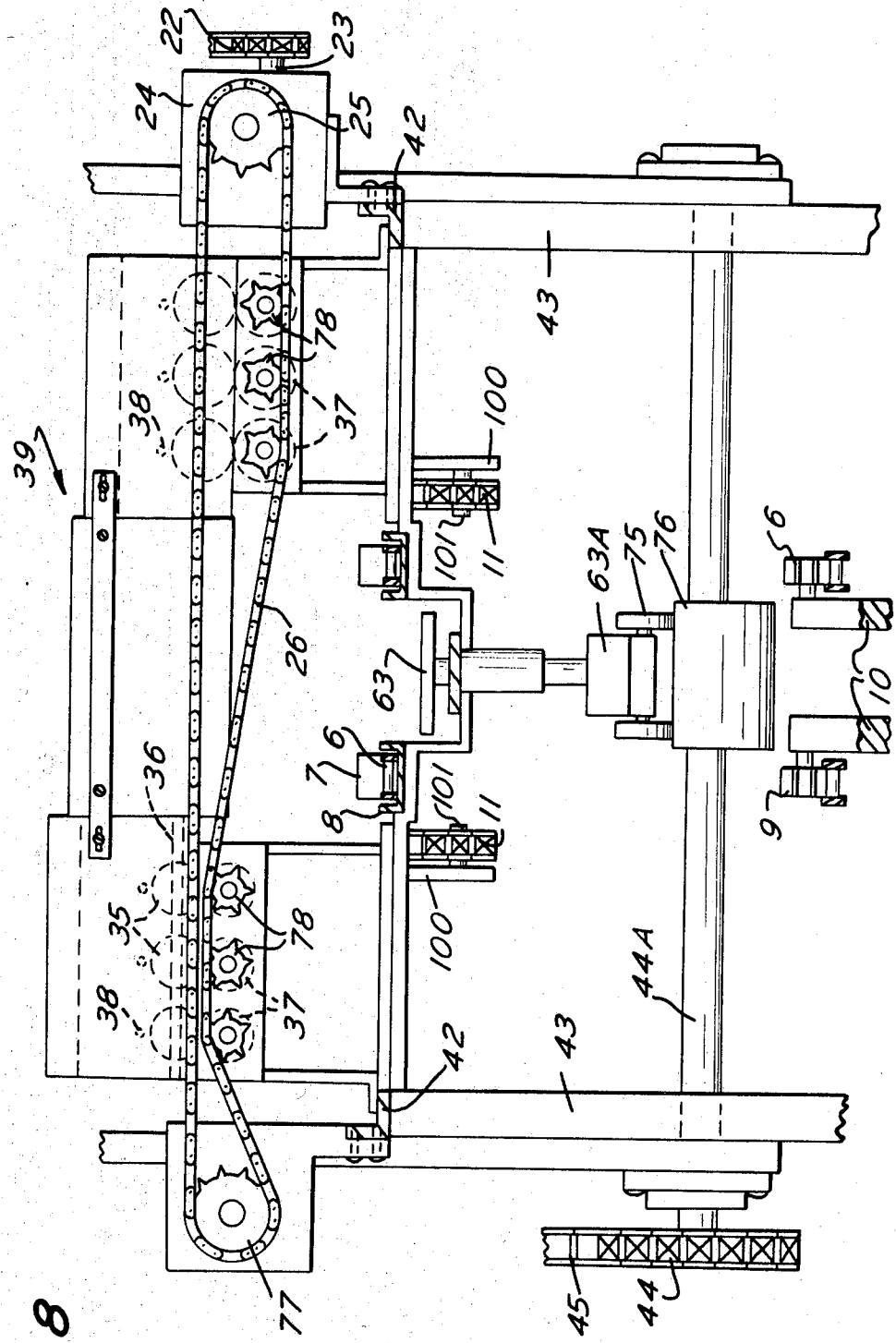

FIG. 8

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TRIMMER AND STACKER

The existing machinery in the printing and bookbinding art is, to a large extent, exemplified by the AUTOMATIC CONTINUOUS BOOK TRIMMER, shown in U.S. Pat. No. 3,146,650, of E. J. Sarring et al. This machinery is typified by a suitable input hopper or the like through which the book units or signatures are fed to a trimming apparatus. The feeding is effected by means of a lugged chain or the like which transfers the signatures from the feed table or hopper to the trimming station. At the trimming station, the signatures are located by a suitable guide means and the front, head and tail edges thereof are trimmed by separate knives. These trimming operations provide flush edges of the finished product. The trimmed, finished product is then transferred by a suitable conveyor which may include a further lugged chain, to a further process such as addressing, labelling or the like.

In the case of a system using multiple signatures, the trimming station is, in the existing machinery, much more cumbersome, expensive, and inefficient. In multiple signature printing, a plurality of printed areas are juxtaposed on a single web width. This technique is frequently used where the printed material or signature has a width which is less than one-half the full web width in order to provide a more economical utilization of the web or paper.

Obviously, when a multiple signature, for example, a double printing (referred to in the art as "two-up printing") is utilized, a more complicated, expensive and inefficient operation is required at present. In this process, a so called "five-knife trimmer" is normally utilized. That is, the front edge of the booklet is trimmed by a first knife which is perpendicular to the travel of the booklet. Subsequently, second and third knives trim the outer edges of the booklet thereby trimming the head of one signature and the tail of the other signature. Subsequent cuts are made by fourth and fifth knives which delete the unwanted portion between the two signatures and, thus, trim the tail and head of the first and second signatures, respectively. The separated booklets or signatures are then transported from the cutting station to the collating, labelling or the like station in two separate paths.

It is seen from this description, that the existing equipment requires five trimming knives which must be operated in the proper sequence. In addition, two separate output paths are utilized. The five knife trimmer is, obviously, an inefficient, uneconomical and cumbersome technique for handling multiple printing.

In the subject invention, there is described a system whereby handling of multiple printed material is effected by economical efficient means which does not significantly alter the operation of the binding equipment from that known in the art for single printing.

With the instant invention, the same input station can be utilized and a single output station or utilization device can be used. This invention comprises a unit which can be inserted into existing equipment to convert a single print operation to equipment which can operate upon multiple print copy.

In essence, according to this invention, the printed material having multiple prints thereon is supplied by an existing hopper or feed station. The lugged chain direction is altered to the extent that the printed material is driven upwardly along an inclined plane, through a splitting apparatus which will separate the multiple signatures into a plurality of booklets or the like comprising individual signatures. The plurality of individual signatures are fed to a stacking station which is driven in synchronism with the lugged chain. The stacking station is designed such that the individual printed signature units are stacked one upon the other and lowered into engagement with the output lugged chain in a synchronized manner to avoid jamming of the machine. The output lugged chain will then drive the stacked signature units to a typical three-knife trimmer wherein the front, head, and tail edges will be trimmed. Thus, a multiple signature unit will be handled, insofar as input and output operations are concerned, identically to a single signature unit but with the advantage of having multiple copies of the signature produced whereby increased production per unit time can be effected in an efficient, economical and relatively simple operation.

Thus, one object of this invention is to provide an automatic, continuous book trimmer.

Another object of this invention is to provide an automatic continuous book trimmer which is specially adapted to multiple signature printing.

Another object of this invention is to provide an automatic continuous book trimmer which is used with multiple signature printing and which uses the input and output equipment of a single signature trimmer.

These and other objects and advantages of this invention will become more readily apparent when the following description is read in conjunction with the attached drawings, in which:

FIG. 1 is a side view of the invention;

FIG. 2 is a view of the opposite side of the invention;

FIG. 3 is a top view of the invention;

FIG. 4 is a fragmentary view of the output path and the connection therewith to the drive system and taken along lines 4–4 of FIG. 1;

FIG. 5 is a fragmentary view of the input end of the invention including drive means and alignment means and taken along the lines 5–5 of FIG. 2;

FIG. 6 is a sectional view of the input and alignment means taken along the lines 6–6 of FIG. 5;

FIG. 7 is a sectional view of the invention showing the splitting and stacking stations taken along the lines 7–7 of FIG. 3; and

FIG. 8 is a sectional view of the collating and stacking stations t taken the lines 8–8 of FIG. 7.

Throughout the description, similar elements and components are designated by similar reference numerals.

Referring now to FIGS. 1 and 2, there are shown side views of the apparatus which makes up the present invention. As noted, in the prior art a lugged chain drive is typically used to transport the printed material from the input feed station to the trimming station. A similar arrangement is used in this invention. A prime mover or motor 1 is mounted on a suitable base 2 which may be a separated pedestal or actually be the floor upon which the binding assembly rests. Through suitable mechanical coupling including shaft 3A, sprocket 3 is used to drive the drive chain 4. In some embodiments, drive chain 4 may be driven by the existing trimmer station. Drive chain 4 is an endless loop which, through its motion causes sprocket 5 to rotate. Rotation of sprocket 5 causes rotation of shaft 5A. Rotation of shaft 5A causes rotation of sprockets 6A (see FIG. 4) which drive main chains 6. A plurality of lugs 7 are attached to main chain 6 by a suitable attachment means. The lugs 7 are spaced apart by a predetermined distance which is a function of the speed of operation of the system and the size of the material which is to be operated upon.

As in seen, chains 6 pass through suitable troughs 8 which may be recessed portions of the apparatus whereby the printed material is engaged only by the lugs 7 of chains 6.

Again, main chains 6 are endless loops which pass around sprocket 12 (see FIG. 3) thereby causing rotation of shaft 12A. A tensioning apparatus is associated with chain 6. A toothed wheel or idler sprocket 9 engages chain 6 and applies tension thereto so that slack is avoided in chain 6. Sprocket 9 is attached by suitable shaft to the positioning rod 10 which is attached to frame member 43 of the assembly by a suitable pivot pin 10A. Rod 10 is rotated about pivot 10A to a suitable position wherein chain 6 is properly tensioned. A suitable locking mechanism, for example, a set screw (not shown) maintains rod 10 and gear 9 in the desired position.

Rotation of shaft 12A causes rotation of drive gear 13 which is used to transmit driving energy to other portions of the apparatus. For example, through idler gear 14, driven by gear 13, gear 15 is driven in the same direction as gear 13. Gear 15 is connected to shaft 15A to which sprockets 90 (see FIG. 3) are attached. Endless loop chains 11 are engaged by the driven by sprockets 90. Thus, chains 6, the main lugged

chains, and chains 11 the input lugged chains, are driven in synchronism through the gear train comprising gears 13, 14, and 15. Chains 11 pass around idler sprocket 101 which is adjustably mounted in frame member 100 which is attached to frame member 42 in suitable fashion. This arrangement provides tension and chain length adjustment.

Gear 15 rotatively drives idler gear 16 which further drives gear 17. Gear 17 is attached to shaft 17A and causes rotation thereof. Shaft 17A has attached at the opposite end thereof a gear 27 (see FIG. 2) which engages and drives idler gear 28. Idler gear 28 engages and causes rotation of gear 18. Gear 18 is connected to shaft 18A and causes rotation thereof. Gear 18 further drives idler gear 29 which engages and drives gear 20 which is attached to and causes rotation of shaft 20A. The gear trains so far mentioned are located external of frame members 34. As will be seen in FIG. 3, gears internal of frame members 34 cause rotation of shafts 29, 21A and 19A. The arrangement of the gear trains shown in FIGS. 1, 2 and 3, are provided in order to drive each of the shafts and the rollers affixed thereto while utilizing a minimum space. Consequently, some of the gears are located on opposite ends of the shafts and, thus, opposite sides of the apparatus. In addition, this arrangement permits equilization of the torque and other mechanical stresses placed on the shaft and gears. The gear drive arrangements are illustrative of a preferred embodiment only and are not limitative of the invention. Moreover, it is understood that suitable bearings or bushing means are used where necessary.

Attached to shaft 29 is a knurled roller 56 (see FIG. 3) which is a pinch roller as will be described hereinafter. In order to provide adjustment capabilities therefor, shaft 29 is mounted in a suitable bearing in adjustment arm 32. Arm 32 is affixed to frame 34 via suitable pivot 30. By rotation of arm 32 around pivot 30, shaft 29 moves in slot 31 whereby adjustment in the pressures applied by knurled roller 56 is provided. Suitable adjustment means 33 including a screw arrangement and a spring member are mounted on frame 34. By adjustment of the adjustment means 33, the position of arm 32 is controlled and, thus, the position of the roller on shaft 29. A similar adjustment is located on each side of the separating station and is shown in both FIGS. 1 and 2.

Continuing with FIG. 1, there is shown endless loop chain 22 which engages and is driven by sprocket 21 on shaft 21A. Chain 22 also engages and is driven by sprocket 23 which is the input of a gear box 24. Gear box 24 may be utilized to alter the speed and/or through bevel gears or the like, change the direction of the drive. The output sprocket 25 of gear box 24 engages and drives chain 26 which is more clearly shown in FIG. 8. Chain 26 through means not shown in FIG. 1 drives rollers 37 which form a portion of the stacking station. Immediately adjacent to the rollers 37, a re a plurality of weighted balls 35 which bear upon rollers 37 and are selectively driven thereby through frictional contact. The balls are positioned by guide member 36 having a plurality of holes, one hole for each ball, and an angled end thereof. In addition to maintaining the balls 35 in the proper location, guide member 36 acts as guide for directing printed material from the splitting station between rollers 37 and balls 35 thereby to maintain the printed material in contact with rollers 37. Stops 38 which may be pieces of bar stock or rod material are affixed in the frame member 39 immediately above each of the balls to retain same within the guide member 36. Frame member 39 is a suitable member for maintaining and supporting the guide member 36 and the like in proper relationship.

Guide means 40 comprising vertical wall-like members are disposed adjacent to and on opposing sides of main lugged chain 6. Guide members 40 are utilized to guide the printed matter after it has passed through the splitting and stacking stations and while it is being transported to the output station. Suitable clamping means 41 are utilized to provide adjustable clamping of the guide means 40 to accommodate printed material of different dimensions. The adjustment means 41 is affixed to the bed or support member 42 which is supported by legs 43. Of course, the frame and support member are of illustrative configuration only. Also mounted in frame member 34, adjacent the bottom thereof, is a suitable bearing which supports one end of the shaft 44A. Shaft 44A is connected at the other end thereof to sprocket 44 (see FIG. 2).

Referring to FIG. 2, endless loop chain 45 engages a suitable sprocket 102 attached to shaft 12A and is driven thereby. Chain 45 also engages sprocket 44 and causes rotation thereof along with shaft 44A which drives elevator stacker 63 as will appear hereinafter.

Continuing with FIG. 2, there is shown the opposite side view of the invention. For the most part, the apparatus of FIG. 2 has been described previously. However, FIG. 2 more clearly shows the input end of the system. The engagement of endless loop chains 11 with suitable sprockets on shaft 15A is suggested. In addition, the endless loop formed by chain 11 engages a suitable sprocket 104 (see FIG. 5) mounted on shaft 46A for idler type rotation. Thus, movement of chain 11 will not drive shaft 46A. By means of a suitable sprocket shaft, 46A is driven by the feed hopper station through chain 103. As well, gear 46 which is affixed to one end of shaft 46A is also driven by the input feed station. Gear 47 affixed to the corresponding end of shaft 47A engages gear 46 and is driven thereby. As will become apparent, suitable pinch rollers of hard rubber or the like are affixed to shafts 46A and 47A to interact to grip the printed material which is supplied thereto by other suitable apparatus such as a feed hopper or the like, and move the printed material along the inclined ramp described infra whereby the lugs 7 on chain 11 can engage the printed material and cause movement thereof.

Shaft 47A is mounted by suitable means at one end of arm 48 which is connected to support 50 by a suitable pivot joint 49. Thus, by adjustment of pivot 49 and arm 48, the interaction of the rollers on shafts 46A and 47A can be controlled.

The inclined plane along which chain 11 drives the printed material includes a side guide member 41, against which the input material is abutted for proper alignment for being fed into the trimming station.

Referring now to FIG. 3, there is shown a top view of the splitting and stacking stations. At the input end or left side of FIG. 3, the input lugged chains 11 are shown in fragmentary view. Between and adjacent the input chains 11 are the ramps or bars 52 which operate as an inclined plane to support the printed matter to be raised as it is transported by chains 11. These bars, along with input chains 11, cause the printed material to be raised a suitable distance from the input station to the slitting station and the stacking station wherein the stacking operation can occur such that the stacked signatures are deposited on lugged chains 6 at the level of the output station. Of course, if the input station is at the same level as the input of the slitting station, the support bars 52 need not be inclined.

The registration guide bar 51 which may comprise a horizontal bar substantially similar to bars 52 and a vertical shoulder attached thereto is also shown in fragmentary view. A single guide bar 51 is shown inasmuch as suitable means for registering the printed material therewith are provided (see FIG. 5).

A knurled roller 56 is shown adjacent the ends of the infeed station which includes chains 11 and bars 51 and 52. While a single knurled roller 56 is shown, it is understood that a second roller of substantially similar construction is located directly below the roller shown. In fact, roller 56 shown in FIG. 3 is affixed to shaft 29 shown in FIGS. 1 and 2. Cooperating knurled roller 74 (see FIG. 7) is affixed to shaft 17A shown in FIGS. 1 and 2. As in seen, gear 17 is driven in the proper direction so that any material being fed by chains 11 is engaged by pinch rollers and driven in the continuous transporting direction. In addition, gear 55 is attached to shaft 29 at the end of roller 56 and on the inboard side of frame 34.

It is understood, that a cooperating gear (not shown) is located on shaft 17A on the inboard side of frame 34 and which engages gear 55. Thus, shaft 17A is driven when gear 17

is driven. When the shaft 17A is driven the gear which cooperates with gear 55 is driven. Thus, gear 55 is driven by the cooperating gear. Therefore, knurled roller 56 and cooperating knurled roller 74 (shown in FIG. 7) are positively driven in a counter rotational manner to transport material therethrough from the input station.

Adjacent to the knurled roller 56 are the vertically aligned shafts 18A and 19A. These shafts each have mounted thereon a plurality of cooperating rollers 57 and 58, respectively. These rollers, which may be cylindrical in configuration, cooperate to drive the printed material therethrough after it has passed through the pinchrollers comprising knurled roller 56 and its counterpart. In addition, slitter discs 59 and 60 are affixed to shafts 19A and 18A, respectively. The slitters are typical slitter discs having a beveled edge. The printed material is driven through the slitter discs by the positively driven rollers 57 and 58 on the respective shafts. As the printed material passes between the slitter discs, it is relatively cleanly cut wherein a "two-up" print is separated into two signatures each having single print thereon. Of course, a plurality of cooperating slitter discs could be distributed along the shafts 18A and 19A to effect cutting and separating of multiple prints. For example, in "three-up" printing, a second cooperating pair of splitter discs would be required and the splitter discs would be substantially equally or uniformly distributed across the width of the printed material.

After the slitting and separation, the printed material is driven by rollers 61 and 62 which are affixed to shafts 20A and 21A, respectively. Rollers 61 and 62 are, similar to rollers 57 and 58, of a suitable material such as hard rubber or the like. In addition, it should be noted that shafts 18A and 19A are engaged by inboard mounted gears 53 (on shaft 19A) and the vertically aligned cooperating gear which is affixed to shaft 18A. Similarly gear 54 on shaft 21A is driven by a vertically aligned gear which is affixed to shaft 20A. Thus, shafts 18A and 20A are driven when the associated gears 18 and 20 are driven by idler gears 28 and 29, respectively, which are mounted outboard of frame 34. The gear drive coupling between bear 53 and its counterpart and gear 54 and its counterpart permit positive drive while eliminating the necessity for idler gears and, furthermore, are mounted inboard to provide mechanical advantages both in torque equalization and space utilization.

After the printed material passes through the last drive station comprising rollers 61 and 62 on shaft 20A and 21A, respectively, in the direction shown, the material is transported onto the upper surface of rollers 37. By means of the guide member 36, the printed material is directed beneath weighted balls 35 which function to maintain the printed matter in contact with the upper tangential surface of rollers 37. Rollers 37 have sprockets attached to the ends thereof (see FIG. 8) which are engaged by the driven by chain 26. As seen in FIG. 8, the chain 26 engages and drives the sprockets associated with rollers 37 so that the direction of rotation of the sets of rollers is counter relative to the other set. Thus, the printed material is driven toward the center of the apparatus by each of the sets of rollers 37.

In the preferred embodiment, elevator 63 is located at the center of the apparatus. Elevator 63 is driven in synchronism with the entire apparatus and is selectively driven to a raised position when the rollers 37 are driving material toward the center of the apparatus. Subsequently, elevator 63 is lowered until flush with the surface represented by frame members 42, bar 64 and troughs 8 for chains 6. When the elevator 63 is flush with the surface, the printed material thereon rests on the surface. Thus, chains 6 passes through troughs 8 with lugs 7 extending above the surface thereby to abut with and drive the printed material deposited by the elevator.

Referring now to FIG. 4, there is shown a fragmentary view of the output end of the transport table of the apparatus. The drive shaft 5A is connected to drive sprocket 5. The drive chain 4 is linked to sprocket 3 associated with the primer mover and with drive sprocket 5. As shaft 5A rotates, it causes rotation of sprockets 6A and, thus, lugged chains 6. As is seen, lugged chains 6 are supported by and moved through substantially U-shaped channels or troughs 8. The guide member 40 and the adjustable clamping means 41 associated therewith are mounted on the upper surface of frame member 42. Thus, when the printed matter has been deposited by elevator 63 (see FIG. 3) and is engaged by and moved by lugged chains 6, guide members 41 are positioned to effect a guiding function so that the printed material is properly delivered to the output station. Referring now to FIG. 5, there is shown in fragmentary view of the input end of the apparatus. In FIG. 5, frame member 42 is joined via suitable mounting means such as screws or the like to a cross member support bar 66. The inclined ramp bars 52 are also affixed via screws or the like to the crossmember 66. A plurality of rollers 65 which may be fabricated of any suitable material are affixed to shaft 47A and rotatable therewith when gear 47 is driven by gear 46 (see FIG. 2). The cooperation between rollers 65 and rollers which are vertically aligned therewith cause the printed material to be gripped and driven from the input station onto chains 11 and ramp bars 52. The lugs on chain 11 will drive the printed material up the ramp defined by bars 52 and guide bar 51. Guide bar 51 is used for registration of the printed material and to form a reference point for the slitting operation. In order to insure that the printed material is properly registered, skewed rollers are attached by suitable means to shaft 67 which is mounted in the pivot means 49.

Referring now to FIG. 6, an end view of the registration means is shown partially in section. Shaft 67 is shown connected between the pivots 49. Mounting means 70 are affixed to shaft 67. Rollers 68 are affixed to the mounting means 70 at an angle relative to the direction of feed of the printed material. The rollers 68 cooperate with rollers 69 which are substantially vertically aligned with the rollers 68. Rollers 69 are mounted on shaft 71 which is affixed to the ramp bars 52 by suitable means. It will be understood that shaft 71 is mounted at a slight angle with respect to ramp bars 52 in the input end of the apparatus as suggested in FIG. 5. The rollers 68 are mounted at an angle to cooperate with rollers 69. Thus, referring concurrently, to FIGS. 5 and 6, the material which is fed into the system via rollers 65 is driven along ramp bars 52 by rollers 65. When the material engages rollers 68 and 69, a frictional driving force is supplied to the material which tends to direct the material toward guide 51. This drive supplied through a suitable power takeoff, for example via belts (not shown) from shaft 12A. Inasmuch as rollers 68 and 69 are encountered at staggered times, the drag and drive forces produce the effect of directing the material toward guide member 51 whereby registration of the printed material is effected.

Referring now to FIG. 7, there is shown a sectional view of the slitting and stacking stations taken along the lines 7–7 of FIG. 3. In FIG. 7, input chains 11 with lugs 7 operate as described supra, in the direction shown by the arrow, and pass around sprockets 72 on shaft 15A and idler sprocket 101. Thus, the printed material is driven along the ramp bars 52 and into engagement with the knurled rollers 56 and 74 to be gripped thereby and driven between the slitters 59 and 60 on the shafts 19A and 18A, respectively. The separated material is driven by rollers 61 and 62 on shafts 20A and 21A, respectively. The separated material is driven onto rollers 37 in conjunction with the guide 36. The material is driven under the weighted balls 35 which will tend to hold the printed material against the rollers 37 such that the printed material may be driven thereby. Lugged chain 6 passes around sprocket 73 in the direction indicated by the arrow and passes adjacent the stacking station to engage and transport printed material at the appropriate times. Elevator 63 includes a suitable frame 63A to which is affixed roller 75. Roller 75 rides on cam 76 which is either an eccentric cam or any other cam mounted eccentrically on shaft 44A. Thus, when shaft 44A is driven by chain 45 (see FIG. 2), cam 76 is rotated and selectively causes elevator 63 to be raised through the application of force upon

roller 75. As noted supra, the operation of elevator 63 is, thus, synchronized with the operation of the remainder of the circuit, especially the lugged drive chains. Therefore, the printed material is deposited at the stacking station to be engaged and driven by lugged chains 6 when elevator 63 is in the down position.

Referring now to FIG. 8, there is shown a sectional view of the stacking station taken along the lines 8–8 of FIG. 7. The support member 39 s is shown supporting the ball mounting bracket including guide means 36 and rods 38. The balls 35 are shown, in phantom, vertically aligned with rollers 37 which are also shown in phantom. Each of the rollers 37 has a sprocket 78 affixed to the end thereof. Chain 26 which is driven by sprocket 25 and passes around idler sprocket 77 engages sprockets 78 at the ends of the rollers. As described supra, sprocket 25 is driven, via gear box mechanism 24, by sprocket 23 which is, in turn, driven by chain 22. It is seen that chain 26 passes over and tangentially engages at the upper uppermost portion thereof one set of sprockets 78 whereby the rollers 37 effect clockwise rotation. The chain 26 engages, tangentially, the bottommost portion of another set of sprockets 78 thereby causing the associated rollers 37 to effect counterclockwise rotation. Because of the counter rotation, it is obvious that the sets of rollers, drive the materials which have been delivered thereto, toward the center of the apparatus. Of course, if additional multiple prints are divided, similar apparatus may be utilized with the center prints, for example, being delivered directly to the center of the apparatus and the additional prints stacked thereon. Moreover, if additional prints are required, it is possible that the rotation of the rollers can be reversed and the printing material delivered to the outer portions of the apparatus.

It is further noted, that one set of rollers 37 is somewhat elevated with respect to the other set. This operation permits one signature or unit of printed material to be inherently lower than the other whereby jamming of the units cannot occur during delivery to the elevator. In addition, although not shown, the different sets of roller s rollers sets, 37 may have different diameters and/or the sprockets 78, in the different roller sets, may have different numbers of teeth wherein different delivery speeds will be effected to further avoid jamming of material.

Typically, the material will be delivered onto elevator 63 which would be in the raised position due to the synchronous operation. Subsequently, elevator 63 would be lowered to the position shown as a function of the rotation of cam 76. At this point, the material which had been delivered to elevator 63 rests upon trough 8 so that lugs 7 on chain 6 can engage and push the material toward the output stage.

Thus, there has been described an apparatus for slitting, separating and stacking the separate signatures of a multiple printing operation. The multiple printed units are pr provided by a standard feed hopper and are inserted into the system by initial engagement with rollers 65 (see FIG. 5). The multiple-print unit is registered by means of rollers 68 in conjunction with guide 51. The multiple-print unit is then fed into the slitting station where it is engaged and driven, by knurled rollers 56, passed slitters 59 and 60 and subsequently driven by rollers 57 and 58 at the slitter station and rollers 61 and 62 subsequent thereto. The slit or separated signatures are then driven onto the rollers 37 at the stacking station. The rollers 37 drive the separated signatures toward the center of apparatus where b they are delivered to an elevator which elevator subsequently deposits the separated but now stacked signatures onto a lugged chain for transport. The lugged chain, in conjunction with guides 40, transports the stacked signatures to a suitable output station. For example, the output station may be a typical three-knife trimmer where wherein the edge, head and tail cuts are simultaneously made for two or more signatures which have been stacked in proper registration. Thus, a typical three knife cutter is employed to trim two or more signatures which were initially printed in a multiple signature process.

It should be noted, as suggested supra, the multiple printing may include two or signatures on the signatures on the original web. By utilizing additional slitting knives properly located on the slitting shaft, two, three or more signatures may be separated. In addition, by supplying additional sets of rollers which can be driven in the proper direction of rotation by adjustment of the drive chain, the multiple units can all be stacked into a single stack for subsequent usage.

Moreover, in the event that the individual signatures are relatively thin, i.e. a few pages, the lugged chain 6 which transports the stacked signatures to the utilization stage may be so arranged as to operate more slowly or to have fewer lugs wherein a plurality of slit and stacked signatures may be accumulated prior to transportation thereof from the stacking station to the trimming station. For example, two stacking operations may occur for each trimming operation at the trimming station. This has the advantage that the trimming station knives can be operated less frequently if desired.

The obvious advantage of this system is the exclusion of an additional trimming station, i.e. the fourth and fifth knife station. In addition, the system provides fully collated and stacked signatures in a single feed path which can be then delivered to the output labelling, addressing or counting stations or the like. It is not necessary to restack the signatures as would be required in the existing systems using five-knife cutters.

Obviously, this invention provides many advantages of operation, efficiency and economics relative to known and existing systems. Other advantages will be noted by those skilled in the art. Moreover, the description herein is of a preferred embodiment only and the advantages and modifications which are suggested supra and which may be apparent to those skilled in the art are intended to be included in this description.

I claim:

1. In combination: inputs means for feeding material, cutting means adjacent to said input means for cutting said material, stacking means adjacent to said cutting means for stacking said material after it has been cut, said stacking means including a plurality of rollers disposed substantially orthogonally to the direction of material travel, drive means for rotatively driving said rollers around the axis thereof whereby material deposited on the rollers is driven thereby to transport means, said transport means moving said material away from said stacking means, coupling means coupling together said input means, said cutting means, said stacking means and said transport means to effect synchronism in the operation thereof, and means adjacent said rollers to maintain said material in frictional engagement with said rollers to insure driving of said material by said rollers.

2. The invention of claim 1 wherein said plurality of rollers comprises at least two sets of rollers, said drive means comprising chain means linked to sprockets on each of said rollers, said chain means and said sprockets being so arranged that said sets of rollers rotate in counterrotational directions.

3. The combination recited in claim 2 wherein said stacking means includes elevator means, said elevator means disposed between said sets of rollers whereby said sets of rollers feed material onto said elevator means; cam means, said cam means, connected to said elevator means to selectively cause said elevator means to assume raised or lowered ps positions; a said elevator means and said cam ma means being synchronized with said sets of rollers so that material is fed onto said elevator means when in said raised position; said transport means being operative to engage said material when said elevator means is in said lowered position.

4. The combination recited in claim 1 wherein said input means includes feed chain means for moving said material; ramp means adjacent said feed chain means for moving said material; ramp means adjacent said feed chain means so that said material is moved up said ramp means to be raised relative to the initial position at said input means; guide means affixed to said ramp means for controlling the position of said

material as it is moved up said ramp means; a said cutting means comprising at least one pari pair of cooperating slitting discs for cutting said material into separate segments; said stacking means including conveyor means for conveying the separate segments of the cut material to a predetermined stacking station adjacent said transport means.

5. In a trimmer, including a trimming station for continuously trimming and separating individual signatures into multiple signature printing and having a central axis, combination of:

A. input means feeding the signatures into the trimmer;

B. slitter knives receiving the sheets from the input means and slitting the signatures into at least two segments;

C. a plurality of longitudinal aligned roller sets receiving the previously slit signatures and directing them transversely inwardly toward the said central axis:

said rollers being disposed in planes parallel to the a said central machine axis;

D. means to press the previously slit signatures into engagement with the said longitudinal aligned rollers;

E. elevator means positioned upon the said central machine axis and reciprocating to an upper position and a lower position:

said elevator means receiving the slit signatures from the longitudinal rollers when in the upper position; and

said elevator means lowering the said signatures when moving to the lower position; and

F. chain means receiving the said signatures from the elevator means when in the lower position:

said chain means carrying the signatures to the trimming station.

6. The invention of claim 5 wherein the said input means includes an indexing guide parallel with and spaced from the

central axis and rollers angularly positioned with regard to the said central machine axis whereby the said angularly positioned rollers urge the signatures against the indexing guide for initial aligning purposes.

7. The invention of claim 5 wherein the longitudinally aligned rollers include a right set functioning to the right of the central machine axis and a left set functioning to the left of the central machine axis.

8. The invention of claim 7 wherein the said right and left sets of longitudinally aligned rollers position in respective horizontal planes, the plane of one set of rollers being above the plane of the other of said set of rollers whereby signatures may be readily stacked one on top of the other upon the elevator means.

9. The invention of claim 7 and drive means rotating the said right and left roller sets, said drive means simultaneously rotating one of said roller sets in a clockwise direction, and the other of said sets in a counterclockwise direction.

10. The invention of claim 5 wherein the means to press the signatures into engagement with the longitudinal rollers include a plurality of weighted balls.

11. The invention of claim 10 wherein the said weighted balls roll in place and re are positioned by a plurality of respective holes provided in a guide member.

12. The invention of claim 5 wherein the said elevator means deposit the stacked signatures upon a surface when reciprocating to the lower position, the said chain means recessing below the said surface.

13. The invention of claim 12 wherein the chain means are provided with upwardly projecting lugs, the lugs extending above the said surface to engage the stacked signatures for carrying to the trimming station.