May 26, 1970 H. K. ABSLER ET AL 3,514,094

WEB DELEAVER WITH OVERRIDING DRIVE MEANS

Filed June 13, 1967 5 Sheets-Sheet 1

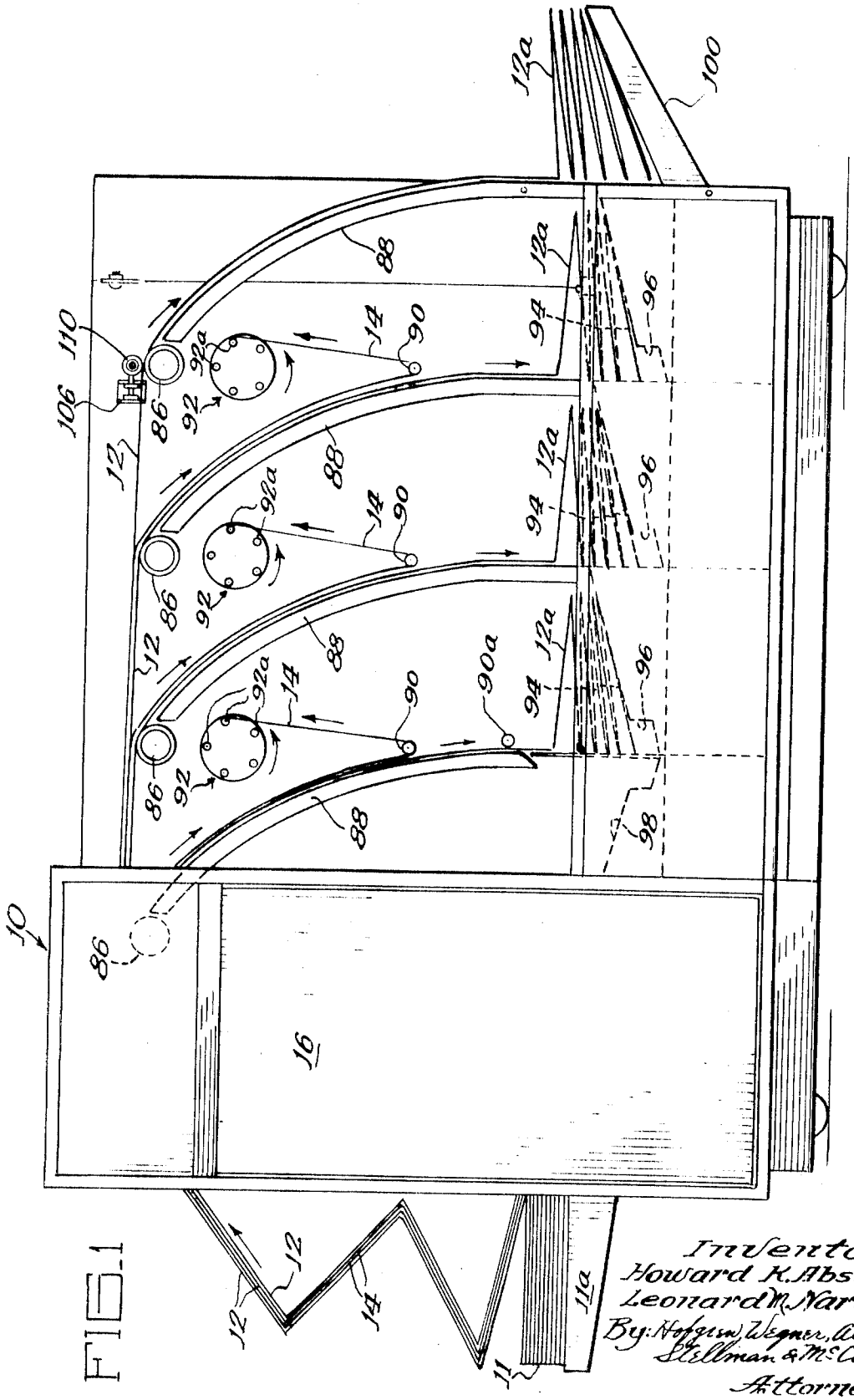


FIG. 1

Inventors
Howard K. Absler
Leonard M. Narel
By: Hofgren, Wegner, Allen, Stellman & McCord
Attorneys

May 26, 1970 H. K. ABSLER ET AL 3,514,094

WEB DELEAVER WITH OVERRIDING DRIVE MEANS

Filed June 13, 1967 5 Sheets-Sheet 2

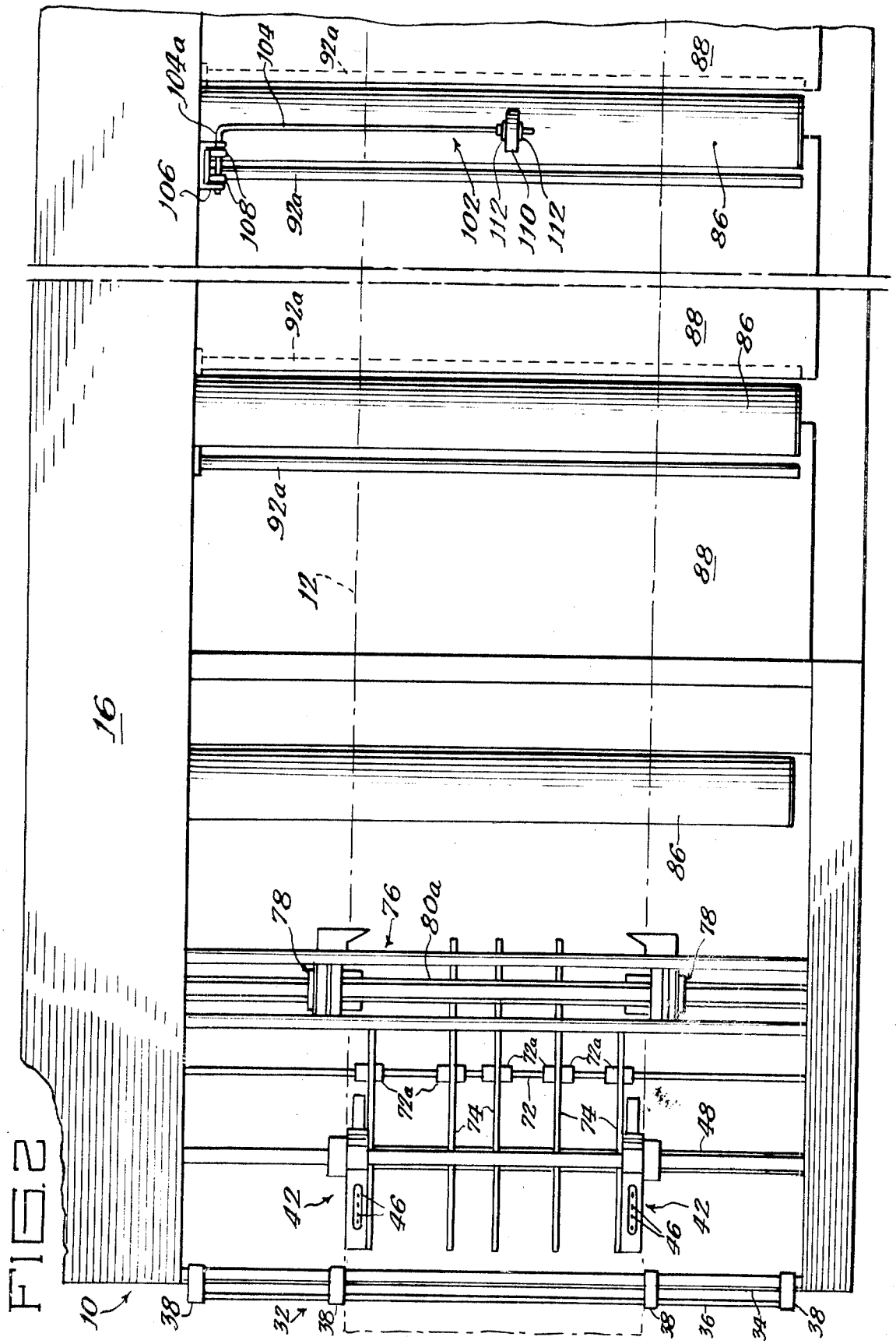


FIG. 2

May 26, 1970 H. K. ABSLER ET AL 3,514,094

WEB DELEAVER WITH OVERRIDING DRIVE MEANS

Filed June 13, 1967 5 Sheets-Sheet 3

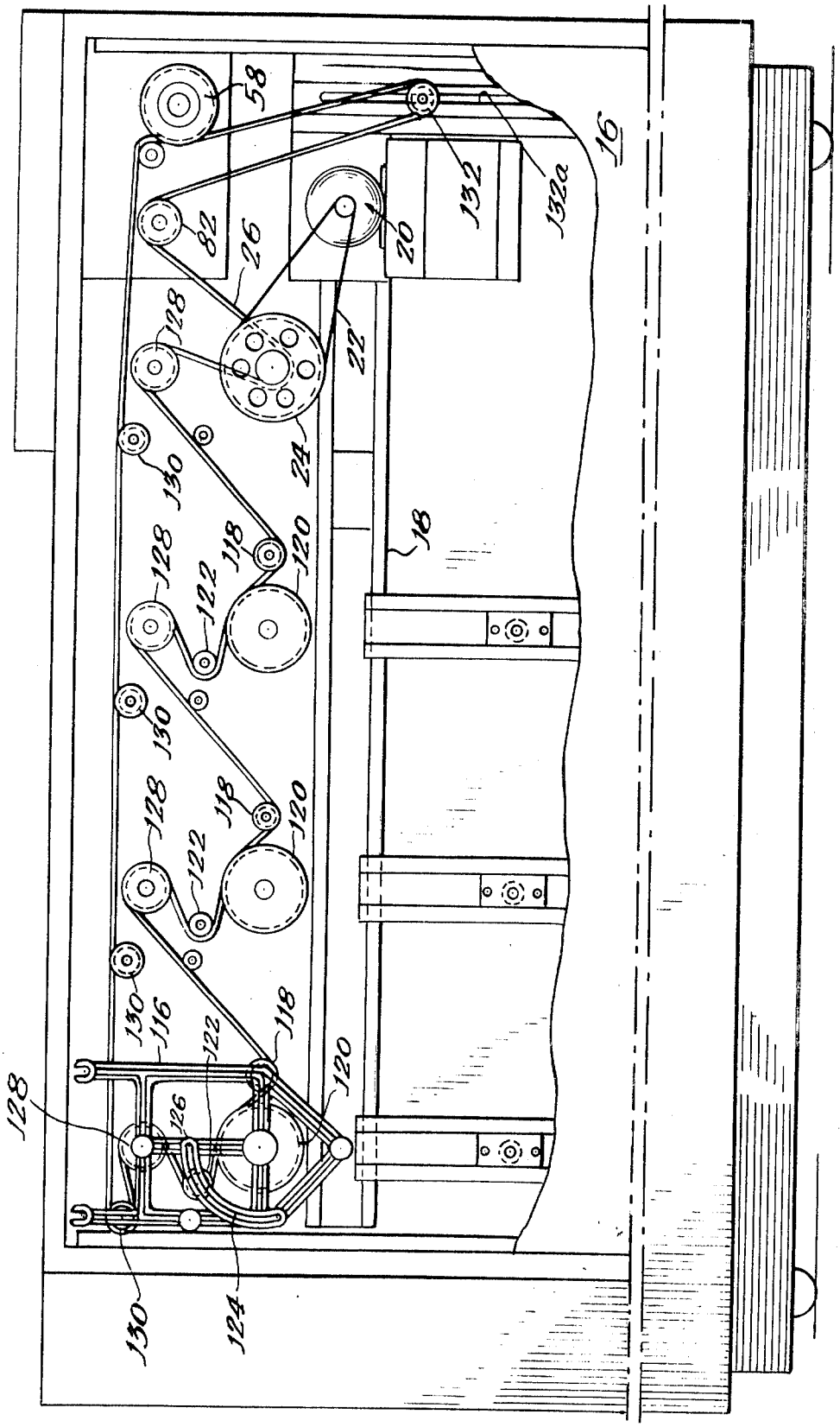


FIG. 3

May 26, 1970 H. K. ABSLER ET AL 3,514,094

WEB DELEAVER WITH OVERRIDING DRIVE MEANS

Filed June 13, 1967 5 Sheets-Sheet 4

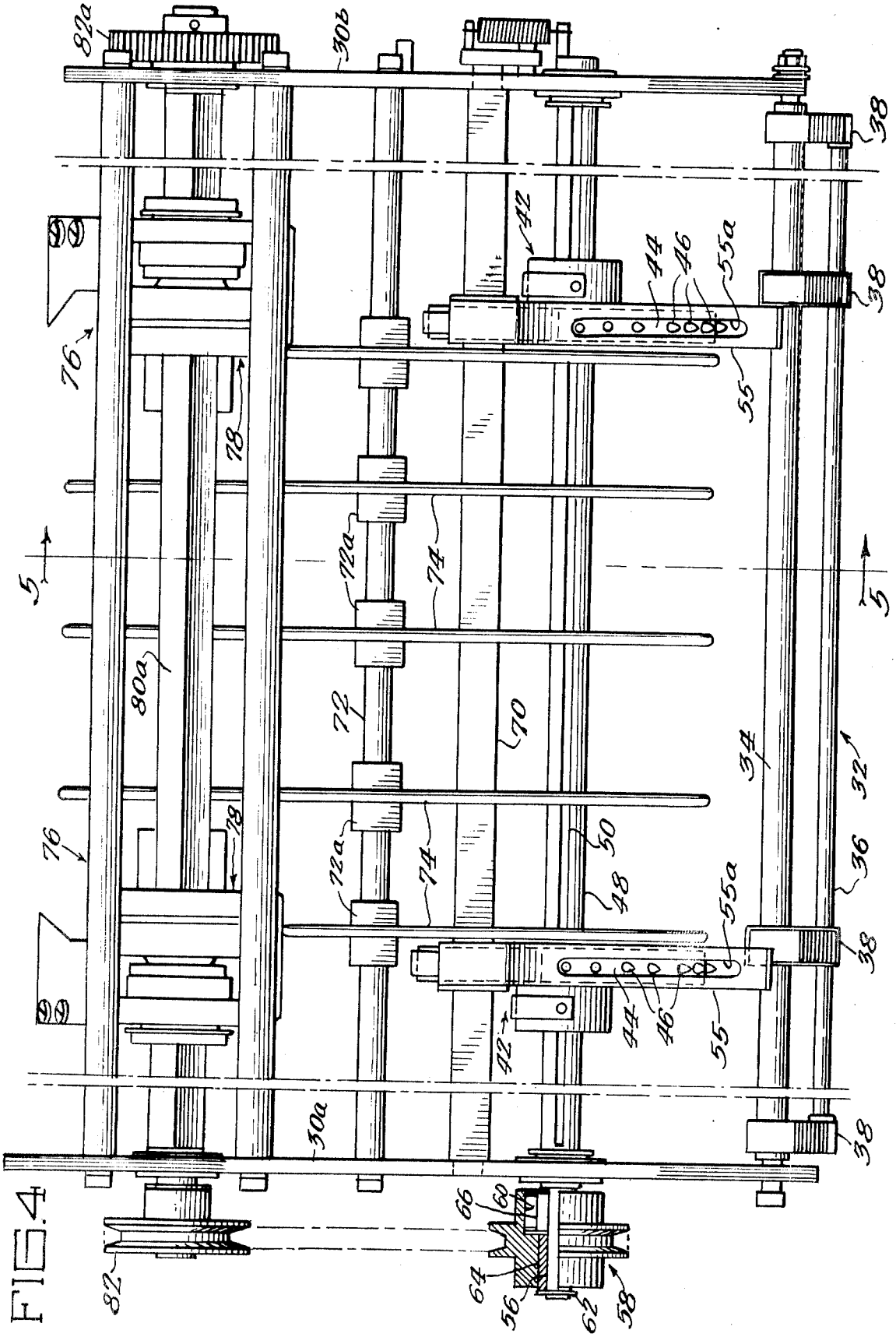


FIG. 4

May 26, 1970 H. K. ABSLER ET AL 3,514,094

WEB DELEAVER WITH OVERRIDING DRIVE MEANS

Filed June 13, 1967 5 Sheets-Sheet 5

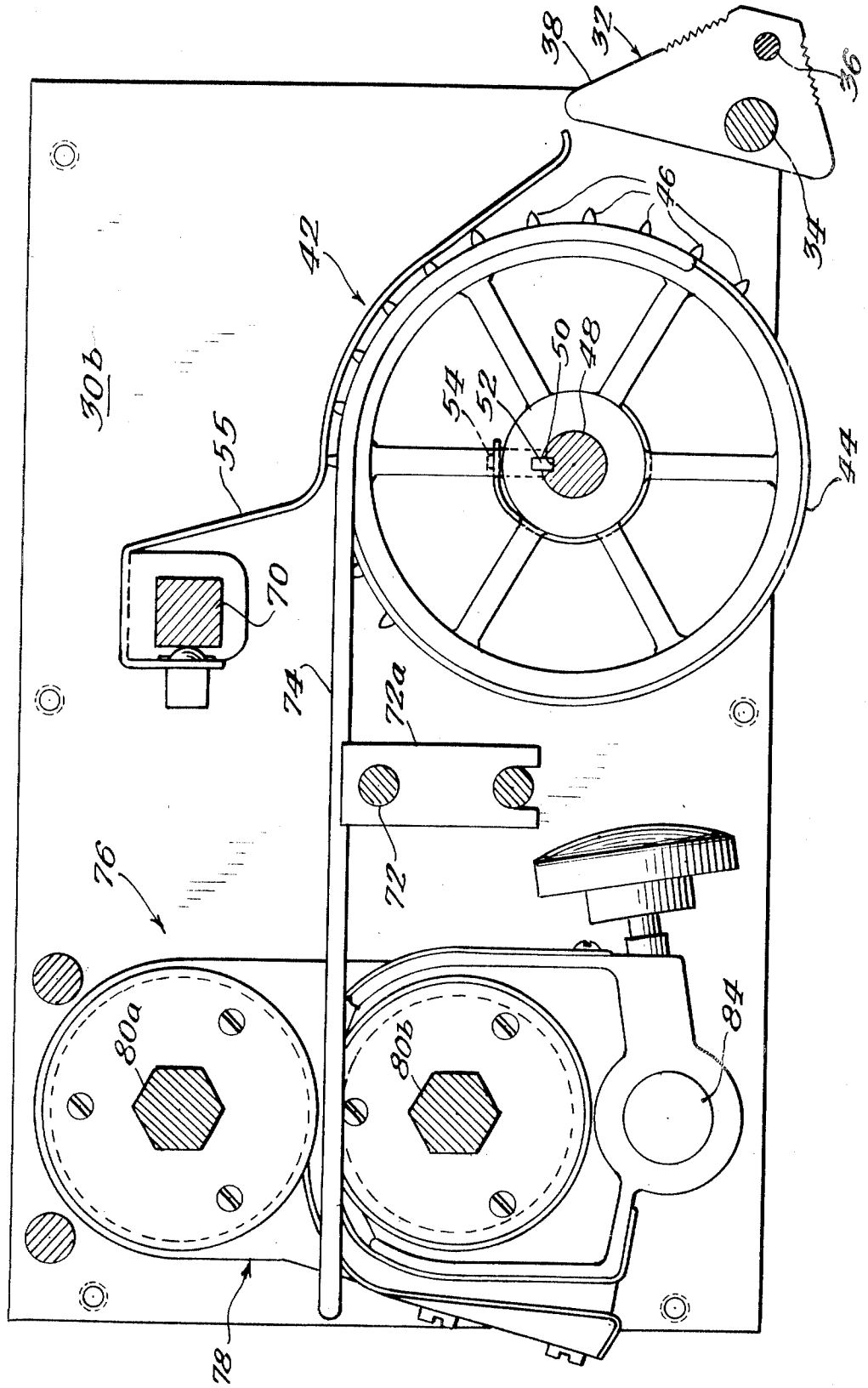


FIG 5

United States Patent Office 3,514,094 Patented May 26, 1970

3,514,094

WEB DELEAVER WITH OVERRIDING DRIVE MEANS

Howard K. Absler, Skokie, and Leonard M. Narel, Cary, Ill., assignors to Uarco Incorporated, a corporation of Illinois

Filed June 13, 1967, Ser. No. 645,830
Int. Cl. B65h 41/00, 17/02
U.S. Cl. 270—52.5 12 Claims

ABSTRACT OF THE DISCLOSURE

A stationery deleaver for separating multiple plies of stationery from a folded stack into a plurality of individual folded stacks of single plies of stationery. Pin feed wheels at the infeed end of the deleaver are driven by means of an overriding clutch so that when carbon interleaved stacks are being deleaved, faster driven carbon rewind reels and paper drive rollers control the speed of stationery and carbon. In addition, stationery having no pin feed holes can be driven through the machine. When deleaving carbonless forms with pin feed holes, the pin wheels advance the stationery through the deleaver.

BACKGROUND OF THE INVENTION

Field of the invention

This application relates to deleaver mechanisms for separating folded stacks of multiple plies of continuous form stationery into individual folded stacks of single plies of stationery.

Description of prior art

Deleaving apparatuses of the same general type as the deleaver of this invention which are presently in commercial use include a frame having an infeed end with driven pin wheels for feeding the stationery material through the deleaver by engagement with the perforated margins of the stationery. Adjacent the driven pin wheels are trimming mechanisms for removing marginal material, such as the control punch holes in the margin. Next in the path of stationery travel are a plurality of inclined paper guides, at the top of which are rollers. Individual plies of stationery are webbed over each inclined paper guide and carbon paper, if interleaved in the original stack, is wrapped around a carbon rewind spindle.

The theory of operation of these currently marketed devices is that the pin feed wheel at the infeed end of the machine drives the paper through the machine.

Carbon rewind wheels in such devices are driven by friction clutches with the torque thereof fixed as an initial adjustment prior to running a pack of stationery through the machine. The initial setting is at an amount of torque that will not quite pull the stationery off the pinfeed wheels when the rewind wheels are just starting and carbon tension is high. As the carbon rewind builds up in diameter, the carbon tension decreases until finally the torque available is not sufficient to continue rewinding the carbon. If the initial torque is low, the carbon is rewound loosely which results in a bigger diameter for a given footage and also an imbalance roll which will stop rewinding sooner.

Since the greatest time consuming factor of the deleaving process is setup time, it is desirable to eliminate all subsequent setups or adjustments after the initial setup. To this end, the instant invention is directed.

Prior art patents assigned to the assignee of this invention which are directed to deleaver mechanism include Pine Pat. No. 3,143,342 entitled "Deleaver Stand" and

Pine et al. Pat. No. 3,079,142 entitled "Deleaver for Continuous Form Stationery." In the former Pine et al. patent, the stationery stack is positioned on end and is webbed around rollers with the plane of direction of the stack of the plies changed for subsequent refolding into one single stack.

In the Pine et al. Pat. No. 3,079,142, a stationery stack of several plies may be separated into several stacks of individual plies of stationery. Here there are no pin feed wheels in the machine for driving the stationery through the machine. Instead, the stationery is propelled by a single driven roller assembly. Also, there is no provision for the carbon reels having any driving influence. Instead the carbon reels are subordinate to the propelling means provided by the main driven roller assembly.

Sornberger Pat. No. 2,805,855 shows a deleaving mechanism wherein a multiple ply folded stack is separated into one stack of single plies and another stack of remaining plies. In this structure, one roller is utilized to drive the separated ply and carbon sheet, and another roller is utilized to drive the remaining plies and carbon sheets.

The Pine Pat. No. 3,386,729 assigned to the assignee of this invention, also discloses a deleaver mechanism wherein the multiple ply stack is separated into one stack of a single ply of stationery and another stack of remaining plies. In Pine Pat. No. 3,386,729, the stationery is driven by two rollers, one for driving the separated ply, and the other for driving the remaining plies. Driven rewind reels take up the carbon sheet adjacent the separated ply. The carbon sheet and stationery ply are fed together for some distance downwardly along an arcuate paper guide. The carbon sheet is returned upwardly around a wrap bar to a driven rewind reel. Since only one ply is being separated from the multiple stack into a single stack, no effort is made for the speed of the carbon rewind reel to govern the speed of stationery travel. In the aforementioned Pine patent, refold shelves at the bottom of the arcuate paper guides are inclined upwardly relative thereto and are provided with recesses adjacent the terminal end of the paper guides for encouraging generally flat refolding stack and preventing initial stack arching.

SUMMARY OF THE INVENTION

This invention is directed, in brief, to the provision of a stationery deleaver for separating multiple plies of stationery from a folded stack into a plurality of individual folded stacks of a single ply of stationery, wherein the deleaver is provided with pin feed wheels at the infeed end of the machine which are driven through an overriding clutch mechanism; driven paper feeding rollers at the top of a plurality of tandem arranged paper guides; and driven carbon rewind reels adjacent each paper guide, the carbon rewind reels being driven continuously at a faster rate of surface speed than the pin feed wheels so that when deleaving stationery interleaved with carbon sheets, the pin feed wheels will act only as idlers for maintaining alignment of the stationery. The paper rollers at the top of the arcuate paper guides are initially driven at a rate of surface speed faster than the rewind reels but at the end of the run of a stack of stationery, the speed of the rewind reels and driven paper rollers is nearly the same. Also, trimmer apparatus may be provided at the infeed end of the deleaver which may be initially driven much faster than the base speed of the rewind spindles and slightly faster than the speed of the rewind spindles at the end of a run of a stack of stationery.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevational view of the deleaver of this invention showing the deleaving operation in separating a zig-zag folded stack of four plies of stationery with

three plies of carbon interleaved into four individual stacks of single plies of stationery;

FIG. 2 is a fragmentary broken enlarged top plan view of the deleaver shown in FIG. 1;

FIG. 3 is a fragmentary enlarged broken side elevational view of the deleaver with a portion broken away to show the drive train thereof;

FIG. 4 is an enlarged top plan broken view of the infeed portion of the deleaver; and

FIG. 5 is a section view of the infeed portion of the deleaver taken generally along the line 5—5 of FIG. 4.

DESCRIPTION OF THE PREFERRED EMBODIMENT

As shown in FIG. 1, the deleaver **10** of this invention is intended for use in deleaving a zig-zag folded stack of stationery **11**, initially supported on a shelf **11***a* at the infeed end of the stationery, to remove the individual plies of stationery **12** from the stack and refold the individual plies into individual stacks **12***a* of single plies of stationery. If the stacks **11** is also interleaved with carbon strips **14**, these strips are also separated and collected for disposal.

The deleaver **10** includes a housing generally indicated **16** which encloses the functional components of the deleaver as well as frame assembly, generally indicated **18** in FIG. 3. With further general reference to FIG. 3, the frame supports, and the housing encloses, motor means **20** for driving functional components of the deleaver. The motor **20** drives a motor drive belt **22** which rotates a master compound pulley **24** about which the main deleaver drive belt **26** is reeved.

Referring now to FIGS. 2, 4 and 5, the infeed end of the deleaver includes a pair of laterally spaced frame plates **30***a* and **30***b*. A tension bar assembly **32** spans the area between the plates and includes a tension bar **34** and a tie rod **36**, to which are connected paper guides **38**. The paper guides **38** are movably related to the tension bar and tie rods to provide a means for initially guiding stationery into the deleaver.

A pin wheel assembly **42** is mounted in the infeed area of the deleaver and includes a pair of pin wheels **44** having radially outwardly extending pins **46** for engaging pin feed openings in marginal areas of continuous form stationery. The pin wheels **44** are spaced apart on a driven pin wheel shaft **48** which is mounted between plates **30***a* and **30***b*. Shaft **48** has a longitudinal slot **50**, and the pin wheels are keyed to the shaft by means of a key **52** which is positioned in slot **50** and engages the pin wheel **44**. Key pin **54** provides a frictional contact of key **52** in keyway **50** so that the pinwheel can be moved to selected positions along the length of the pin wheel shaft **48**. This provides a means for adjusting the distance between the pin wheels for accepting stationery of different widths. A paper hold-down means **55** is positioned over a portion of the periphery of each pin feed wheel **44** and is provided wih a slot **55***a* which permits the pins **46** to project slightly therethrough. This general structure of the pin wheel assembly and tension bar assembly is known in the art and is generally typical of mechanisms which drive stationery by means of engagement with the pin feed holes in the marginal areas of the stationery.

Pin wheel shaft **48** has a reduced end **56** on which is mounted a combination pulley and clutch housing **58**. The combination pulley and clutch housing **58** has a stepped bore **60** and is fastened to the reduced end **56** by means such as grip ring **62**. The stepped bore receives a bearing **64** which is interposed between the pulley and clutch housing **58** and the reduced end of the shaft **56** to permit relative rotation between the two. In addition, in the enlarged area of the stepped bore, an overriding clutch means **66** is provided. This overriding clutch is preferably of the type manufactured by the Mini-Clutch Company and identified as Model No. HU64B6R. Generally speaking, the clutch is affixed to shaft **48** and normally transmits driving power to the shaft **48** from pulley **58** when the pulley is rotated by belt **26**. However, when stationery in engagement with pin wheels **46** is pulled at a rate of speed faster than that imparted by the pin wheels through the driving connection of pulley housing **58** with clutch **66**, an overriding relationship is established between the clutch and the housing **58** to permit shaft **48** to rotate at a speed faster than that at which it would be driven through the clutch means.

Cross rods **72** are provided to support spacers **72***a* for gripping and holding longitudinal guides **74** which provide a means for supporting the stationery through the infeed station.

The infeed station further includes a slitter or trimmer assembly **76** including a pair of trimmer units **78** mounted on shafts **80***a* and **80***b*. Shaft **80***a* is driven by trimmer pulley **82**, and gear **82***a* at the opposite end of shaft **80***a* engages similar gear (not shown) on shaft **80***b*. In general, the trimmer assembly disclosed herein is substantially the same as that disclosed in Pine et al. Pat. No. 3,185,007 and Meter et al. Pat. No. 3,185,009, both patents issued on May 25, 1965. As disclosed in the aforesaid patents, the two trimmer units are mounted on another shaft **84** so that they may be laterally moved to adjust for different widths of stationery which are fed through the infeed station.

With particular reference to FIGS. 1 and 2, a plurality of stationery drive rollers **86** are mounted on the housing **16** across the path of travel of stationery **12** beyond the infeed station. These rollers are driven through a drive mechanism to be explained later. Preferably these rollers have an exterior with a high coefficient of friction to drive the stationery by surface engagement therewith.

Arcuate paper guides **88** extend downwardly and away from each of the rollers **86**. Wrap around bars **90** are removably mounted on the housing **16** closely adjacent the lower end of each paper guide **88**. The several bars **90** may be disconnected from the housing **16** when the deleaver is being utilized to deleave carbonless stacks of stationery to permit free descent of the stationery without interference from the rods **90**. At the first paper guide **88**, an alternate position **90***a* is proivded for the wrap bar so that the carbon will have to descend a greater distance along the length of paper descent before being returned upwardly to the carbon rewind reels **92**. This provides improved refolding qualities when multiple plies are being refolded in this area. The carbon rewind reels are also driven through drive mechanism to be explained later. Each rewind reel includes a plurality of rods **90***a* which extend outwardly from the reel. Preferably there are three to six rods to insure that as the carbon is wrapped by the driven action of the wheels, a substantially round configuration will be obtained to afford smooth rewrap and drive capabilities.

A stationery sheet and the carbon sheet thereabove are webbed over a drive roller **86** and down the paper guide **88**. The carbon is wrapped around bar **90** and returned upwardly to rewind reel **92**. This arrangement causes the carbon strip to hold the stationary strip closely adjacent the paper guide, resulting in improved refolding of stacks **12***a* and permitting a higher rate of speed of paper feed.

Angled refold shelves **94** are provided below the terminal end of each of the paper guides **88**, each of the refold shelves being recessed as shown at **96** to insure that the stacks will be refolded in a generally flat configuration. The lower end of the first paper guide **88** is shortened relative to the remaining paper guides and a mutually inwardly facing refold shelf **98** is opposite shelf **94** so that multiple ply refold may be accomplished by first directing the refolding operation in the area of the trough formed by the mutual inward incline operation of shelves **94** and **98**. Shelf **100** at the rear of the machine accepts the first separated ply of stationery into its refold stack **12***a*, and may be removed along with shelf

11*a*, when the machine is not in use to reduce the overall envelope of the machine.

Generally speaking, the structure described with respect to reference numerals **88** through **98** is similar to that found in the Pine Pat. No. 3,386,729 entitled "Deleaver," filed July 16, 1965, and assigned to the assignee of this invention.

A hold-down assembly **102** is provided for the last roller **86** or that roller which separates the uppermost stationery sheet **12** from the remaining plies and therefore does not have a carbon sheet thereabove. This roller assembly includes a roller arm **104** which has a transversely extending end portion **104***a*. End portion **104***a* is mounted in bracket **106** for rotation with respect thereto by means of collars **108**. The free end of arm **104** supports a freely rotatable wheel **110**, such as a caster wheel or the like, which is fixed in its position with respect to the rod by means such as grip rings **112**. This provides a means for maintaining the uppermost stationery ply closely adjacent drive roller **86** and properly directed in its downward path of travel since there is no carbon sheet **14** thereabove which may assist in this movement.

Referring now to FIG. 3, the drive train includes a plurality of casings **116** mounted in the frame (only one of which is shown for clarity of illustration), each of which rotatably supports a pluarity of pulleys for driving the stationery drive rollers and carbon rewind reels. Belt **26** first engages idler pulley **118** and then engages a portion of the periphery of pulley **120** which is part of the carbon rewind assembly **92**. Belt **26** is then reeved about adjustment pulley **122** which is movably mounted in slot **124** of arm portion **126**. The function of pulley **122** is to change the wrap on pulley **120**, to regulate the maximum torque that can be transmitted through this pulley. While the the machine is running, the maximum torque could theoretically be infinite; but during initial setup, the torque should be low enough to permit manual rotation of the rewind assembly **92** in order to get the carbon plies started without rotating all of the other elements of the drive assembly.

From pulley **122**, belt **26** is reeved about pulley **128** which is part of the stationery drive roller **86**. The belt is then reeved about idler **130** on the illustrated member **116** and returned about pulley **58** which drives the pin feed assembly, passing over pulleys **130** in the return path of travel. From pulley **58**, the belt is wound downwardly and about idler **132** which is mounted for adjustment in an upright slot **132***a*. The belt returns upwardly from pulley **132** and is wrapped about pulley **82** which drives the trimmer assembly.

Preferably the diameter of the several pulleys and the circumference of the stationery drive rollers **86**, the carbon rewind reels **92** and the pin wheels **48** as well as the slitter mechanism in the trimmer assembly (not shown) is such that the speed ratio of the several components is the follows:

RELATIVE SURFACE SPEED OF COMPONENTS

	Start of run (no carbon)	End of run 1,100' of carbon
Carbon rewind reels	Base speed	Base speed.
Stationery drive rollers	29% faster	Do.
Last stationery drive roller	49% faster	16% faster.
Slitter	52% faster	17% faster.
Pinfeed wheels	4% faster	25% slower (overriding).

The deleaver of this invention is capable of feeding stationery at a faster rate of speed while at the same time eliminating the necessity of repeated opeartor attention during a run of a stack of stationery. Because the main motive force for pulling the stationery through the deleaver is the carbon rewind reels, supplemented by the stationery drive rollers, there is no need for maintaining a balance between the surface speed at which these reels are running and the surface speed of the pin feed wheels. This adjustment has been a constant problem in the art, especially in view of the fact that the surface speed of the rewind reels is constantly changing because the diameter of the reels changes as the amount of carbon collected on the reels increases. With this problem of balancing the speed between these components obviated, one of the main causes of stationery misfold is eliminated.

In addition, the disclosed deleaver is versatile in that stationery with or without pin feed openings may be deleaved. In the embodiment illustrated in FIG. 1, the deleaver may separate stationery into four plies; therefore, a four ply stack could be completely deleaved and a stack of a greater number of plies than four would be deleaved into three individual stacks and a multiple refold stack which could be subsequently passed through the deleaver again. If the six ply form were being deleaved, the first three plies could be deleaved through the first pass through the deleaver and the margins trimmed by the trimmer mechanism at that time. During the second pass through the deleaver, the remaining three plies would be pulled by the rewind reels and the pin wheels and the trimmer mechanism would perform no function. With the currently commercially available deleaver mechanisms previously described, this could not be accomplished without deleaving on a separate machine which did not utilize pin wheels as a motive force.

Although the pin feed wheels are generally subordinate to the carbon rewind reels as a driving force, they may be used for advancing stationery through the deleaver when the folded stack is not provided with interleaved carbon sheets. In addition, they serve as a brake means so that during the initial webbing of the stationery, the stationery will not run backwards but will be positively held in position. As illustrated in the above chart, in the preferred embodiment the pin wheels are driven at an initial rate of surface speed approximately four percent faster than that of the rewind reels. However, the diameter of the rewind reels soon increases so that the surface speed of the reels overcomes that of the pin feed wheels and for most of the deleaving operation the rewind reels are the effective motive force for pulling stationery and carbon through the deleaver assisted by the stationery drive rollers with the pin feed wheels having no driving influence but only performing the aligning function. Finally, all of the transfer material of a pack of stationery may be rewound without interruption.

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.

We claim:

1. A mechanism for deleaving interfolded stacks of stationery into individual folded stacks of single plies of stationery, comprising: first stationery engaging means in the path of travel of the stationery for engaging portions thereof to advance the same; means beyond the stationery engaging means for collecting carbon webs interleaved in the stack; and first drive means for driving said stationery engaging means and said carbon sheet collecting means, said carbon sheet collecting means being driven at a faster rate of surface speed than the stationery engaging means, and means responsive to said stationery being pulled through said stationery engaging means to disengage said stationery engaging means from said drive means whereby, when forms with interleaved carbon sheets are being deleaved, the stationery engaging means does not perform an advancing function by reason of being disengaged from said drive means.

2. The deleaver mechanism of claim **1** wherein said stationery engaging means comprises pin drive members which are constructed and arranged to engage pin feed openings in the marginal areas of stationery which may be fed through the deleaver.

3. The deleaver mechanism of claim **2** which further includes stationery drive means in the path of travel of

stationery beyond the stationery engaging means and in advance of the carbon sheet collecting means, said stationery drive means being driven by the first drive means for engaging the surface of the stationery and advancing the same through the deleaver.

4. The deleaver mechanism of claim **3** wherein the stationery drive means is driven at a faster rate of surface speed than the pin drive member.

5. The deleaver mechanism of claim **4** wherein the stationery drive means is driven at a rate slower than the surface speed of the rewind means.

6. The deleaver mechanism of claim **5** including trimmer means in the path of stationery travel for removing marginal material from the stationery, said trimmer means being driven at a faster rate of surface speed than said pin drive member.

7. The deleaver mechanism of claim **1** wherein said stationery engaging means is associated with said first drive means for overriding clutch means responsive to higher speeds imparted to said engaging means by stationery pulled by said carbon sheet collecting means, disengagement of said engaging means from said first drive means resulting from the engaging means being overridden by the faster rate of speed of the carbon sheet collecting means.

8. The deleaver mechanism of claim **3** wherein arcuate paper guides extend downwardly and away from the stationery drive means and means are provided towards the lower end of the stationery guides for reversely wrapping a carbon sheet thereabout to web the same to the carbon collecting means which is positioned above said reverse wrapping means so that the faster driven carbon sheets pull the interleaved stationery sheet downwardly a substantial distance along the arcuate paper guides.

9. An apparatus for separating interfolded stacks of multiple plies of strips of stationery and transfer material into a plurality of individual stacks of single plies of folded stationery, comprising: housing means having means defining a path of stationery travel therethrough; drive means in said housing; a pin feed wheel in the path of stationery travel for engaging perforated marginal edges of stationery to advance the same, said pin feed wheel being connected to said drive means by overriding means so that said pin wheels may be responsive to a higher rate of speed imparted thereto by the stationery in engagement with the pin wheel to override the driving connection from the drive means and rotate freely in engagement with the stationery; and a rewind reel in the path of stationery travel beyond said pin wheel for collecting transfer material, said rewind reel being driven by said drive means at a faster rate of surface speed than said pin wheel whereby when forms with interleaved transfer strips are being deleaved, the rewind reel provides the motive force for pulling the stationery and transfer strips through the deleaver.

10. The apparatus of claim **9** including a stationery driving roller interposed in the path of travel of the stationery between the pin feed wheel and the rewind reel, the stationery driving roller being driven at a faster rate of surface speed than the pin feed wheel.

11. The apparatus of claim **10** further including marginal trimming means interposed in the path of travel of the stationery between the pin feed wheel and the stationery driving roller, the trimming means being driven at a faster rate of surface speed than the pin feed wheel.

12. The apparatus of claim **11** wherein the relative surface speed of the several components is in the approximate ratio of the herein disclosed chart entitled "Relative Surface Speed of Components."

References Cited

UNITED STATES PATENTS

2,845,232 7/1958 Johnson et al. ------ 242—67.2

FOREIGN PATENTS

706,209 3/1965 Canada.

EUGENE R. CAPOZIO, Primary Examiner

P. V. WILLIAMS, Assistant Examiner

U.S. Cl. X.R.

242—67.2