June 11, 1968 R. N. STEFFENS 3,387,779

PAPER-HANDLING MACHINES

Filed Oct. 20, 1965 5 Sheets-Sheet 1

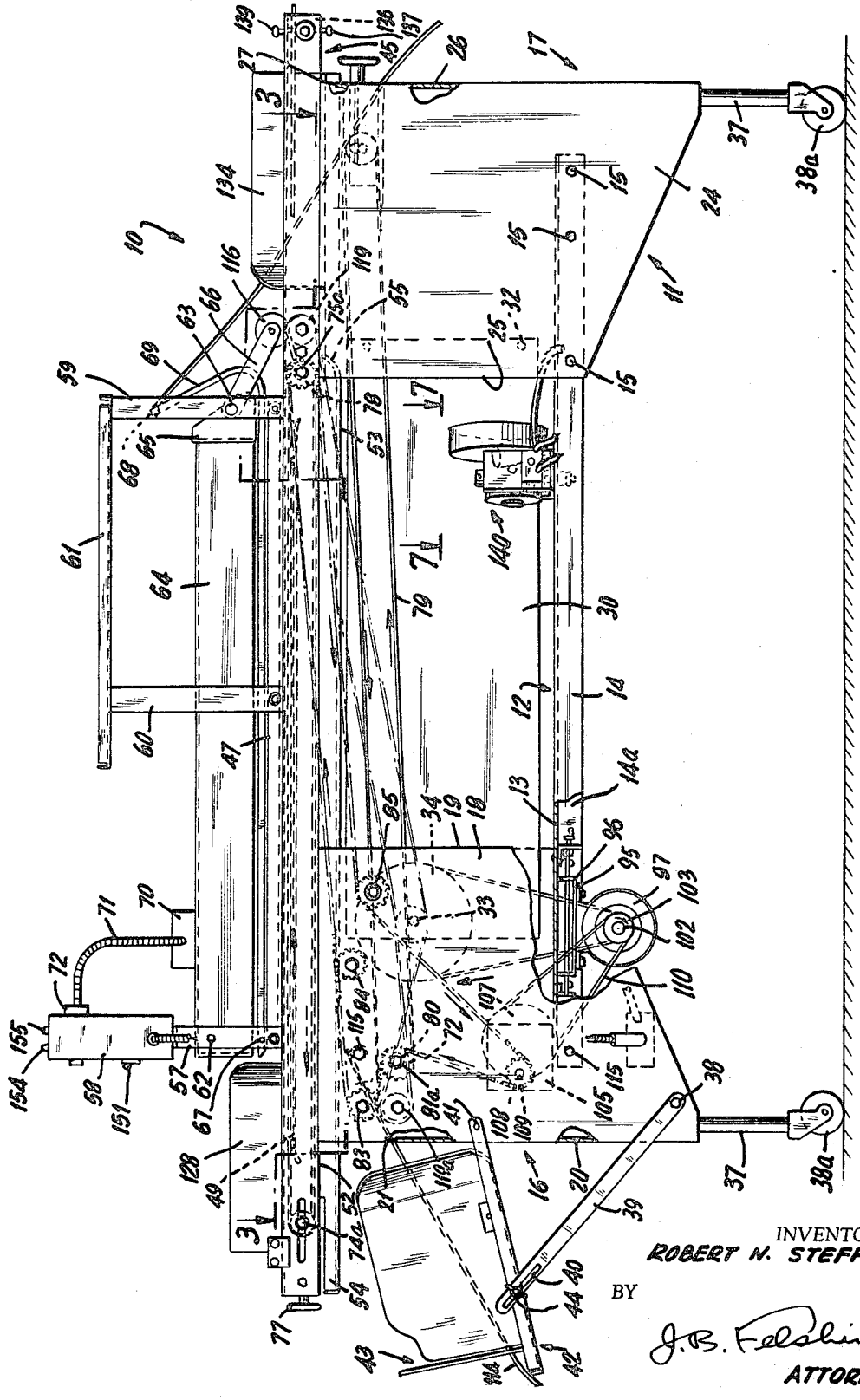


FIG. 1

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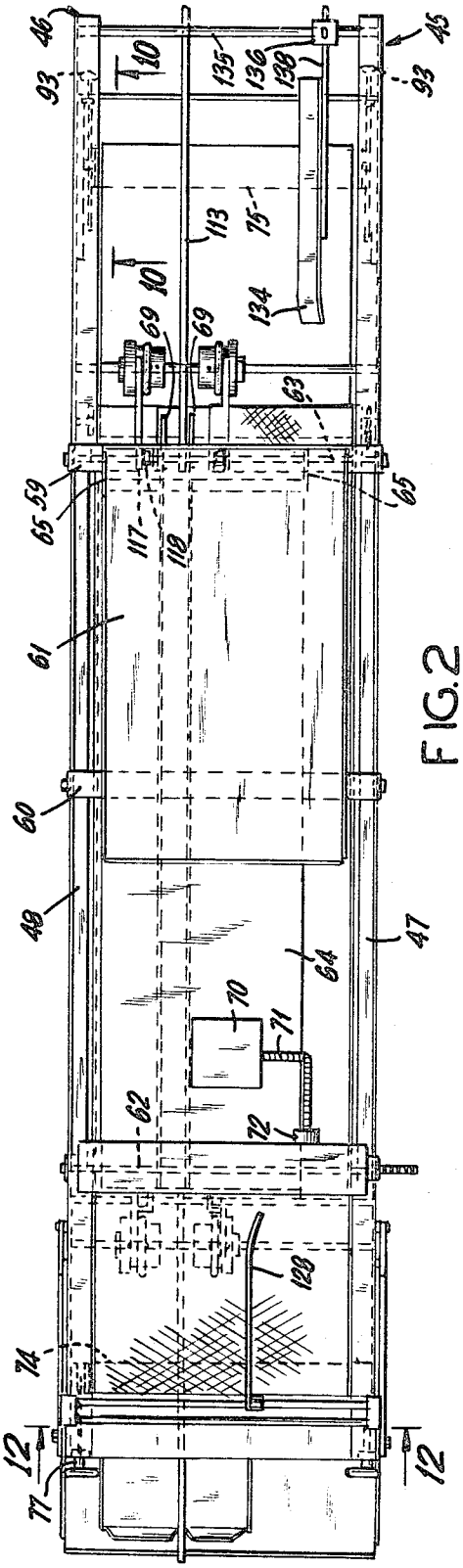


FIG. 2

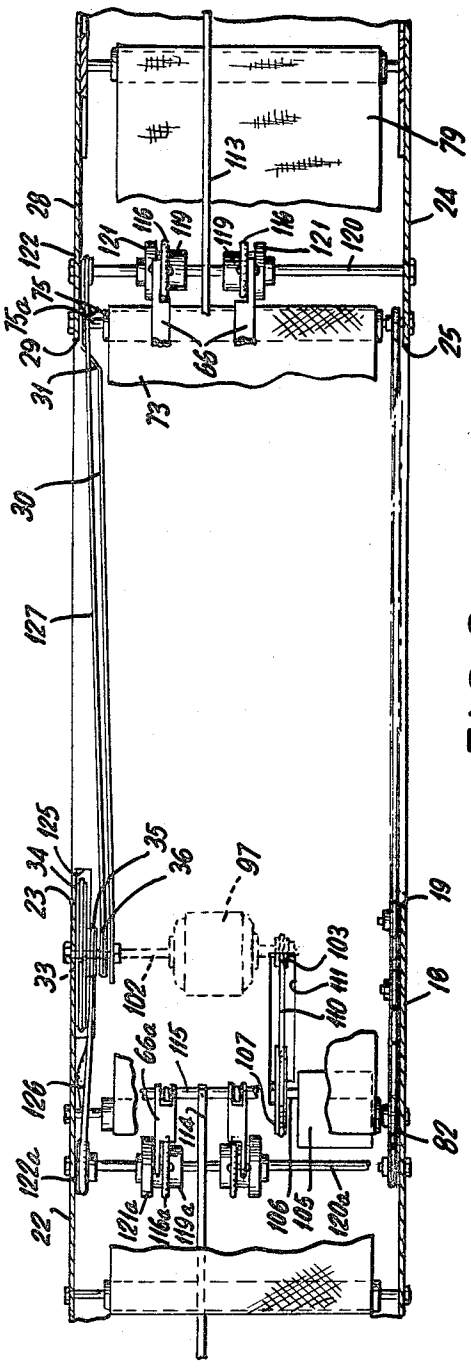


FIG. 3

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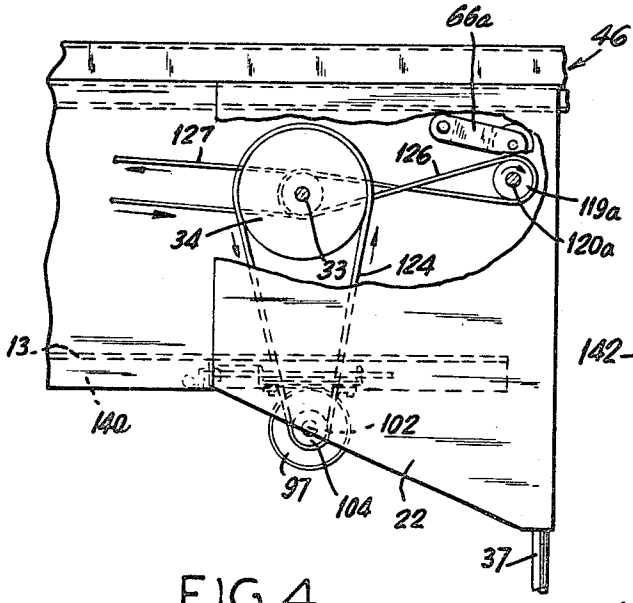


FIG. 4

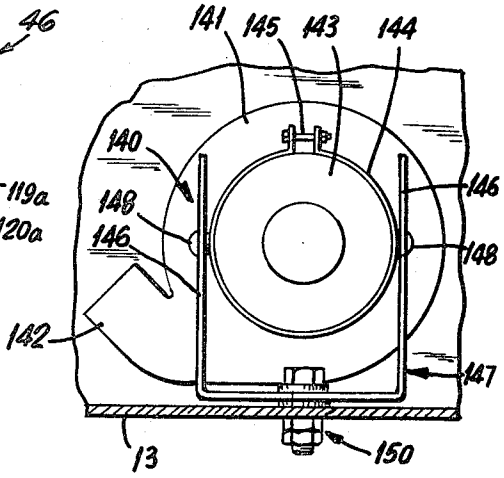


FIG. 8

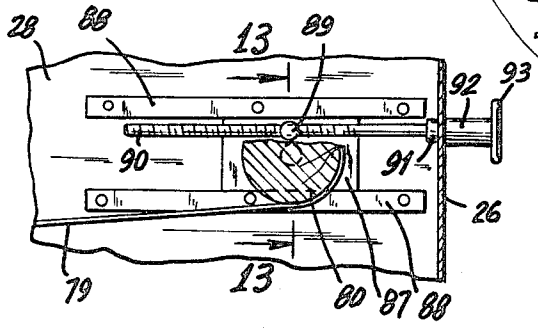


FIG. 10

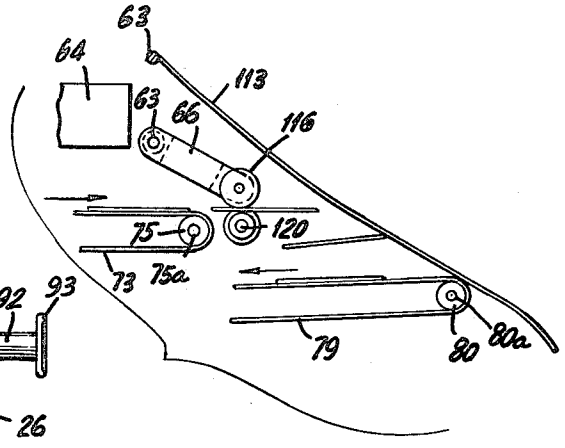


FIG. 11

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Filed Oct. 20, 1965 5 Sheets-Sheet 4

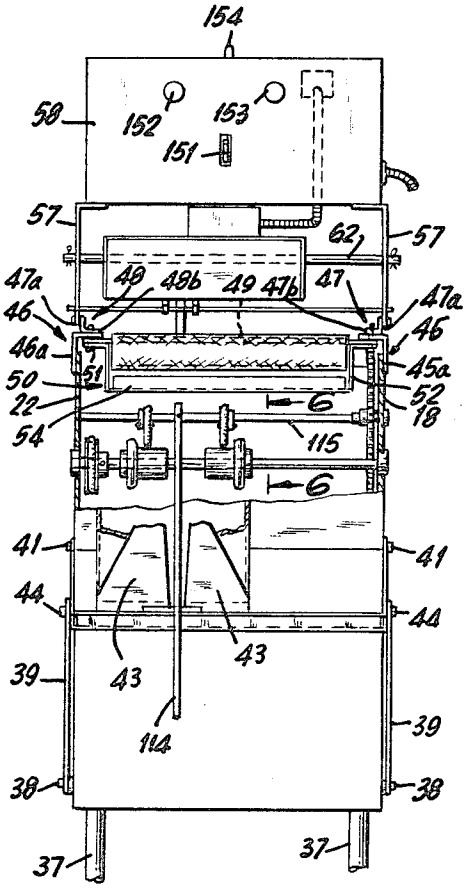


FIG. 5

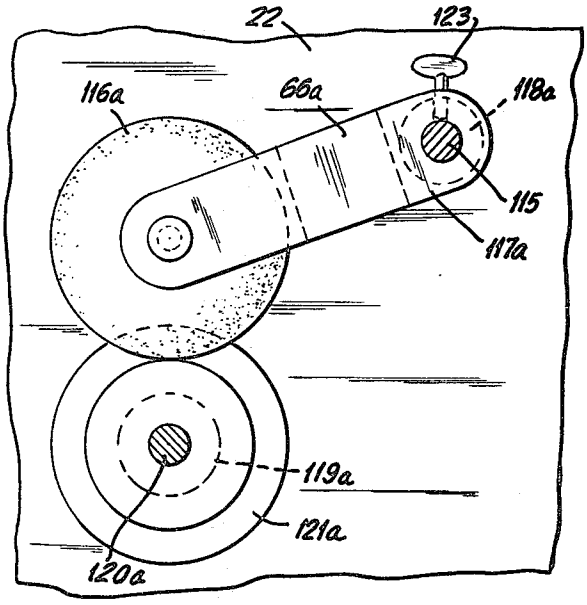


FIG. 6

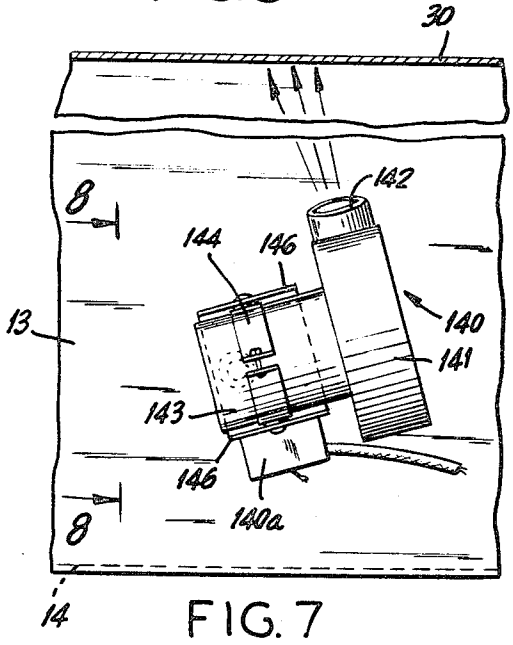


FIG. 7

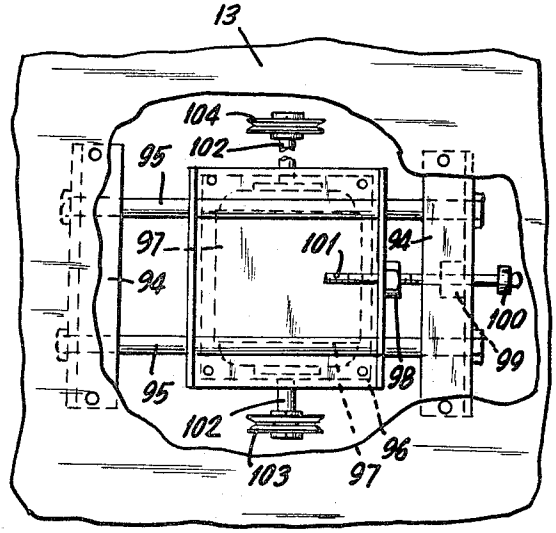


FIG. 9

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PAPER-HANDLING MACHINES

Filed Oct. 20, 1965 5 Sheets-Sheet 5

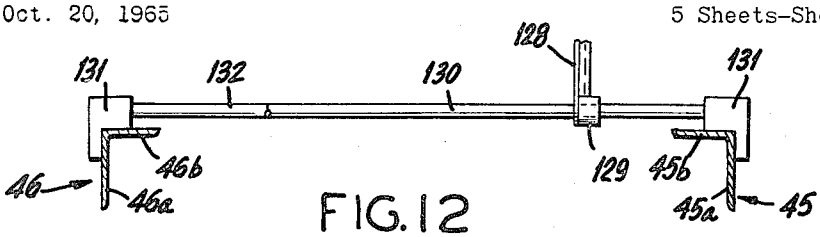


FIG. 12

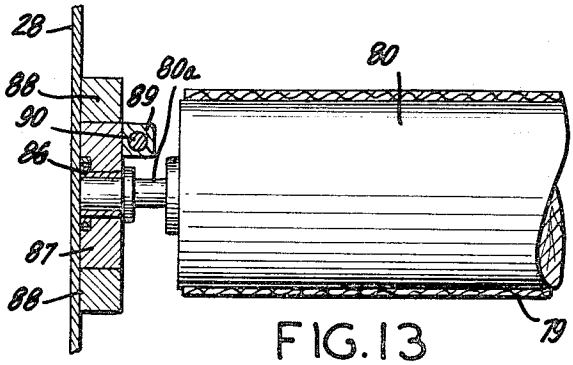


FIG. 13

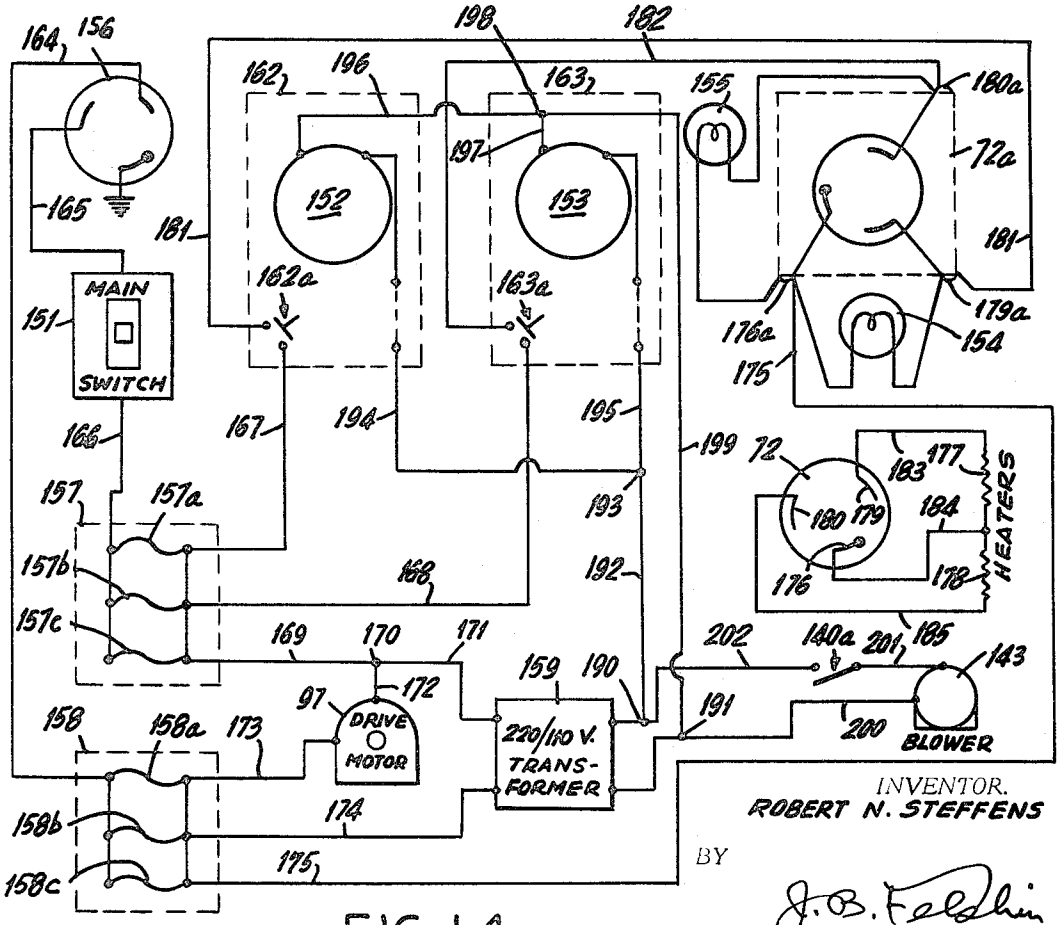


FIG. 14

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3,387,779

PAPER-HANDLING MACHINES

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Filed Oct. 20, 1965, Ser. No. 498,848
16 Claims. (Cl. 263—6)

This invention relates to paper handling machines. It is particularly directed to machines for use in the graphic arts field for drying ink impressions for making thermographed impressions, or for use with no heat at all and only for handling paper.

One object of this invention is to provide in a machine of the character described, means to move paper in one direction on a top belt during which time heat may be applied to dry ink impressions on the paper, and then to move the paper back in an opposite direction by a lower belt onto which the paper is deposited from the top belt, during which time the paper may be cooled, and to bring the paper back to near the place from where the paper moved out in the first direction, whereby the press operator has full control over the entire job and need not keep running to the delivery end of the first belt to empty a stock hopper at the far end of the belt. This feature of the invention also saves space over a construction in which the heating zone belts and cooling zone belts are in tandem.

Another object of this invention is to provide a machine of the character described which permits more time to cool the paper and in which an air blower for cooling allows a gentle air current in the cooling area without blowing the paper off the belt, and wherein the cooling is easily controllable.

Yet another object of this invention is to provide in a machine of the character described, means to transversely curve the paper as it is moved from the heating to the return belt, so that even light papers will be tossed straight out onto the return belt in relatively stiff condition so that the papers will not roll over. With such construction, even onion skin or air mail paper can be efficiently handled. The means to accomplish this stiffening of the paper is adjustable so that when heavy card stock is handled it will not be curved transversely (such card stock being stiff in itself).

A further object of this invention is to provide in a machine of the character described, a pair of infra-red heaters and highly improved electric control means to regulate the temperature produced by each heater.

Another object of this invention is to provide a strong, compact and durable machine of the character described which shall be relatively inexpensive to manufacture, which shall be easy to adjust, which shall be smooth in operation, and which shall yet be practical and efficient to a high degree in use.

Other objects of this invention will in part be obvious and in part hereinafter pointed out.

The invention accordingly consists in the features of construction, combinations of elements and arrangement of parts which will be exemplified in the construction hereinafter described, and of which the scope of invention will be indicated in the following claims.

In the accompanying drawings in which is shown an illustrative embodiment of the invention,

FIG. 1 is a side elevational view of a machine embodying the invention;

FIG. 2 is a top plan view thereof;

FIG. 3 is a cross-sectional view taken on line 3—3 of FIG. 1;

FIG. 4 is a partial, elevational view of the front end of the machine, seen from a side opposite to the side shown in FIG. 1;

FIG. 5 is a vertical front end view of the machine with some parts broken away;

FIG. 6 is an enlarged view taken on line 6—6 of FIG. 5;

FIG. 7 is an enlarged view taken on line 7—7 of FIG. 1;

FIG. 8 is a cross-sectional view taken on line 8—8 of FIG. 7;

FIG. 9 is a partial top view of the bottom frame of the machine with parts broken away to show the adjustable motor mount;

FIG. 10 is a cross-sectional view taken on line 10—10 of FIG. 2;

FIG. 11 is a partial side view of the rear end of the machine illustrating movement of a sheet of paper from the upper belt to the lower belt;

FIG. 12 is a cross-sectional view taken on line 12—12 of FIG. 2;

FIG. 13 is a cross-sectional view taken on line 13—13 of FIG. 10; and

FIG. 14 is a wiring diagram of the electrical controls for the machine.

Referring now in detail to the drawing, **10** designates a machine embodying the invention. The machine **10** comprises a body or frame **11**. Said frame **11** comprises a rectangular bottom pan member **12** having a top wall **13** provided with downwardly extending elongated side flanges **14**, **14***a*. Fixed to side flanges **14**, **14***a* as by bolt and nut assemblies **15** are similar, symmetrically disposed front and rear C-shaped frame members **16** and **17**, respectively.

Front frame member **16** comprises a side wall **18** having a rear edge **19**, a front wall **20** having a top edge **21**, and side wall **22** having a rear edge **23** aligned with rear edge **19**.

Rear frame member **17** comprises a side wall **24** having a front edge **25** in spaced relation to edge **19**, a rear wall **26** having a top edge **27**, and a side wall **28** having a front edge **29** in spaced relation to edge **23** and aligned with edge **25**.

A side panel **30** is mounted on side walls **22** and **28** partially closing the space between edges **23** and **29**. The rear end of panel **30** is offset as at **31** and is mounted to wall **28** by nut and bolt assemblies **32** or any other suitable means. The front end of panel **30** is mounted on wall **22** by means of a shaft **33**. Mounted on shaft **33** for rotation therewith between wall **22** and panel **30** are three pulleys **34**, **35**, **36**, the purpose of which will appear hereinafter. Mounted in each of the four corners of frame members **16** and **17** is a leg **37** having a caster **38***a* at the lower end thereof, to permit the machine to be rolled from one location to another. Means, not shown, may be provided to adjust the lenghs of legs **37**.

Pivotally mounted, as at **38**, on the lower front ends of side walls **18** and **22** are a pair of paper receiver supporting arms **39** each having an elongated slot **40** at its upper end. Pivotally mounted, as at **41**, on side walls **18** and **22** above and forwardly of pivotal mounts **38** is a paper receiver or hopper **42**. Mounted in receiver **42** are a pair of adjustable stop plates **43** to accommodate various widths of paper. Receiver **42** is provided with bolt and wing nut assemblies **44** cooperating with the slots **40** to hold receiver **42** in various adjusted angular positions about pivots **41**.

Mounted at the upper ends of side walls **18** and **24**, and **22** and **28**, respectively, are a pair of longitudinally extending main frame members **45** and **46**, respectively. Each member **45**, **46** comprises an angle iron comprising a downwardly extending flange **45***a*, **46***a* positioned outwardly of the side walls of the frame members **16** and **17**, and comprising an inwardly extending top flange **45***b*, **46***b*. Any suitable means, such as welding or nuts and bolts, are

provided to hold flanges 45*a*, 46*a* on and outwardly of the side walls of the frame members 16 and 17. The top flanges 45*b*, 46*b* are in facing relation and co-planar. The front and rear ends of main frame members 45 and 46 extend outwardly beyond front and rear walls 20 and 26 of the frame members 16 and 17.

Mounted at the upper surface of each flange 45*b* and 46*b* is the horizontal flange 47*b* and 48*b* of a pair of angle irons 47 and 48. Angle irons 47 and 48 are shorter and smaller than angle irons 45 and 46, and are positioned between the ends of the larger angle irons. Angle irons 47, 48 each comprise an upwardly extending flange 47*a*, 48*a* extending from the outer ends of flange 47*b*, 48*b*, respectively.

Mounted at the undersurface of flanges 45*b*, 46*b* are the longitudinal end edges of a supporting plate 49, the purpose of which will appear hereinafter. Mounted below plate 49 is a dust pan 50. Dust pan 50 comprises a pair of top flanges 51, a pair of side walls 52 extending downwardly from the inner ends of top flange 51, a bottom wall 53, and a front dust pan extension 54 extending out to substantially the front end of angle irons 45 and 46. The rear end of bottom wall 53 is curved upwardly as at 55. Nut and bolt assemblies 56 pass through and secure together all of flanges 48*b*, 46*b*, 51 and plate 49, on one side; and flanges 47*b*, 45*b*, 51 and plate 49 on the other side.

Mounted on flanges 47*a* and 48*a* adjacent the front ends thereof, are a pair of inverted L-shaped supporting members 57. Mounted on the top flanges of the supports 57 is an electrical control box 58. Mounted on flanges 47*a* and 48*a*, adjacent the rear ends thereof is a support 59. A support 60, similar to support 59 is also mounted on said flanges. Mounted on the tops of supports 59 and 60 is a utility tray 61. Supports 59 and 60 have the shape of an inverted U. Mounted on supports 57, in spaced relation to the tops thereof, is a cross bar 62. Mounted on support 59 is a cross bar 63 which is lower than bar 62. Slidably mounted on the cross bars 62 and 63 is a rectangular box 64 which houses a pair of infra-red electric heaters 177, 178, of well known construction. The heaters are arranged in tandem in box 64. Bar 62 is received in suitable openinngs formed in the forward ends of the side walls of the box, and bar 63 is received in suitable openings formed in a pair of mounting wings 65 extending rearwardly of the rear wall of box 64. Also adjustably mounted on bar 63 between wings 65 are a pair of arms 66, the function of which will appear below.

Mounted between supports 57, below box 64, is another cross bar 67. Mounted between the legs of support 59, above box 64, is another cross bar 68. Slidably mounted on cross bars 67 and 68 are a pair of paper hold down bars 69.

Mounted on top of box 64 is an electrical connection box 70, connected by cable 71 to a plug 72 which plugs into a socket 72*a* in the rear of control box 58 to supply current to the heaters, as will appear more clearly hereinafter.

Means are provided to carry papers and the like articles from the front end of the machine towards the rear end under the heater box 64. To this end there is provided an endless belt 73, made of woven wire, wire mesh or the like heat resistant material. Belt 73 is mounted on front and rear rollers 74 and 75, each mounted on a shaft 74*a*, 75*a* which shafts are suitably journalled on the flanges 45*a*, 46*a* of angle irons 45, 46. Shaft 74*a* is mounted in longitudinal slots 76 in said angle iron flanges, and means 77 is provided to move said shaft in said slots to adjust the tension of the belt 73. Shaft 75*a* has a sprocket 78 mounted thereon to one side of roller 75 and inside of angle iron 45. Supporting plate 49 is positioned under and supports the top run of belt 73. Dust pan 50 is positioned under the bottom run of said belt to catch dust, dirt, dried ink and the like which might fall off said belt.

Means are provided to carry articles from the rear of the machine to the front thereof, automatically, after such

articles have been carried from front to rear by belt 73. To this end an endless belt 79, of canvas or the like material, is mounted below belt 73 with its rear roller 80 positioned rearwardly of roller 75 to catch papers thrown off the rear end of belt 73. The front end of belt 79 is mounted on a front roller 81, mounted on a shaft 81*a* which is suitably journalled in side walls 18 and 22. A sprocket 82 is mounted on shaft 81*a* between the roller and wall 18. Also rotatably mounted on the inside surface of wall 18 are three idler sprockets 83, 84 and 85 for a purpose hereinafter appearing. In order to adjust the tension of belt 79, shaft 80*a*, on which rear roller 80 is mounted, is journalled, by bearing 86, in a pair of sliding blocks 87. Each of side walls 22 and 28 is provided with a pair of guide members 88 positioned on either side of each block 87 to guide the motion of said block. Each block 87 has an inwardly extending pin 89 having a threaded opening in which is received a threaded rod 90. The rear end of rod 90 comprises a shank 91 passing through an opening in rear wall 26 of frame member 17. Outwardly of rear wall 26 is a larger shank portion 92 formed with a handle 94. The diameter of shank 92 is greater than the opening in wall 26 so that tension in belt 79 holds the adjusting member in place yet allows rotation thereof to move blocks 87 and roller 80 to thereby adjust the tension in belt 79.

Means is provided to drive upper and lower belts 73 and 79 so that the top run of top belt 73 goes from front to rear and the top run of bottom belt 79 goes from rear to front, as indicated by the arrows in FIG. 1. Mounted on the undersurface of bottom wall 13 of bottom pan member 12, adjacent the forward end thereof, are a pair of short, transverse angle iron members 94. Interconnecting the downwardly extending flanges of said members 94 are a pair of cross rods 95. Slidably mounted on rods 95 is a motor plate 96 on which is mounted a main drive motor 97. Motor 97 is thus supported below wall 13 and depends down therefrom. Means to adjust the position of the motor are provided, and include a nut 98 fixed to sliding motor plate 96, a nut 99 fixed to one of the members 94, and a crank arm 100 having a threaded shank portion 101 passing through the nuts 98 and 99. The shaft 102 of motor 97 extends out to both sides thereof, and has a pulley 103 on one end and a pulley 104 on the other end. Mounted on the top surface of wall 13 at the forward end thereof, is a transmission box 105 having an input shaft 106 provided with a pulley 107, and an output shaft 108 provided with a sprocket 109, a belt 110, passing through a suitable opening 111 in wall 13, connects pulleys 103 and 107. As seen in FIG. 1, motor shaft 102 and output shaft 108 of transmission 105 both rotate in a clockwise direction. Sprockets 109, 82, and 78 and idlers 83, 84 and 85 are all substantially in the same vertical plane. A chain 112 interconnects these sprockets and idlers to drive the belts 73 and 79 in the directions indicated above. Starting from drive sprocket 109, the path of chain 112 is upwardly and rearwardly to the rear side of sprocket 82, over the top of sprocket 82 forwardly and upwardly to the underside of idler 83, around in front of and over the top of idler 83, rearwardly and upwardly to the top of idler 84, off the top of idler 84, rearwardly and upwardly to the top of sprocket 78, around behind and under sprocket 78 and frontwardly and downwardly to the top of idler 85, over the top of idler 85 and frontwardly and more steeply downwardly to the rear side of drive sprocket 109, around in front of drive sprocket 109 and back to the point of beginning.

Means are provided to deliver paper or articles off belt 73 onto belt 79, and off belt 79 into stock hopper 42 into a neat pile in an orderly fashion without allowing sheets, even thin sheets like onion skin or air mail paper, from turning over or diverting from the straight line feeding direction while being so transferred. To this end, thin, flexible strip 113 of brass or similar material is loosely mounted at one end on cross bar 63 and hangs rearwardly

and downwardly therefrom to reset on belt 79 and roller 80. Strip 113 thus acts as a stop as papers are transferred from upper belt 73 to lower belt 79, see FIG. 11. Similarly, a strip 114 is loosely mounted at one end on a cross bar 115 and hangs frontwardly and downwardly therefrom to lie between the stop plates 43 of paper hopper 42, see FIGS. 1 and 5.

Power feed or paper throw-out means are also provided with which the strips 113 and 115 cooperate at both points of transfer above described. Each arm 66 is provided with a roller 116, of rubber or other high friction material, at its lower free end. The upper ends of arms 66 are bifurcated into a pair of spaced lugs 117 each formed with an opening through which cross bar 63 may freely pass. Between lugs 117 is a collar 118 which may be fixed to cross bar 63 in any adjusted position by means of a set screw 123 to adjust the position of each arm 66 and its roller 116. Cooperating with each roller 116 is a roller 119 which may be made of wood or other low friction material, fixed to a shaft 120 journalled in the frame of the machine. Each roller 119 has an outer larger diameter portion 121 forming a step with roller 119. A drive pulley 122 is mounted on shaft 120 adjacent the end of the shaft at wall 28. Pulleys 120 include means such as set screws, not shown, to allow them to be fixed in various adjusted positions on shaft 120. The power feed means at the front of the machine are similar to those at the rear just described, and similar parts are designated by the same reference numeral followed by "*a*." Means are provided to drive shafts 120 and 120*a* and their step pulleys 119 and 119*a*. An endless belt 124, passing through a suitable opening 125 in wall 13, connects pulley 104 on motor shaft 102, and pulley 34 on shaft 33. A belt 126 interconnects pulley 35 on shaft 33 with pulley 122*a* on shaft 120*a*. Belt 126 is crossed to get the proper direction of rotation of pulley 119*a*. A belt 127 interconnects pulley 36 on shaft 33 with pulley 122 on shaft 120 to drive step roller 119. Belts 124, 126 and 127 may be made of round plastic or any other suitable material. These rollers accomplish the above orderly feeding by using the principle that if a sheet of paper, held horizontally, is slightly curved, it will stand straight out, whereas if held horizontally and not curved, the paper will bend downwardly. Therefore, by positioning each pair of step rollers 119 and 119*a* about four inches apart near the center of the sheet, with the cooperating rubber rollers 116 and 116*a* between them spaced about one-quarter inch inwardly from the steps 121, 121*a*, the paper, as it feeds through will be curved upwardly so as to feed straight, not turn over, and stack neatly in the hopper 42. If heavier paper, such as card stock, is used, which card stock is inherently stiff enough to not require any bending, then the rubber rollers 116, 116*a* may be adjusted to ride on larger diameter portions 121, 121*a* so that the card stock is fed but not curved.

A vertical, adjustable guide plate 128 is also provided to guide various widths of paper onto top belt 73 (FIG. 12). A ring member 129 is fixed to the lower front corner of plate 128. A rod 130 passes through ring 129 and a registering opening in the plate. Rod 130 is supported in a pair of similar, symmetrically disposed end blocks 131. A second rod 132, positioned horizontally in front of rod 130 also interconnects blocks 131. Each block 131 is notched out as at 133 to snugly fit the corners of angle members 45 and 46 to slide thereon. Thus, plate 128 is adjustable along members 45 and 46 by sliding of blocks 131, and angularly around rod 130 by set screw means, friction fit or the like, between ring 129 and rod 130.

A similar width adjusting, vertical guide plate 134 is provided at the rear end of the machine to guide papers or articles moving off belt 73 onto belt 79 (FIGS. 1 and 2). A rod 135 is fixed between members 45 and 46 at the rear ends thereof. A block 136 has a first opening receiving rod 135 and a set screw 137 to adjust the block on the rod; and a second opening at right angles to the first opening in a parallel plane receiving a rod 138 extending from plate 34. A set screw 139 controls the position of rod 138 in the second opening. Thus, the two right angle openings and set screws 137 and 139 permit universal adjustment of plate 134.

Means is provided to cool the heated and dried papers returning to the front of the machine on bottom belt 79. To this end a combined motor-blower unit 140 is provided and comprises a fan portion 141 having an outlet blower end 142 and a motor portion 143 having a separate on-off switch 140*a* (FIGS. 7 and 8). Motor portion 143 is adjustably mounted in a split ring type bracket 144 having a nut and bolt assembly 145 at the ends thereof for tightening the ring. Bracket 144 is pivotally mounted on the arms 146, 146 of a U-shaped bracket 147 by means of pivots 148. The outer portion of the cross arm 149 of bracket 147 is pivotally mounted on wall 13 adjacent the rear end thereof by means of a bolt, washer and nut assembly 150. Thus, universal adjustment of output blower end 142 is possible by means of assemblies 145 and 150 and pivots 148. The blower may be advantageously adjusted to blow air onto the papers on belt 79 by first bouncing the air off of side panel 30 to thereby prevent a direct flow of air onto the papers which might blow them off of the belt or onto each other, or otherwise upset neat stacking in hopper 42.

Mounted on control box 58 is a main switch 151, a pair of dials 152, 153 and front and rear lights 154, 155 on the top of the box. Referring to the electrical drawing of FIG. 14, the control box 58 also has a three prong locking-type plug 156, which connects to a mating plug leading from a power line, not shown. Within control box 58 are two fuse panels 157 and 158 each having three fuses designated by "*a*," "*b*" and "*c*" after the number, and a 220 to 110 volt A.C. transformer 159. The dials 152, 153 each control a variable electric input control 162, 163, respectively. Tuttle Electric Products, Inc. of Kirkland, Ill., is one manufacturer of such components. These components are known in the art as "clock switches." Each control 162, 163 has a normally opened switch or pair of contacts therein 162*a*, 163*a*, the closing of which is controlled by the setting on dials 152, 153. The dials are graduated to have an "off" position, and also a scale from zero to one hundred in increments of ten. These clock switches cause their associated contacts to be closed a percent of time per minute of operation equal to the number set on the dial. For example, if a dial is set for forty, the associated contacts will be closed for .40×60 or 24 seconds for each minute the control circuit is supplied with current.

The 220 volt A.C. line current is supplied to plug 156. A line 164 carries current from one prong to one side of fuse panel 158. A line 165 carries current from another prong to one side of main switch 161. The third prong of the plug is a ground line. Line 166 connects the other side of switch 151 to one side of fuse panel 157. A line 167 connects the other side of fuse 157*a* to one side of the normally open contacts 162*a* on clock switch 162. A line 168 connects the other side of fuse 157*b* to one side of the contacts 163*a* on clock switch 163. A line 169 connects the other side of fuse 157*c* to a juncture 170.

A line 171 connects juncture 170 to one terminal on the high (220) side coil of transformer 159.

A line 172 connects juncture 170 to one side of drive motor 97.

A line 173 connects the other side of fuse 158*a* to the other side of drive motor 97. A line 174 connects the other side of fuse 158*b* to the other terminal of the high side coil of transformer 159. A line 175 connects the other side of fuse 158*c* to the common terminal 176*a* on plug 72*a* on the control box. Plug 72 mates with plug 72*a* to carry power to the front and rear heaters 177, 178, respectively, in the box 64.

Plug 72*a* has two additional terminals 179*a* and 180*a*.

A line **181** connects terminal **179***a* to the other side of contacts **162***a*. A line **182** connects terminal **180***a* to the other side of contacts **163***a*.

Front heater **177** is connected to terminal **179** and common terminal **176** of plug **72** by a line **183** and common line **184**. Rear heater **178** is connected to terminal **180** and common terminal **176** of plug **172** by a line **185** and said common line **184**.

Front light **154** is connected in parallel with front heater **177** by being connected across terminals **176***a* and **179***a*, and rear light **155** is connected in parallel with rear heater **178** by being connected across terminals **176***a* and **180***a*; whereby said lights show the on or off condition of both heaters at any instant.

On the low (110 volt A.C.) side of transformer **159** the ends of the low side coil are respectively connected to a pair of junctures **190** and **191**. A line **192** extends from juncture **190** to a juncture **193**. A pair of lines **194**, **195** extend from juncture **193** to one side of the "clocks" within switches **162**, **163**, respectively, through an internal connection. The other side of each "clock" is connected by a pair of lines **196**, **197** to a juncture **198**. A line **199** connects junctures **198** and **191**. A line **200** connects juncture **191** to one side of blower motor portion **143**, and the other side of said blower is connected by a line **201** to one side of manual switch **140***a*. The other side of switch **140***a* is connected by a line **202** to juncture **190**.

It will thus be seen that there is provided an apparatus in which the several objects of this invention are achieved, and which is well adapted to meet the conditions of practical use.

As possible embodiments might be made of the above invention, and as various changes might be made in the embodiment above set forth, it is to be understood that all matter herein set forth or shown in the accompanying drawings, is to be interpreted as illustrative and not in a limiting sense.

I claim:

1. In combination, a support, means on said support to convey articles from one location in one direction to a second location, means on said support to convey articles received from said conveying means at said second location, in an opposite direction back to a place near said first location and means at said place to receive said articles from said second mentioned conveying means, means to transfer said articles from said first mentioned conveying means to said second mentioned conveying means at said second location, and means to transfer said articles from said second mentioned conveying means to said receiving means, said first mentioned conveying means being superimposed over said second mentioned conveying means in longitudinal alignment therewith, said first and second mentioned conveying means each comprising a single conveyor belt, drive means to move said belt of the first mentioned conveying means only in one direction and the belt of the second mentioned conveying means only in an opposite direction, the delivery end of the belt of said first mentioned conveying means terminating short of the receiving end of the belt of the second conveying means.

2. The combination of claim **1**, and means on said support and disposed above said first conveying means to apply heat downwardly to said articles on said first mentioned conveying means.

3. The combination of claim **2**, and means to apply a flow of air upwardly to said articles on said second mentioned conveying means.

4. The combination of claim **2**, said heating means comprising a pair of infra-red heaters mounted in tandem over said first mentioned conveying means to direct heat downwardly and clock controlled means to selectively vary the amount of heat applied by each of said infra-red heaters.

5. The combination of claim **1**, the delivery end of the belt of the second conveying means terminating short of the loading end of the belt of the first mentioned conveying means, and said receiving means being disposed below the loading end of said first-mentioned conveying means.

6. The combination of claim **1**, said first mentioned transfer means comprising a pair of opposed roller means, between which said articles from the first mentioned conveying means, pass, said second mentioned transfer means comprising a pair of opposed roller means between which articles from said second mentioned conveying means, pass, and means to drive at least one of each pair of opposed rollers.

7. The combination of claim **6**, each of said roller means comprising a pair of spaced rollers.

8. The combination of claim **7**, said rollers comprising means to engage only the side edges of flat flexible articles passing therebetween whereby to transversely flex said articles.

9. The combination of claim **1**, each of said transfer means comprising means to engage only the side edges of flat flexible articles passing therethrough to transversely flex said articles.

10. The combination of claim **1**, said first mentioned conveyor belt comprising a perforated belt, and said second mentioned conveyor belt comprising an imperforate belt.

11. The combination of claim **3**, said air flow applying means comprising blower means, means to moveably mount said blower means below said second mentioned conveying means, and means on said support, to deflect air flow from said blower means to said articles on said second mentioned conveying means.

12. The combination of claim **11**, said blower means comprising a motor-blower unit, said mounting means comprising means to mount said unit for universal adjustment thereof about three mutually perpendicular axes.

13. The combination of claim **7**, one roller of each pair of opposed rollers comprising a relatively high friction material, and the other of said pair of rollers comprising a relatively low friction material.

14. The combination of claim **8**, said means to transversely flex, comprising adjacent portions of greater and smaller diameters on one roller of each pair of opposed rollers and the other roller of said pair of opposed rollers being positioned to ride on said portion of smaller diameter.

15. The combination of claim **4**, said clock controlled means to selectively vary the amount of heat applied by each of said infra-red heaters comprising means to selectively allow current to flow to each of said heaters for adjusted variable portions only of each successive period of time.

16. The combination of claim **11**, said blower means comprising a motor-blower unit, said mounting means comprising means to mount said unit for movement of said unit vertically, horizontally and angularly to adjust the vertical, horizontal and angular directions of air flow.

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