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Patterson

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[45] **July 10, 1973**

[54] **DELEAVING AND TRIMMING MACHINE**

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[52] **U.S. Cl.** **270/52.5**

[51] **Int. Cl.** **B65h 41/00,** B65h 17/02

[58] **Field of Search** ..... 270/52.5, 73, 61 F

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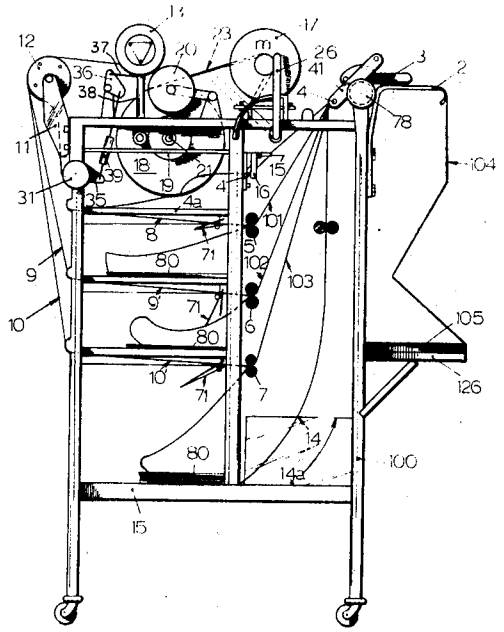
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[57] **ABSTRACT**

A machine for trimming, removing carbon paper from, separating, and refolding plies of forms, such as Data Processing forms. The machine trims the edges, separates the plies of paper from the carbon, and folds the paper and rolls the carbon paper. The machine will fold one or more forms separately. Previous machines relied upon forms folding themselves along the lines they were previously folded. The folding device enables the machine to be speeded up and the output of the machine is greatly increased.

15 Claims, 19 Drawing Figures



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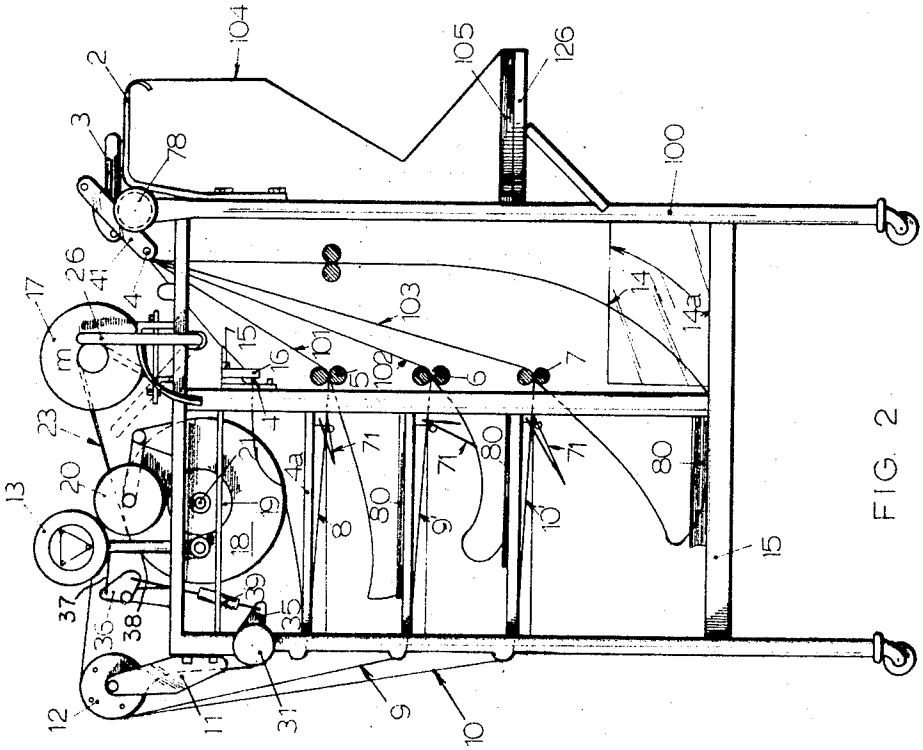


FIG. 2

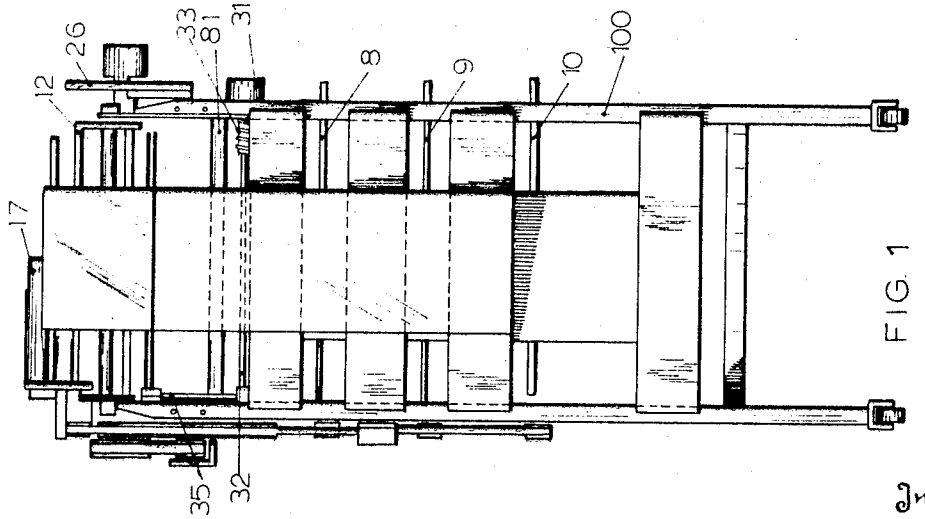


FIG. 1

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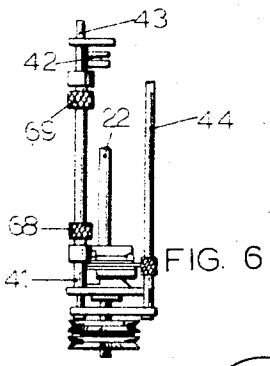


FIG. 6

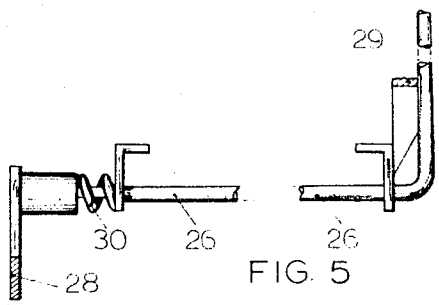


FIG. 5

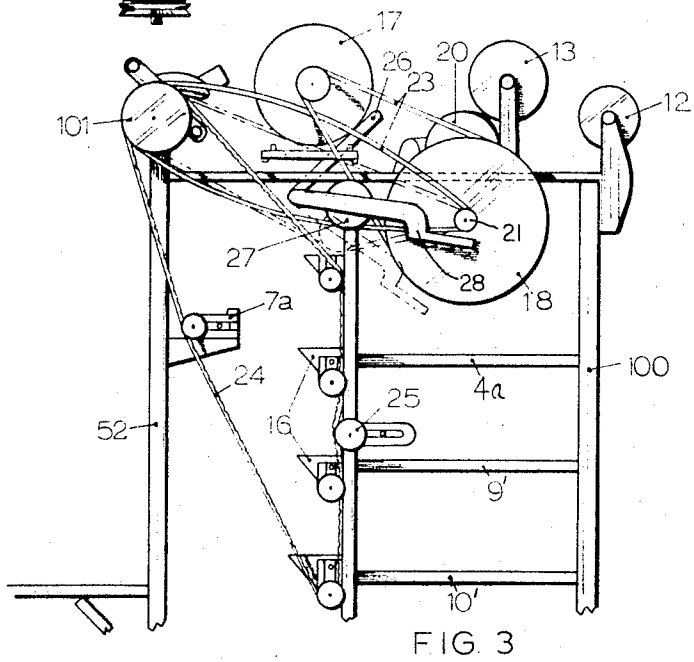


FIG. 3

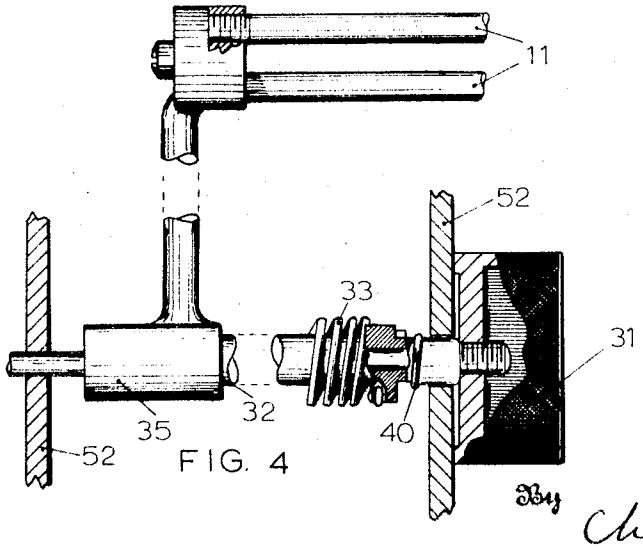


FIG. 4

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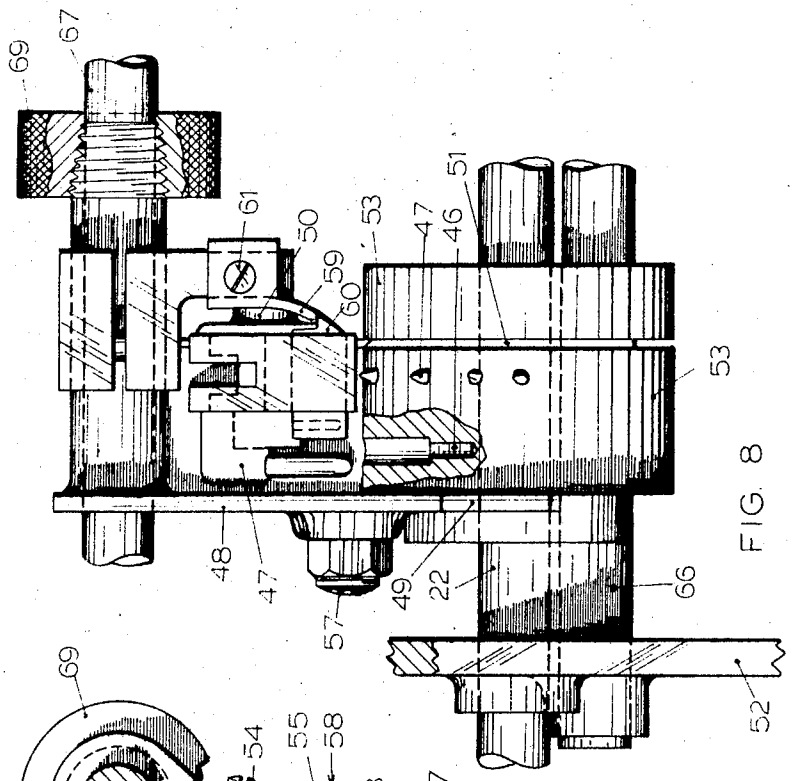


FIG. 8

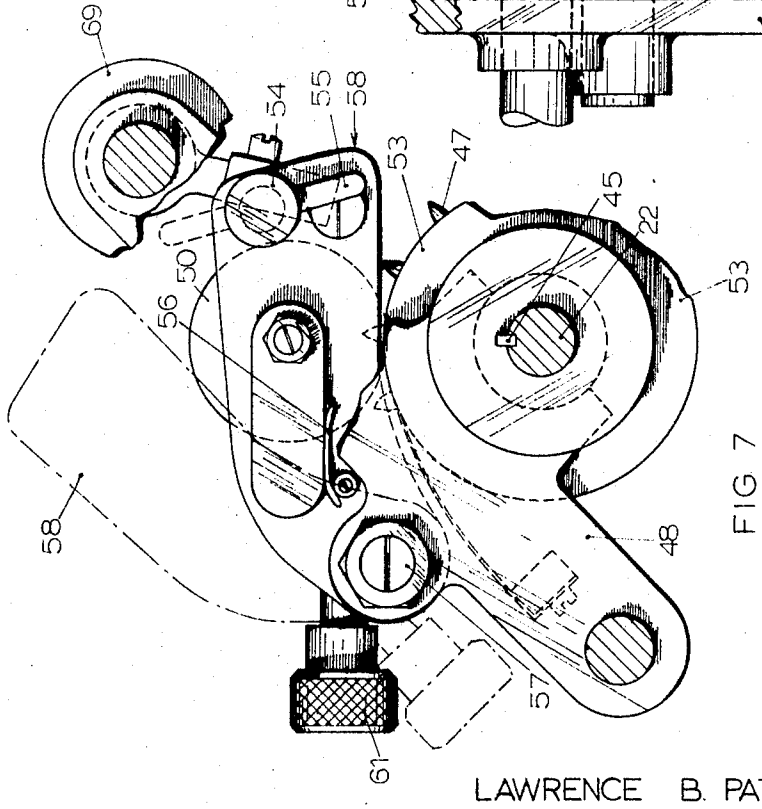


FIG. 7

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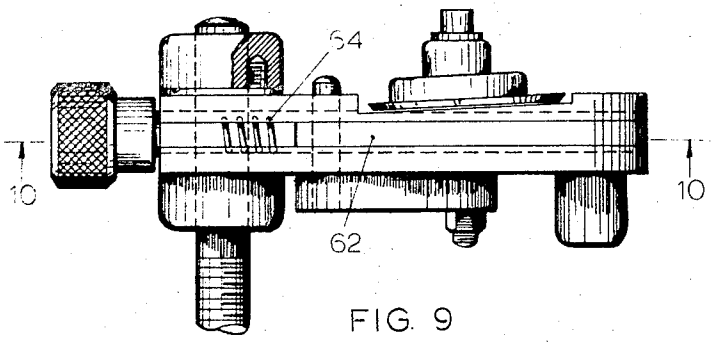


FIG. 9

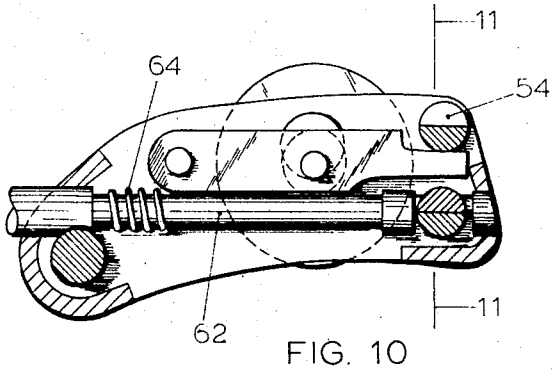


FIG. 10

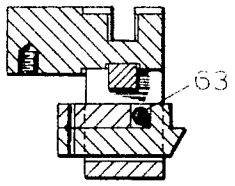


FIG. 11

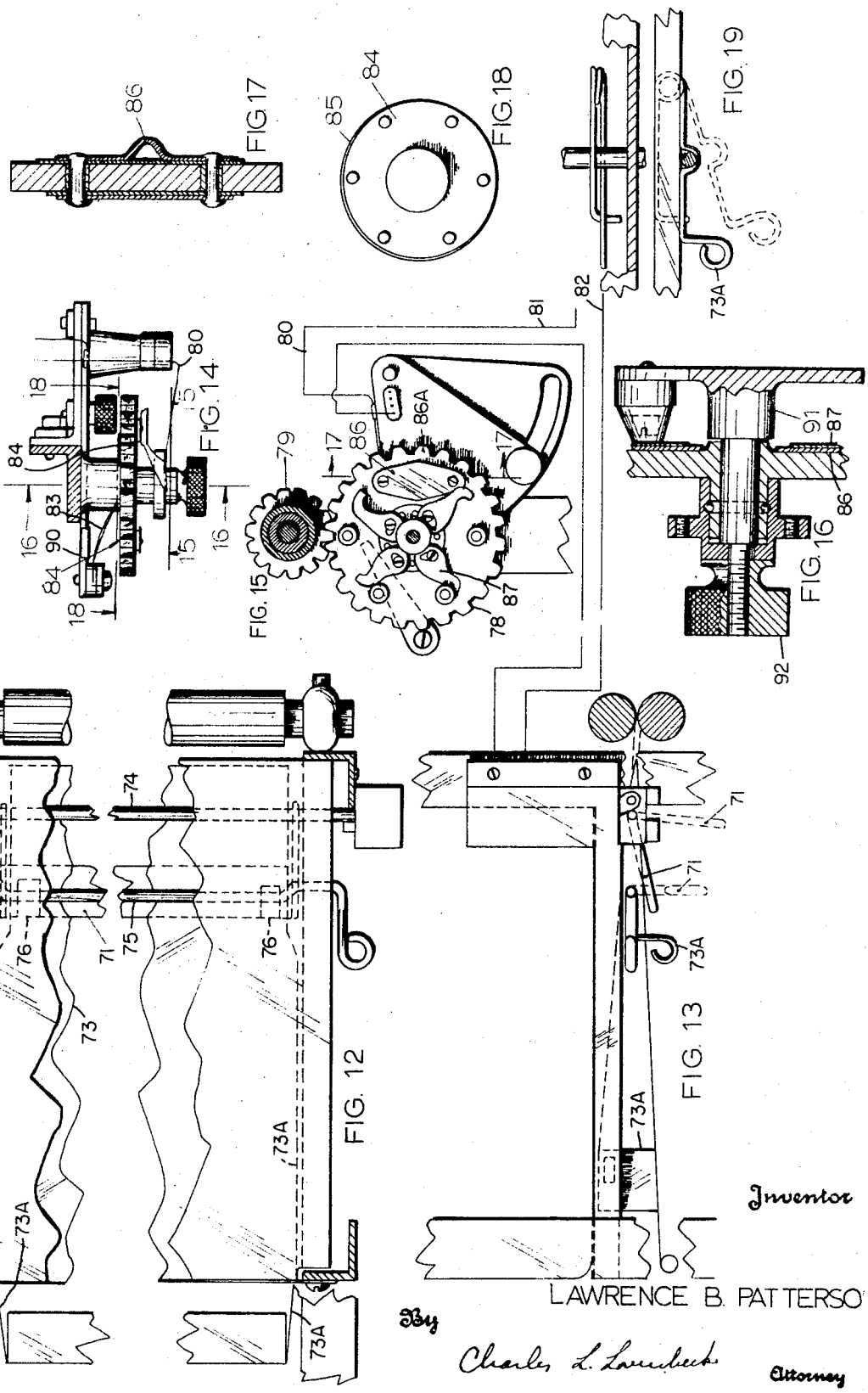
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DELEAVING AND TRIMMING MACHINE

STATEMENT OF INVENTION

This invention relates to form handling machines and, more particularly, to folding, deleaving and trimming machines.

OBJECTS OF THE INVENTION

It is an object of the invention to provide an improved combination folding, deleaving and trimming machine.

Another object of the invention is to provide a folding, deleaving and trimming machine which is simple in construction, economical to manufacture, and simple and efficient to use.

Another object of the invention is to provide an improved folding device on a trimming and deleaving machine.

Another object of the invention is to provide an improved trimming device which will trim at least six plies at a time and is self-sharpening.

Another object of the invention is to provide an improved trimming device in a deleaving machine wherein the rollers have adjustable pressure in combination with feed sprockets which pull the forms apart before they enter the rollers.

Another object of the invention is to provide an improved means for separating carbon paper and forms before they are folded in a deleaving machine.

With the above and other objects in view, the present invention consists of the combination and arrangement of parts hereinafter more fully described, illustrated in the accompanying drawings and more particularly pointed out in the appended claims, it being understood that changes may be made in the form, size, proportions, and minor details of construction without departing from the spirit or sacrificing any of the advantages of the invention.

GENERAL DESCRIPTION OF THE DRAWINGS

FIG. **1** is a front elevation view of the machine according to the invention.

FIG. **2** is a side elevation view taken at right angles to FIG. **1.**

FIG. **3** shows a view of the machine taken from the side opposite to FIG. **2.**

FIG. **4** is an enlarged partial view of the tension regulator for the carbon paper.

FIG. **5** is a partial view of the control lever for stopping and starting the machine.

FIG. **6** is a partial top plan view of one of the trimmer wheels and the sprocket shaft.

FIG. **7** is a vertical side view of the trimmer wheels.

FIG. **8** is a view of the trimming mechanism taken at right angles to FIG. **7.**

FIG. **9** is a top plan view of part of the trimming mechanism.

FIG. **10** is a sectional view of the trimming mechanism taken on line **10—10** of FIG. **9.**

FIG. **11** is a sectional view of the trimming mechanism taken on line **11—11** of FIG. **10.**

FIG. **12** is a top view of one of the shelves showing the folding blade.

FIG. **13** is a side view of the mechanism shown in FIG. **12.**

FIG. **14** is a top view of the timing mechanism.

FIG. **15** is a cross sectional view of the timing mechanism taken on line **15—15** of FIG. **14.**

FIG. **16** is a cross sectional view taken on line **16—16** of FIG. **14.**

FIG. **17** is a cross sectional view taken on line **17—17** of FIG. **15.**

FIG. **18** is an end view of a part of FIG. **14.**

FIG. **19** is a partial side view of FIG. **12.**

DETAILED DESCRIPTION OF THE DRAWINGS

The machine shown has a frame **100** which may be supported on suitable casters as shown. The frame is shown having, for example, four shelves **4*a***, **9'**, **10'** and **15** which may separate a four-ply form made up of plies **101, 102** and **103** of a form **104.**

The form comes off the folded stack **105** and is trimmed by the trimmers shown in FIGS. **7** and **8.** The trim strip **14** is collected in container **14A.** The separate plies and carbon paper pass between sets **5, 6** and **7** of driven rolls which are driven by the belt **24** which is driven off the sprocket shaft by the belt **23** from pulley **21.** The forms are urged downward and caused to stack by the folding blades **71.**

Referring to FIGS. **1** and **2,** the paper on the paper holder shelf **126** is drawn up over guides **2** and **3** and over the feed sprocket **53** in FIG. **7.** The upper forms are then guided through the upper set of roll **4** and fold on upper shelf **4*a***. The next two sets of rolls **5** and **6** each pass a single ply of carbon and forms, but the lower set of rolls **7** may pass more than a single ply of carbon and forms if there are more than four forms to be separated. The single ply of carbon **8, 9** and **10** are above and pass through the rolls **5, 6** and **7** and are brought out in front of the machine and up. The upper carbon passes in back of the reel control rods **11** and over the roll **12** and to the reel **13.** The two lower carbons do not pass back of the rods. As the carbons and forms pass through the rollers, there are carbon guide plates the full width of the forms that separate the forms from the carbon. These forms fold on their respective shelves. The upper bearing bracket **15** for the rollers is of a conventional design and allows the upper roller to raise or lower according to the thickness of the paper. The surface speed of the rollers is greater than the surface speed of the feed sprocket **53** so that there is a slight slippage of the rollers on the paper. The guides **16,** in FIG. **3,** may be provided to facilitate feeding the paper onto the rollers. The trim strip **14** cut off by the trim wheels **50** is collected in container **14A.** Either side of the form may be trimmed off, or both sides may be trimmed off as desired.

DRIVE

The motor **17,** which may be a conventional type of a fractional horsepower electric motor, drives the large pulley **18** and the shaft of the large pulley **18** drives the reel through pulley **19** and the friction wheel **20.** The small pulley **21** on this shaft also drives the feed sprocket shaft **22.** The pulley **21** drives sprocket shaft **22** which drives the belt **24.** The belt **24** is adjusted by the idler pulley **25** which is slidably supported on a bracket on the side of the machine in a manner that is well known to those skilled in the art.

The feed sprocket is started and stopped by lever **26.** As lever **26** is moved forward, the idler pulley **27,** carried on the belt support lever **28,** is moved downward and tightens the belt **23,** as shown by the dotted lines

in FIG. 3. This lever 26 as shown in FIG. 5 is held in position and prevented from slipping on quadrant 29 by spring 30.

TENSION ON CARBON

The reel control is adjusted by knob 31. When this knob is turned to the right, it tends to turn shaft 32 through spring 33, forcing the reel control rods 11 against the carbon paper. If the carbon paper does not have sufficient tension, the arm 35 will cause the reel to contact the friction wheel 20. This will cause the reel to wind up the carbon and when sufficient tension is reached, this will cause opposite movement of the arm and the reel will then break contact with friction wheel 20. This control of the reel is done through the bell crank 36, FIG. 2, link 37 to link 38 and turnbuckle 39 to arm 35. The knob 31 is held in adjustment by spring 40.

TRIMMERS

The right and left hand trimmers 41 and 42 in FIGS. 2 and 6 are shown in the fragmentary view in FIG. 6 and can be adjusted on the bars 43 and 44 to different width forms. The feed sprocket 53 is driven by a key 45 which is held in place by set screw 46. The paper forms are fed through the trimmers by pins 47 on the feed sprocket of which only four are shown. These pins engage the punch holes in the edges of the forms. The feed sprocket 53 is also guided by side rail 48 engaging slot 49. The trimming discs 50 are held in trimming position by cam 54 as shown in FIG. 10 and is also shown in trimming position in FIG. 7 by the pin 55 pointing down. When the pin 55 is in the upward position, as shown by dotted lines, the cam 54 will allow the disc to rise out of the trimming position by spring 56. This cam 54 has stops and can only be rotated to the right for trimming. The trimming body 58 which pivots on screw 57 will be raised, as shown by the dotted lines, in order to rotate the cam 54 because pin 55 cannot be rotated to the right since it will engage side rail sleeve 48. This is a safety feature which prevents damaging the trimming disc.

Raising the trimming body 58 facilitates placing the forms on the feed sprocket pins and adjusting the trimmers to suit the width of the form. FIG. 8 shows the trimming body 58 held in operating position by latches 59 and 60. The trimmer can only be released by rotating knob 61 which causes the crank pin 63 to slide latch bolt 60 to the disengaged position.

OPERATION

In operation, referring to FIG. 15, the forms are placed on the pins in the trimmers with the edge of the paper on top center. If the edge of the paper has been parted at a concave fold, the gear 78 should be engaged with gear 79 when the C-C mark lines up with arrow 86*a* and if the edge of the paper has been parted at the convex fold, the mark C-V should line up with the arrow. This will cause the solenoids to be actuated at the right time to fold the paper. The top form is then guided to enter the top form guide 15*a*, and the carbon paper guided to enter carbon paper guide 15*b*. The paper form then enters the rollers a little ahead of the carbon paper. With the lever 72 in the upper position, the form goes underneath the carbon paper guide 73. The lever 72 is then lowered and the carbon will then go above the carbon plate guide. This process is repeated for the remaining shelves. While the forms are being folded on the shelves, the carbon paper is guided to come out the front of the machine and is then wound up on the reel.

The timing and actuating of the solenoids is done by gear 78 that is in mesh with gear 79. These gears have the correct ratio to cause gear 78 to make one complete revolution for every two forms that pass through the trimmer.

The carbon paper is guided into the rolls first and the lever 72, FIGS. 12 and 13, is lowered, which lowers the carbon guide plate 73 below the center of the rolls. As the machine is turned by hand and the carbon starts to lap over the guide plate, the lever 72 is raised and the form is then fed into the rolls and passes below the plate 73 and is folded on shelf by folding blade 71, while the carbon is guided out the front of the machine.

FOLDING

Solenoid 70 swings lever 71. Gear 78 is enmeshed with gear 79. These gears have the correct ratio to cause gear 78 to make one complete revolution for each two forms that pass through the trimmer.

Referring to FIG. 14, wire 80 carries current to contact blade 83 through wire guides 81 and 82. The blade 83 contacts disc 84 and current passes through the rivets to the contact point 86 and to the blade 87, once each revolution of gear and through wire 88 to removable plug and socket 89 and then to solenoid 70.

The blade holder 90 will have a blade 87 for each folder or solenoid on the machine. The blades on the blade holder will be adjusted to actuate the solenoid at the right time to fold the forms.

The assembly of gear 78 and blade carrier 90 is removed from stud 91, FIG. 16, by unscrewing nut 92 when it is necessary to use another assembly for different length forms. Each assembly remains intact when removed from the stud because of pin 92*a* engaging annular groove 93. The blade carrier 90 is made of insulating material.

By loosening screw 94, gears of different size are made to mesh with gear 79. The electrical parts are insulated from gear 78 by insulation 95.

When the solenoid is actuated, the blade 71 swings down and forces the form to fold along its dotted line to cause it to stack properly.

Referring to FIGS. 12 and 13, the carbon paper guide plate 73 is raised and lowered by rod 75, FIG. 12. The rod is supported on each end by wire clips 73a, FIGS. 13 and 19, and by opening this clip guide plate may be removed. The rod 75 is offset or has a crank which is fastened to guide plate 73 by bearings 76 as shown, FIG. 12. The folding blade 71 extends beyond each side of guide plate and is attached to solenoid crank rod as shown. Lowering lever 72, as shown by dotted lines in FIG. 13, lowers guide plate edge adjacent to rollers. Edge of guide plate is turned up to guide carbon over rods 74 and 75. Right end of guide plate is supported by spring clips 73*a*. The left end is also supported by the clips shown.

The foregoing specification sets forth the invention in its preferred practical forms but the structure shown is capable of modification within a range of equivalents without departing from the invention which is to be understood is broadly novel as is commensurate with the appended claims.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A machine for separating sheets of a continuous web of paper folded into sheets and made up of multi-layers of paper and for refolding said paper comprising,
- means to support a stack made up of a first paper layer and a second paper layer folded into said web,
- a layer of carbon paper between said paper layers,
- positive means to drive said web,
- a first pair of rolls receiving a said first layer,
- a second pair of rolls receiving a said second layer,
- means driving said first rolls and said second rolls at a surface speed greater than the surface speed of said positive means thereby providing a slight slippage between said rolls and said paper layers whereby said layers are pulled apart,
- means to support a first stack of refolded said layer, and
- a driven roll on said machine for rolling said sheet of carbon paper, and
- means to exert a force on said web whereby said layers are refolded at the edge of each said sheet each time a predetermined length of said sheet rests on said means to support a said stack.

2. The machine recited in claim 1 wherein said means to exert a force on said paper comprises,
- a rigid member extending transversely of said web, and
- means to move said rigid member intermittently into engagement with said web whereby said web is urged to fold.

3. The machine recited in claim 2 wherein trimming means is provided whereby said rigid member is timed to move in synchronism with the movement of said web whereby said web is refolded along the lines along it was originally folded.

4. The machine recited in claim 3 wherein trim wheels are supported at each side of said machine for trimming the edges of said web before said sheets are separated.

5. The machine recited in claim 4 wherein said trim wheels are in the form of relatively thin discs, swingably supported on said machine whereby said discs can be swung out of trimming position and thereby change from a trimming to a non-trimming position.

6. The machine recited in claim 4 wherein means is provided on said machine to remove carbon paper sheets from said web and means to wind said carbon paper on a reel.

7. The machine recited in claim 6 wherein means is provided on said machine to maintain substantially proper tension on each sheet of said carbon paper.

8. The machine recited in claim 1 wherein means is provided for adjusting the tension on said carbon paper.

9. A machine for separating layers of a form in the form of a web and for refolding said layers to form sheets of the same size as the original sheets of said form comprising,
- a machine having a plurality of vertically spaced restack shelves,
- a form shelf on said machine for supporting said web folded into sheets of predetermined length,
- guide means for moving said web from said form shelf to separating means,
- said separating means comprising spaced sets of driven rolls, one set of said driven rolls being disposed above and adjacent each said form shelf, and
- folding means adjacent said rolls,
- said folding means being adapted to force said web toward said shelf each time the end of a said sheet passes said folding means whereby said layers are refolded to the same size as the original sheet,
- said means to move said folding means comprises a crank and a solenoid actuating said crank swinging said means into engagement with said layers to fold said layers,
- timing means for actuating said solenoid in synchronism with said driving means.

10. The machine recited in claim 9 wherein a trimming means is provided for trimming the edges of said web prior to separating said web.

11. The machine recited in claim 10 wherein carbon paper is disposed between said layers of said web and means is provided to rewrap said carbon paper on a reel.

12. The machine recited in claim 10 wherein said forms have perforated lines at the end of each said sheet and said folding means swings into engagement with said web adjacent each alternate said perforated line.

13. A machine for folding forms made up of a plurality of layers of paper having carbon paper between said layers of paper and folded into sheets,
- a first shelf for a stack of said forms,
- a plurality of second shelves,
- means to separate said layers and to remove said carbon paper from between said layers, and
- means to refold single layers of said forms into sheets on said second shelves,
- means to roll said carbon paper on a single driven roll, and
- means to adjust the tension on said carbon paper as it is rolled onto said single driven roll,
- means is provided on said machine to cut off edges of said forms, and
- spring loaded means for swinging said trimming means away from said paper layers.

14. The machine recited in claim 13 wherein said means to cut off said edges comprises a cutting disc disposed adjacent each side of said multi-layer web.

15. The machine recited in claim 14 wherein said disc is inclined at an angle to the surface of the paper being cut.

* * * * *