

July 1, 1969

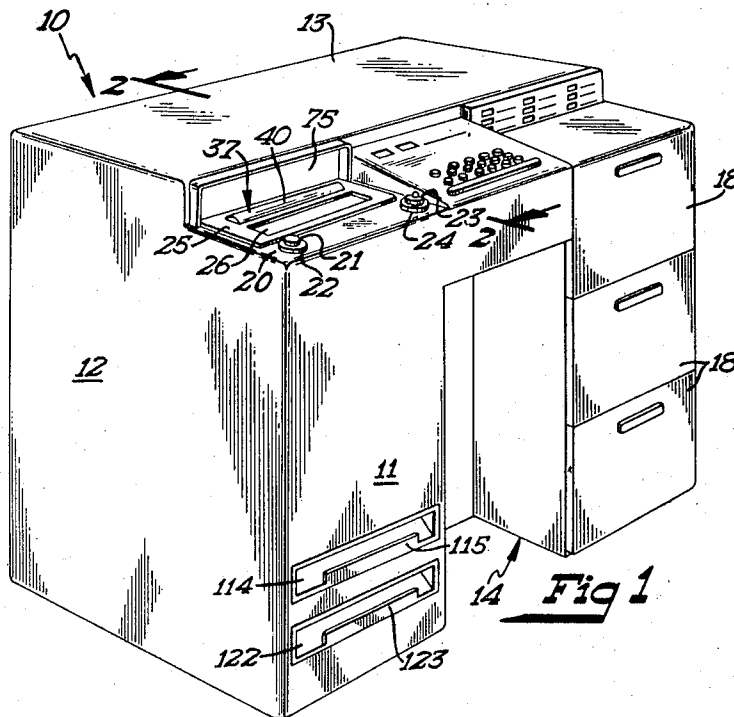
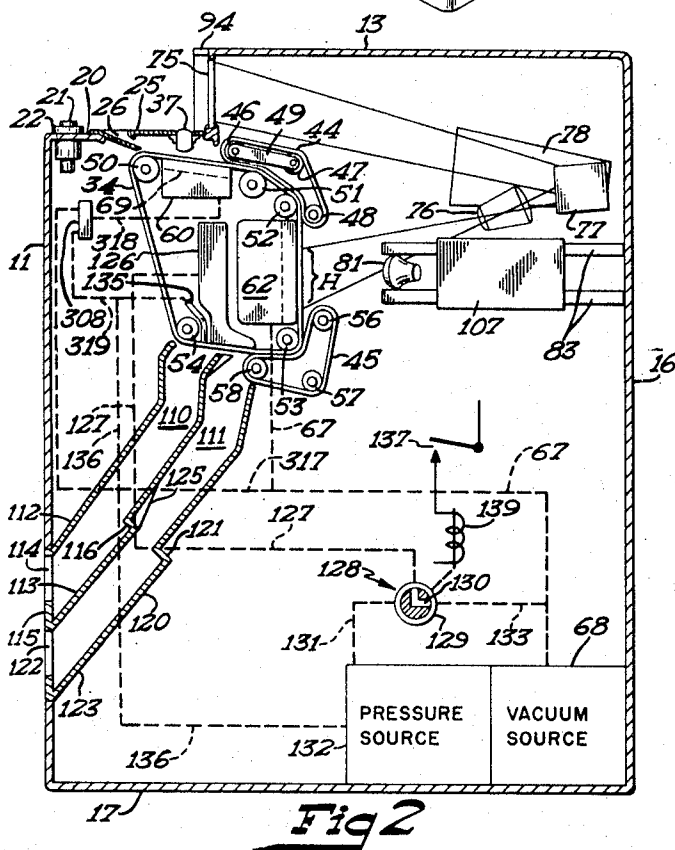
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3,452,981

FEEDING APPARATUS FOR SHEET MATERIAL

Original Filed May 28, 1965

Sheet 1 of 6



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FEEDING APPARATUS FOR SHEET MATERIAL

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Sheet 3 of 6

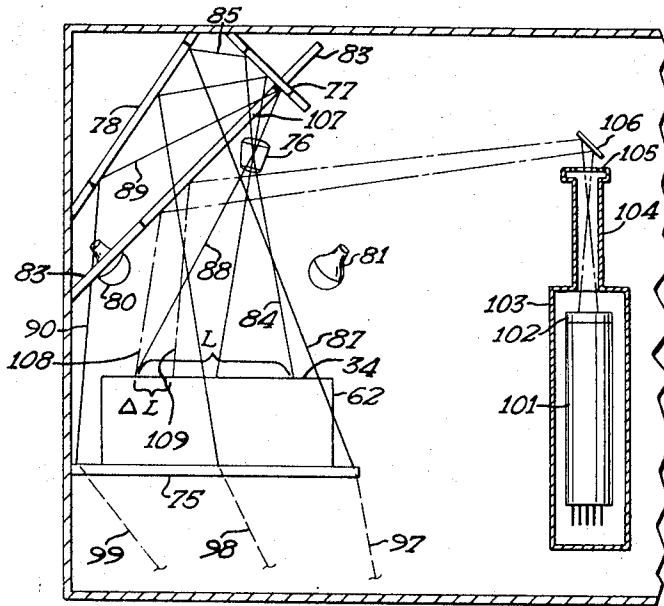


Fig 6

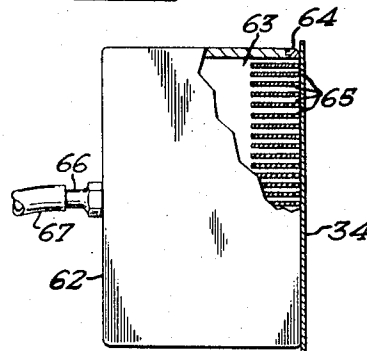


Fig 4

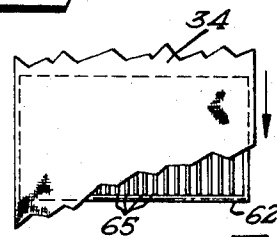


Fig 5

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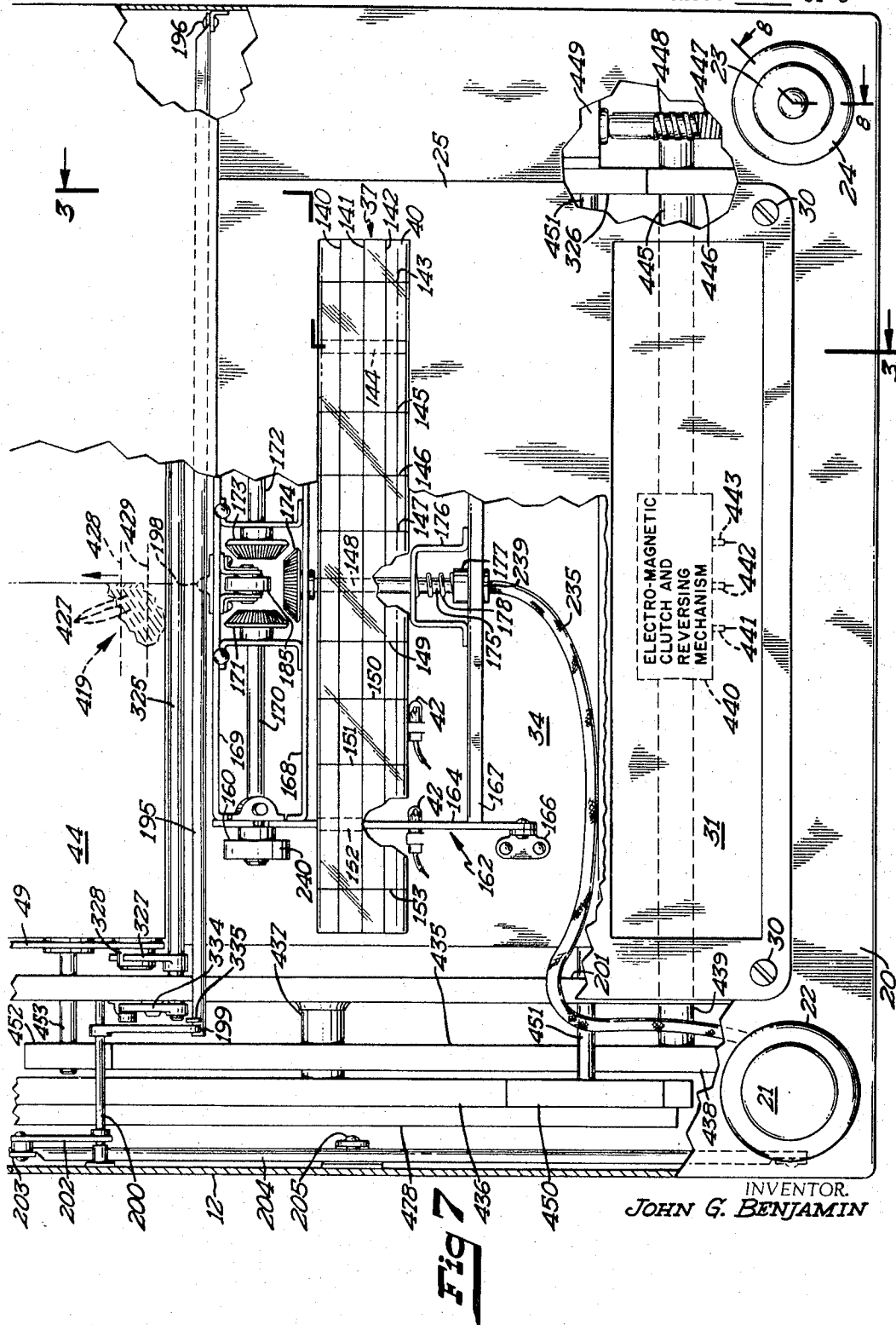
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Sheet 4 of 6



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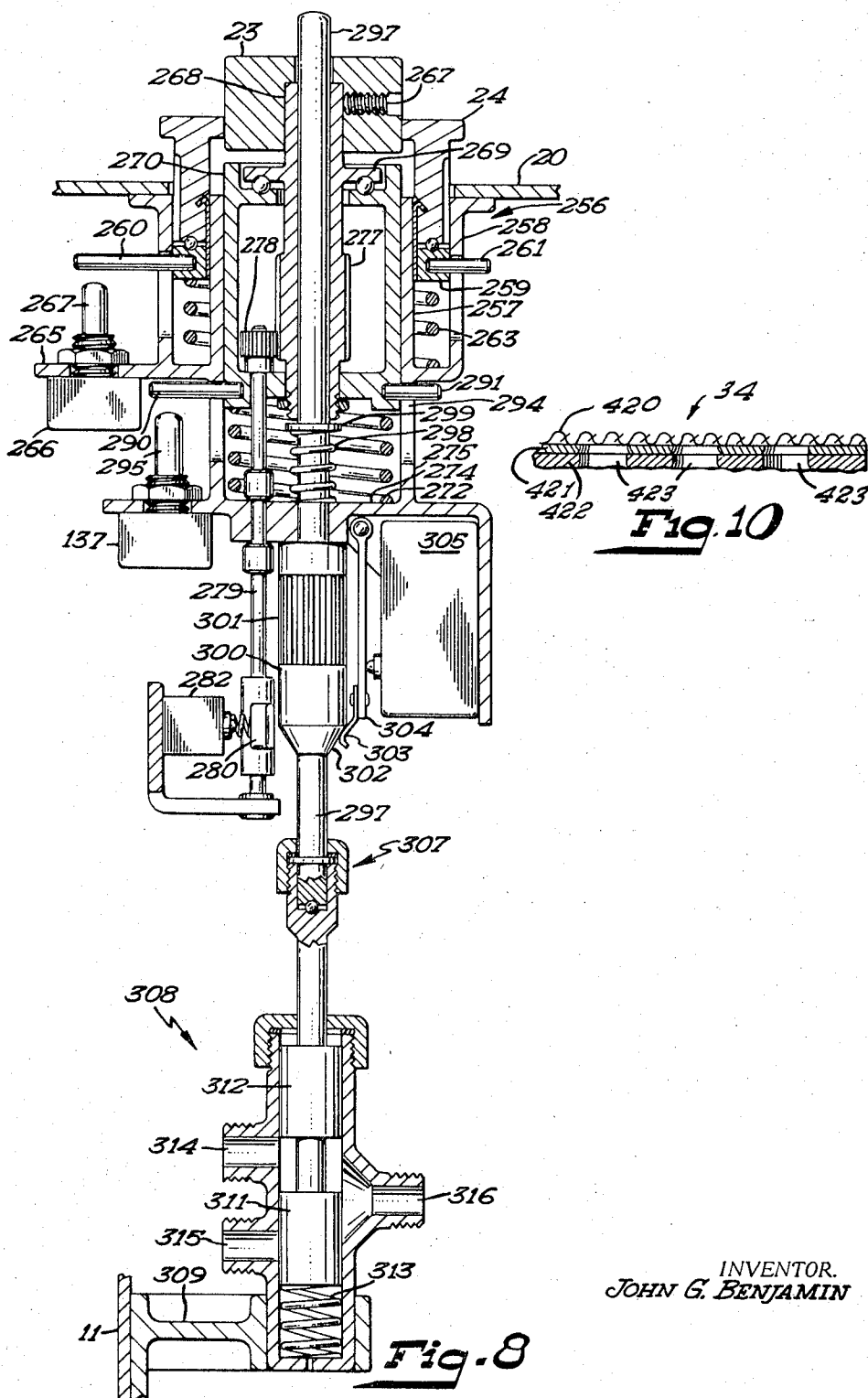
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Sheet 5 of 6



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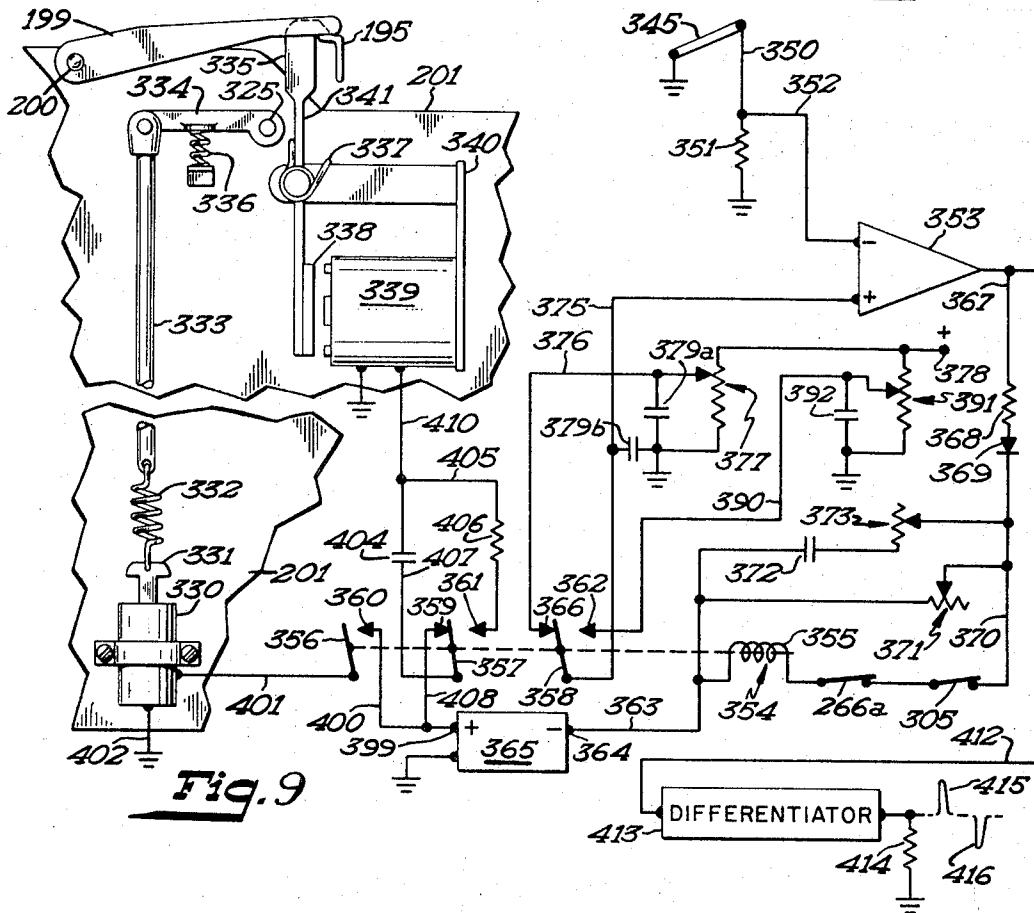
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Original Filed May 28, 1965

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3,452,981

FEEDING APPARATUS FOR SHEET MATERIAL

John G. Benjamin, Minneapolis, Minn., assignor to Minnesota Mining and Manufacturing Company, St. Paul, Minn., a corporation of Delaware
Original application May 28, 1965, Ser. No. 459,695, now Patent No. 3,358,554. Divided and this application Aug. 8, 1967, Ser. No. 672,663

Int. Cl. B65h 29/24; B65k 29/56

U.S. Cl. 271-64

5 Claims

ABSTRACT OF THE DISCLOSURE

An apparatus for selectively directing a sheet material into one of a plurality of output passages is shown. Means for abruptly switching the pressure at the leading edge of the sheet material to direct the sheet material to the desired output passage are included.

This application is a division of application Ser. No. 459,695, filed May 28, 1965, now U.S. Patent No. 3,358,554.

The present invention is concerned with feeding apparatus for sheet material and more particularly with apparatus for feeding sheet material having intelligence thereon upon which an operation is performed as the sheet material passes through the apparatus.

An object of the invention is to provide a sheet material feeding apparatus in which the sheet material leaving the apparatus normally enters one compartment but can be caused to enter another compartment.

A further object of the present invention is to provide an arrangement in which the retention of the sheet material against or its release from a main carrier belt is accomplished by the selective use of air under vacuum or under pressure.

Other objects of the invention will be apparent from a consideration of the accompanying specification, claims and drawing in which:

FIGURE 1 is a perspective view of my apparatus for feeding sheet material, showing the exterior of the cabinet in which said apparatus is housed;

FIGURE 2 is a sectional view, partly schematic, taken along the line 2-2 of FIGURE 1 and looking in the direction of the arrows adjacent that line;

FIGURE 3 is a sectional view of a portion of the apparatus taken along the line 3-3 of FIGURE 7, with certain portions omitted for purposes of clarity;

FIGURE 4 is a top plan view of a box over which a belt carrying the sheet material is passed and which applies a vacuum to the sheet material through the belt as the sheet material moves thereover;

FIGURE 5 is a front elevational view of the same box showing a portion of the belt passing thereover broken away to show the vane construction of the box;

FIGURE 6 is a sectional view, somewhat schematic, taken immediately beneath the top cover of the cabinet and looking downwardly at a portion of the apparatus;

FIGURE 7 is a top plan view of a portion of the apparatus with a portion of the cabinet broken away to see some of the elements within the cabinet;

FIGURE 8 is a sectional view of the right-hand knob assembly, the section of the upper portion being taken along the line 8-8 of FIGURE 7 along two sectional planes displaced 120 degrees and the section of the lower portion thereof being taken along a straight sectional plane which would be indicated by continuation of the lower portion of line 8-8 of FIGURE 7;

FIGURE 9 is a schematic view of the mechanism for shifting the belts and for retaining the tilting mechanism

in depressed position and the electrical apparatus and circuitry for controlling the same; and

FIGURE 10 is a sectional view of a portion of a belt 34 shown in FIGURE 2.

Referring first to FIGURE 1, I have shown my improved sheet material handling mechanism as part of a character reading apparatus for which the sheet material handling mechanism is particularly designed. The reference numeral 10 is employed to designate an overall cabinet having a front wall 11, a left side wall 12 and a top wall 13. Front wall 11 is provided with a recessed portion 14 which is designed to accommodate the legs and knees of an operator when he is seated in a chair in front of the apparatus. Cabinet 10 is also provided with a rear wall 16 and a bottom wall 17, both shown in FIGURE 2. On the right-hand side of the cabinet, the apparatus may have a plurality of drawers 18 for housing various portions of the equipment.

The top wall 13 is depressed at the front to provide a shelf portion 20. This shelf portion, as best shown in FIGURE 3, is provided on its left-hand side with a plurality of concentric knobs 21 and 22. These knobs are provided for the purpose of positioning and clamping the sheet material being fed through the mechanism. The shelf also has thereon knobs 23 and 24, which are used to control the feeding mechanism. A detailed description of knobs 21, 22, 23 and 24 and of the apparatus controlled thereby, including the braking and drive mechanisms, is set forth in my U.S. Patent No. 3,358,554.

As also best shown in FIGURE 3, a substantial portion of the shelf portion 20 is cut away to provide an opening over which is fastened a plate 25 having an opening 26 and a throat portion 27 communicating with the opening 26. The plate 25, as shown in FIGURE 3, is provided on its underside near its rear edge with hooks 28 (only one of which is shown) which extend under a flange portion of a supporting member at the rearward extremity of the ledge. The plate 25 is fastened to the ledge 20 at its forward side by a plurality of quick releasable fastening means 30 of any suitable type.

The throat or passageway 27 is formed by a tubular extension of the plate 25. This tubular extension may be separately formed and secured to the plate so that it constitutes a single unitary assembly. The tubular extension constituting the throat 27 has a lower wall 31 and an upper wall 32. The lower wall 31 is relatively short, terminating adjacent to a belt 34. The tubular extension bounded by the two walls 31 and 32 provides an initial guide for sheet material inserted in the opening 26. The extension is accordingly of a width exceeding the width of the material to be handled by the apparatus.

An elongated lens element 37 is supported by a pair of bracket members 38 and 39 secured to the underside of the plate 25 as shown in FIGURE 3. This lens element has an upper curved surface 40 which may be viewed by an operator and a lower curved surface 41 which faces the sheet material passing through the apparatus. It will be noted that the curved surface 41 passes close to but slightly spaced from any sheet material carried by the belt 34. The lens 37 is employed for a variety of functions including that of determining whether the row or rows of indicia on the paper are tilted or are correctly lined up. The lens element also aids in determining not only the size but also the disposition of the indicia on the paper, and the extent to which the paper or other sheet material is wrinkled. Lens element 37 and the apparatus related thereto are described in my U.S. Patent No. 3,358,554.

In order to illuminate the sheet material as it is passing beneath the lens 37, there are provided a plurality of light bulbs 42 which are shown in FIGURES 3 and 7. As best shown in FIGURE 3, these can be fastened in

clips formed from upturning a portion of the upper wall 32 of the tubular extension 27 of the upper plate 25. As best shown in FIGURE 7, there will be a plurality of these bulbs 42 spaced across the entire width of the sheet material so as to uniformly illuminate the same as the sheet material passes beneath the lens 37. It is, of course, understood that the bulbs 42 will be connected to any suitable source of electricity, being energized whenever the apparatus is to be placed into operation.

Referring to FIGURE 2, it will be noted that in addition to belt 34, there are two other belts 44 and 45. Belt 44 passes over three rollers 46, 47 and 48. Roller 48 is driven by means to be described later. The belt 34 is disposed over rollers 50, 51, 52, 53 and 54, all but 52 of which are driven rollers.

The third belt 45 is disposed over rollers 56, 57 and 58, roller 57 being a driven roller. Belts 34 and 44 are of special construction which will be described later. Roller 46 is journaled on an axle carried by a pair of crossbars 49 which are journaled about the shaft on which roller 47 is journaled. As can be determined from a comparison of FIGURE 2 and FIGURE 3, the bars 49 are tiltable about the shaft of rollers 47 so as to carry the roller 46 between an uppermost position shown in FIGURE 3 to the position shown in FIGURE 2 in which the belt 44 is in clamping engagement with the sheet material being supplied to the apparatus.

Referring back to the cabinet and particularly to FIGURES 1 and 2, it will be observed that any sheet material inserted in the opening 26 will be engaged between belts 34 and 44 when the bars 49 are tilted to the position shown in FIGURE 2 and that this material will be carried between the two belts.

While the material is passing underneath the lens 37 and before being engaged by the belt 44, the material passes over a vacuum box 60 having a plurality of vanes 69 therein, as will be described presently. The belt 34 is apertured and when suction is present in box 60 the suction effect is transmitted through belt 34 to the sheet material lying on belt 34 to hold the sheet material firmly in engagement with the belt. This arrangement is particularly important where automatic feeding equipment is employed for introducing the sheet material. After leaving the belt 44, the paper overlies a portion of the belt 34 which passes over a second vacuum chamber 62. As best shown in FIGURES 4 and 5, this box 62 is provided therein with a plurality of vanes 65, which extend substantially into the interior chamber 63 of box 62 and whose outer extremities lie in the same plane as the outer edge walls of the box. As shown at 64 in FIGURE 4 in connection with the upper wall of the box, the outer extremity of the walls may be some material of very low coefficient of friction, such as the fluorocarbon plastics commonly known as Teflon and Kel-F. It is to be understood that the other wall edges of chamber 62 in contact with belt 34 are similarly provided with outer extremities formed of such low friction material. Each of the vanes 65 similarly has a low friction material applied at its outer edge. As will be noted from FIGURE 5, the belt 34 passes over the vacuum chamber 63 moving parallel to the vanes 65.

The vacuum box 62 is connected through a fitting 66 and any suitable conduit 67 (shown schematically in FIGURE 2) to a source 68 of vacuum. Vacuum chamber 60 may also be connected, as will be described later, to the vacuum source 68. It is to be understood that vacuum chamber 60 is formed similarly to chamber 62, having the edges engaging the belt 34 being coated with a low friction material. Similarly, the chamber 60, as indicated by the dotted line 69, has a series of vanes therein (similar to vanes 65 of box 62).

As was previously noted and as will be described in more detail, the belt 34 is formed with a plurality of openings therethrough. The low pressure present in box 62 can thus be applied through the belt 34 to act on any

sheet material disposed thereon. The presence of the low pressure in box 62 not only allows the higher pressure exterior of the box to hold the sheet material in position on the belt 34 without any support but also enables the higher exterior pressure to hold the sheet material in a flat position relatively free of wrinkles.

While the sheet material being processed is disposed over the portion of belt 34 passing the face of the vacuum chamber 62 it is in the position in which it can be processed in the desired manner. The area being processed has a width L and a height H, as indicated by legends on FIGURES 2 and 3.

My invention is particularly applicable to an arrangement in which indicia on the sheet material are automatically recognized by a suitable character recognition system. The intelligence present on this sheet may be photographed or any of various other processes may be performed in connection with the sheet material while it overlies the vacuum chamber 62.

In order for the operator to properly monitor the passage of the sheet material and the operation of the equipment upon the material, I provide means for projecting onto a screen 75 the line and immediately adjacent lines of indicia on the printed sheet which is being operated on at any given moment. Referring to FIGURES 2 and 6, I have provided a lens 76 and a plurality of mirrors 77 and 78. The means for supporting the mirrors 77 and 78 are not shown in the drawing. It is to be understood that any suitable means can be employed for mounting these mirrors so that the reflecting surfaces are free and that no obstruction exists in the optical path. A pair of lamps 80 and 81 are shown, by way of example, as providing for the illumination of that portion of indicia passing over the open face of the vacuum chamber 62 which is to be projected onto the screen 75. These lamps 80 and 81 can be supported in any suitable manner. In FIGURE 6, I have shown somewhat schematically the relationship between the screen 75 and the flat wholly exposed face of the belt 34 over vacuum box 62 within which region the information on the sheet material is viewed. Referring to the various optical ray lines shown therein, it will be noted that light from the right-hand side of the material being observed passes, as shown by ray line 84 through the lens 76 striking the mirror 77 closely adjacent the left-hand side of the reflecting surface. As shown by ray line 85, the same ray is reflected onto the right-hand portion of the reflecting surface of mirror 78 and is reflected from there, as shown by ray line 87, onto the right-hand side of the viewing surface 75. Similarly, as indicated by the ray lines 88, 89 and 90, the image rays from the left-hand side of the portion being viewed as it passes over chamber 62, are transmitted through lens 76 engaging the reflective surface 77 adjacent its right-hand edge, are reflected off of the left-hand edge of mirror 78 and are projected onto the viewing screen 75 to form an image at its left-hand side. It will furthermore be noted, from a comparison of the relative size of the original image region being viewed as it passes over the vacuum chamber 62 and of the image formed between rays 87 and 90 on screen 75, that the original material is enlarged as it appears on the screen 75. This enables the operator to read the indicia appearing thereon even though they are relatively small. Further detailed description of the projection system is provided in my U.S. Patent No. 3,358,554.

It will be readily observed that the provision of the viewing screen 75 enables the operator to readily observe in enlarged fashion the portion of the material passing over the vacuum chamber 62 which is being scanned, photographed or otherwise handled. In case of any malfunction, the operator is able to observe the general area at which the malfunction occurs and to take manual corrective action if necessary.

As mentioned above, one of the applications of my sheet material handling mechanism and the one for which

it is particularly designed is that of character recognition. While the particular scanning mechanism forms no part of the invention of the present application and various scanning means may be employed, I have schematically shown in FIGURE 6 an arrangement for scanning the indicia on the sheet material as it rides on belt 34 over the face of the vacuum chamber. The numeral 101 is employed to identify a conventional vidicon camera. Of course, it will be understood that other image pick-up devices such as the image orthicon, image dissector, iconoscope, photocell strip or matrix might also be used in various circumstances in place of the vidicon. A vidicon camera, such as shown for purposes of illustration, has a photosensitive target plate 102 upon which is produced a charge image that is scanned by an electron beam from a gun within the vidicon. The vidicon 101 is housed within a light-tight housing 103 having a lens barrel 104 with a front lens element 105. In converting an image to an electrical signal sequence by scanning, a vidicon camera tube gives better net resolution results if the area of the sheet material imaged on target plate 102 for subsequent scanning is relatively small. It is accordingly contemplated that at least one relatively small portion, ΔL of each line of indicia to be scanned will be imaged at any one time across 102 and either the ΔL image on 102 will be shifted along the line as the scanning operation progresses or the entire line length L will be presented in ΔL segments with ends overlapping as two or more ΔL images "stacked" one above the other on the vidicon target 102. In order to accomplish this, I provide an optical arrangement schematically shown at 106. This arrangement, while shown as a single mirror, would actually be a composite lens, mirror and/or prism arrangement probably employing at least two movable or adjustable mirrors. This mirror arrangement 106 cooperates with a further mirror 107 which is supported within the cabinet by any suitable supporting means as designed by the numeral 83. As indicated in FIGURE 6, the ΔL portion being made available on plate 102 for scanning at any one time corresponds to the portion between image edge rays 108 and 109. These rays are reflected off of mirror 107, thence off from mirror 106, thence passing through lens 105 to form an image on the photosensitive target plate 102. It will be obvious that if the mirror 106 is rotated about an axis at right angles to the plane of the paper, the portion of the line between image edge rays 108 and 109 will gradually move along the line. Thus any ΔL portion of the entire line length L can be imaged on 102 for scanning. Also with additional mirrors and/or prisms at 106 and possibly at 107, additional ΔL portions of L can be simultaneously imaged on target plate 102.

Referring back to the movement of the sheet material through the apparatus and back to FIGURE 2, the sheet material will, as pointed out above, be pressure held to the belt 34 as it passes downwardly through viewing and scanning region H in front of the vacuum chamber 62, due to the vacuum in the chamber. As the sheet material passes below the chamber, it is engaged between a sheet material feeding means, for example belts 45 and 34, and the sheet material being fed is once again held between two belts. Upon leaving belt 45, the sheet material is caused to pass into either one of two hoppers or a pair of aligned outlet passages 110 and 111. The hopper or one of the two outlet passages 110 has an upper wall portion 112 which at its uppermost portion is bent slightly to the right to help deflect any sheets moving along the belt into the hopper 110. Below the uppermost deflector portion, the upper wall 112 drops almost vertically downwardly to enable the sheet to drop relatively freely after leaving the belt 34. Thereafter, the upper wall 112 slants on a diagonal, terminating at a slot 114 partially closed by a stop plate 115. The lower wall 113 of the hopper 110 extends generally parallel to the upper wall 112. At its upper end, like wall 112, it is provided with a sloping deflecting portion to facilitate the removal of sheets from the belt 34. Since this lower wall 113 consti-

tutes the upper wall of the other hopper 111, the primary function of this deflecting portion is to deflect material into hopper 111 when this action is called for, as will be presently explained. The lower wall 113 is abruptly bent at 116 to cause the lower portion of the wall 113 to be offset downwardly with respect to the remaining portion. The purpose of this is to permit the sheets of material entering the hopper or outlet passage 110 to pile up and yet not interfere with the passage of additional sheets. The depth of the offset 116 determines the thickness of the pile of material that can be allowed to accumulate in hopper or outlet passage 110 before the pile has to be withdrawn through slot 114.

The hopper or the other of the two outlet passages 111 is very similar to hopper or outlet passage 110 having a lower wall 120, the lowermost portion of which is offset at 121 with respect to the upper portion to allow sheet material to accumulate therein and not to impede the passage of further sheets onto the pile. The hopper or outlet passage 111 terminates at its lower end in an opening 122 which is partially closed by a stop plate 123. As explained previously, the extreme upper end of the wall 113 common to the hoppers or pair of outlet passages 110 and 111 is bent to the right somewhat so that while papers are to be discharged into the hopper 111, the upper end of wall 113 tends to separate the material from the belt 34. It will be further noted that the wall 113, common to the two hoppers or passages 110 and 111, is provided with a diagonal deflecting plate 125 on the underside of the offset portion 116 so that any sheet material descending through the hopper or outlet passage 111 will not be stopped by the offset portion 113 but will move freely downwardly into the position where it is resting against the stop plate 123 adjacent the opening 122.

I employ means for determining whether the material being fed enters hopper or outlet passage 110 or 111. For this purpose, I provide a means for normally causing the sheet material to remain in engagement with the belt, such as a pressure box 126 which may be either maintained at a positive pressure or at a negative pressure with respect to ambient pressure. The edges of this box in contact with belt 34 may also have low friction material thereon, similar to edge 64 of box 62. Connected to this box is a means for controlling operation of a sheet material engagement means, which in this embodiment includes a suitable conduit 127 which leads to the outlet passage of a three-way valve 128. This valve may be of any of various types of threeway valves but is shown schematically as having a valve spool 129 with an L-shaped passage 130. The valve 128 is connected to two inlet conduits 131 leading to a positive pressure source 132 and conduit 133 leading to the negative pressure source 68 previously referred to. A solenoid actuator 139 is employed to rotate the valve spool 129. In the position shown, which is the normal position, the spool 129 is in a position in which the box 126 is connected through conduit 127, the L-shaped passage 130 and conduit 133 to the negative pressure source 68 so that a negative pressure is maintained in the box 126. The box 126 is provided with vanes or other means providing apertures in its lower face, as with box 62, so that the low pressure present in box 126 is applied through belt 34 (which, as previously explained, is perforated) to the bottom surface of any sheet material on belt 34 to cause the ambient pressure on the sheet material top surface to hold it in engagement with the belt 34 as the sheet material passes the upper end of the hopper wall member 113 dividing hoppers 110 and 111. Under these conditions, the material enters the hopper 110 which is the "good" paper hopper. In order to facilitate the separation of the paper or the sheet material from the belt 34, I have provided means for selectively forcing the sheet material away from the belt, which in this embodiment includes an elongated tube 135, the end of which constitutes a nozzle. This tube 135 is connected through a conduit 136 to the pressure

source 132. The effect of tube 135 is to cause any paper passing the divider 113 between hoppers 110 and 111 to be deflected away from the belt 34 to enter the hopper 110.

Where it is desirable to reject certain sheets, means are provided for insuring that these sheets go down the reject hopper 111 so that the sheets which have been properly processed are in one hopper while those which have not been processed are in a different hopper.

Where the apparatus is used merely to feed one sheet through at a time, the solenoid 139 can be controlled directly through a manual switch, which is part of the knob 23 assembly. This switch is shown schematically in series with the winding of the solenoid 139 and designated by the reference numeral 137. The switch 137 may have a further automatically controlled switch in parallel therewith. As will be described later, I provide automatic means for sensing when a paper or sheet approaches the roller 46, this means being effective to lower roller 46 into the position shown in FIGURE 2. The same means may be employed for producing a signal indicative of the position on the belt of the sheet at that time. When it is determined automatically, such as by the scanning apparatus being unable to scan the material, this parallel switch will be closed momentarily. Regardless of whether the solenoid valve is manually or automatically controlled, the actuation of the valve 128 will be done in accordance with belt position and time so that the pressure will be applied to chamber 126 to eject the sheet into the reject hopper 111 at exactly the time that the leading edge of the sheet to be rejected is passing roller 58. Furthermore, the apparatus can automatically sense the trailing edge of the sheet and determine when the pressure should be removed from chamber 126 and the vacuum re-applied.

The construction of knobs 23 and 24 is best shown in FIGURE 8. As shown in that figure, the knobs 23 and 24 are mounted concentrically on the shelf 20. The various elements of the knob assembly are supported by a cylindrical bracket member 256. This bracket member is secured to the underside of panel 20 and has two concentric annular walls, namely an inner cylindrical wall 257 and an outer cylindrical wall 258 spaced to provide an annular passage therebetween. The ring 24 constituting the outer knob slidably extends into this annular passage and engages a bearing ring 259, suitable bearings being disposed therebetween. Extending from the bearing ring 259 are three pins 260, 261 and a pin not shown in the drawing. As previously mentioned, the upper portion of FIGURE 8 is sectioned so that there are two sectional planes 120° spaced apart; thus it would appear that pins 260 and 261 are diametrically opposed. Actually these pins are spaced 120° apart. Interposed between the bearing ring 259 and the lower wall of the annular chamber bounded by walls 257 and 258 is a spring 263. The supporting bracket 256 is provided with a side extension 265 which supports a switch 266 having an operating plunger 267 lying in the path of pin 260. The switch 266 is of the type in which the switch is moved to successively different positions upon successive actuation of the plunger 267. The switch 266 may include a single pole, single throw switch and also a single pole, double throw switch. When the plunger is actuated once, it is moved to one of its two circuit controlling positions; the next time the plunger is actuated, the switch moves to its other circuit controlling position, etc. It will be obvious that whenever ring 24 is depressed, the pin 260 engages the plunger 267 to change the position of the switch element of switch 266. The switch 266 is employed as the main switch for starting and stopping of the apparatus including the application of driving power to the various gear driven rollers for moving and guiding belts 34, 44 and 45.

The knob 23 is shown as a hollow knob and is secured as by a set screw 267 to a sleeve 268 having a flange 269 supported by ball bearings on a further flanged sleeve 270. This further sleeve 270 is located within the cyl-

indrical chamber within the inner wall 257 of bracket 256 and is supported vertically by a spring 272 interposed between the lower end of the sleeve 270 and the bottom wall 274 of the cylindrical chamber formed by a cylindrical extension 275 of the inner wall 257 of bracket 256.

The sleeve 270 is provided with a plurality of projecting pins 290, 291 and a third pin not shown in FIGURE 8. These pins project through slots 294 in the cylindrical extension 275 of the inner wall 257 of bracket 256. It will be obvious that the pins 290 and 291 prevent rotation of sleeve 270. When sleeve 270 is depressed, by reason of the depression of knob 23, pin 290 is adapted to engage plunger 295 of the switch 137, previously referred to. The switch 137 is of the type which is momentarily engaged when the plunger 295 is depressed. The switch 137 is employed to control the pressure supplied to the pressure chamber 126, as was previously described.

Extending through the knob 23 and the sleeve 268 is a cylindrical push rod 297 which is spring biased to the position shown in FIGURE 8 by a spring 298 located between the bottom wall 274 and a flange 299 carried by the push rod 297. The push rod 297 carries an elongated collar 300 having elongated teeth 301 and a conical lower extremity surface 302. The teeth 301 are provided for a driving connection with apparatus not forming part of the present invention. The conical lower end 302 is adapted to engage with a leaf spring 303 secured to an actuating arm 304 of a switch 305. Since the section of the lower portion beginning with bottom wall 274 in FIGURE 8 is along a single plane, rather than two planes 120° apart as is the upper section, switch 305 is opposite to shaft 279. Switch 305 is of the precision snap type. When rod 297 is depressed downwardly, snap switch 305 is moved by surface 302 acting through spring 303 and arm 304 to a position in which the contacts thereof are maintained separated as long as rod 297 is depressed.

The electrical circuit connections for sensing when a sheet approaches roller 46 and for controlling the energization of magnets 330 and 339 will now be described. Referring first to FIGURE 3, it will be noted that I have provided a light source 349 mounted in a reflector 342. It will be understood that the light source 349 is relatively long and extends substantially the full width of the sheet material. The same is true of the reflector 342. In the outer portion of the reflector 342 is a cylindrical lens 344. As has been mentioned previously and as will be described in more detail later, the belt 34 is provided with a plurality of apertures therethrough or, in some embodiments, belt 34 may be fabricated of materials which make it translucent, as will be presently described. Thus some of the light passing from bulb 349 and through lens 344 onto the under surface of the belt 34 is able to pass therethrough. Mounted between the two yoke members 327 and extending substantially the full width of the belt 34 is a light sensitive photosensitive element 345. A typical cell that is suitable is a selenium voltaic cell of the B-17 type made by the International Rectifier Corporation. It will be noted from FIGURE 3 that even though shaft 325 lies between the light source 349 and the light sensitive cell 345, the light sensitive cell is subjected to illumination for the full width thereof. This is also true despite the presence of the right-hand wall of chamber 60 adjacent a portion of the lens 344. It will be seen that the effect of the light 349 and the lens 344 is to illuminate a narrow strip on the underside of belt 34 with sufficient intensity so that the amount of light emerging from the top surface of belt 34 above this strip is sufficient to reliably actuate photosensitive element 345. This illuminated strip extends substantially the full width of belt 34 and at least between that width represented by the distance between transverse lines 152 and 144 of lens 37 in FIGURE 7 and the width of the strip extends substantially between points 347 and 348 on FIGURE 3. The light coming through belt 34 at point 347, as can be seen from the depicted light

path, it able to illuminate the extreme left-hand edge of the light sensitive element 345. Similarly, despite the presence of shaft 325 the light at point 348 is able to illuminate the right-hand edge of the light sensitive element 345. Thus, despite the presence of shaft 325, the light sensitive element 345 is adequately illuminated for the control purposes to be described momentarily. It will also be noted that when the roller 46 is lowered, the roller will intercept that part of this light coming from the strip region adjacent to point 347 so as to diminish the illumination of the cell. I have provided means for compensating for this which will be described in connection with FIGURE 19.

Referring to FIGURE 9, it will be noted that one terminal of cell 345 is grounded and the opposite terminal thereof is connected through a conductor 350 with the upper terminal of a resistor 351, the lower terminal of which is grounded. Thus the photovoltaic voltage output of cell 345 applied across resistor 351. This voltage is applied through conductor 352 to one of the two input terminals of a differential operational amplifier 353. The amplifier is of the type which has two input voltages applied thereto and produces an output voltage which is dependent in the polarity of its output upon which of the two inputs is greater. The amplifier is of a type with a very high gain and the output of which changes from its negative saturation voltage to its positive saturation voltage, depending upon whether the input voltage from the cell 345 is above or below the reference voltage applied to the other input terminal. A voltage is applied to the other input terminal and this voltage is controlled by a relay 354, the energization of which is controlled by amplifier 353. Relay 354 comprises a relay coil 355, a plurality of movable contact members 356, 357, and 358, and a plurality of fixed contact members 359, 360, 362, and 366. The movable contacts are biased to a position in which the contact member 357 is in engagement with fixed contact member 359 and movable contact member 358 is in engagement with fixed contact member 366. The movable contact members are movable upon energization of winding 355 to a position in which the movable contact members 356, 357 and 358 are in contact making engagement with fixed contacts 360, 361 and 362, respectively. The left-hand terminal of relay coil 355 is connected through a conductor 363 to the negative terminal 364 of a power supply 365. The negative terminal 364 is at a negative potential corresponding to the negative saturation output potential of amplifier 353. The output of amplifier 353 is connected through a conductor 367, a resistor 368, a diode 369, a conductor 370, the switch 305 referred to in connection with FIGURE 8 and switch 266a, one of the two switches of main switch 266, to the right-hand terminal of relay coil 355. It will be obvious that when the output of amplifier 353 is at its negative saturation value, which is the condition existing when the photosensitive cell 345 is fully illuminated, the right-hand end of the relay coil will be maintained at the same potential as the left-hand end which is connected to the negative terminal 364 of power supply 365, and the relay will be deenergized. When, however, the illumination of photocell 345 is substantially diminished by the passage of sheet material as it is positioned or carried on belt 34 between cell 345 and the light rays coming through belt 34 from light 349 so that the voltage output from the cells load resistor 351 applied to the upper, inverting input terminal of amplifier 353 decreases to say, a few millivolts (the amount being dependent upon the particular type of amplifier 353 used) less than the reference comparison voltage supplied to the non-inverting input terminal of amplifier 353 plus the particular differential offset voltage of the particular amplifier 353 used, the amplifier output voltage will be switched rapidly to its positive saturation value and a positive voltage will immediately be applied across relay coil 355 with respect to terminal 364 of power supply 365, through conductor 367, resistor 368, diode

369, conductor 370, and closed switches 266a and 305. Connected in parallel with series connected relay coil 355 and switches 266a and 305 is a variable resistor 371 for adjustment of the delay in de-energization of the relay 354. Also connected in parallel with series connected relay 354 and switches 266a and 305 is the series combination of a capacitor 372 and a variable resistor 373 for adjusting the delay in energization of relay 354. The resistor 373 also acts to prevent the capacitor 372 from initially shunting the relay winding 355 by completely bypassing the high frequency voltage change which occurs when the output of the amplifier changes from near its negative saturation voltage condition to near its positive saturation voltage condition. Instead, when this amplifier output change does occur, the speed with which relay coil 355 becomes effectively energized can be varied slightly, depending on the resistance value set in variable resistor 373 and the capacitive value of capacitor 372. Thus, if the resistance of variable resistor 371 is about one to two times the resistance of coil 355 and variable resistor 373 is about one-fifth or less of the resistance of the variable resistor 371, it will be evident that the resistance of resistor 368 can be chosen so as to limit the maximum voltage between wire 370 and wire 363 (during the first moments after amplifier 353 switches to near positive saturation) to a magnitude which is less than the voltage required to supply minimum energizing current to coil 355 or relay 354, and that the amount of time amplifier 353 must be near positive saturation output voltage before relay 354 is actuated is adjustable by the setting of variable resistor 373. It may be seen that undue chattering of relay 354 is also prevented by capacitor 372 and resistor 373 during times when the voltage across load resistor 351 may fluctuate above and below the comparison voltage when the amplifier is first switched by comparison voltage relationships. Maintenance of amplifier 353 at near positive saturation output voltage will result in the exponential charging of capacitor 372 until it assumes a voltage thereacross substantially equivalent to that existing across relay coil 355.

When the movable relay contact 358 is in the position shown in FIGURE 9, that is the position assumed when relay 354 is de-energized, the non-inverting input terminal of amplifier 353 is connected through a conductor 375, movable contact 358, stationary contact 366, and conductor 376 to the slider of a potentiometer 377 connected between a positive source of voltage 378 and ground. Connected between the slider of potentiometer 377 and ground is a capacitor 379a which assumes a reference comparison voltage thereacross dependent upon the position of the slider.

When relay 354 is energized, the non-inverting input terminal of amplifier 353 is connected through conductor 375, movable contact 358, fixed contact 362 and conductor 390 to the slider of a potentiometer 391 connected between the positive source of voltage 378 and ground. A capacitor 392 is connected between the slider of potentiometer 391 and ground. A capacitor 379b, connected between conductor 375 and ground, prevents the input terminal from assuming noncontrolled, spurious potential levels while movable contact 358 is transferring from a connection with contact 366 to a connection with contact 362 or vice versa.

Consequently, a lower level of illumination of cell 345 is required (when relay 354 is closed) to cause the voltage developed across resistor 351 to exceed the comparison voltage applied to the non-inverting differential input plus the particular offset voltage involved and thus to cause amplifier 353 to switch toward negative saturation so that relay 354 can de-energize.

It will be noted from a comparison of potentiometers 377 and 391 that the slider of potentiometer 377 is shown as set at a more positive reference comparison voltage than that of potentiometer 391. Thus, when relay 354 is de-energized, the lower, non-inverting input terminal of

amplifier 353 is maintained at a more positive potential than when it is energized. The feature of changing the comparison voltage applied to the non-inverting terminal of amplifier 353 is provided to compensate for the reduction in maximum light level reaching the light sensitive cell 345 when the roller 46 is holding belt 44 against belt 34, as mentioned above.

The relay 354 is employed to control the energization of both the solenoid 330 and the electromagnet 339. When relay 354 is energized, the engagement of the movable contact 356 with fixed contact 360 results in a circuit being established to solenoid 330 as follows: from the positive terminal 399 of the power supply 365, through conductor 400, fixed contact 360, movable contact 356, conductor 401, relay coil 330 and conductor 402 to ground. The energization of this solenoid, as previously explained, will cause arm 334 to be rotated in a counter-clockwise direction (as viewed in FIGURE 9). This, in turn, will cause a clockwise rotation of shaft 325 as viewed in FIGURE 3 to cause the roller 46 to be moved downwardly against belt 34. It is to be understood that the spring 332 may be adjustable in any suitable manner to provide a desired amount of pressure of belt 44 against belt 34.

During the time that relay 354 is energized, the electromagnet 339 is maintained de-energized. A capacitor 404 in series with the winding of electromagnet 339 is maintained de-energized by a circuit extending from the upper terminal of capacitor 404 through conductor 405, a current limiting resistor 406, fixed relay contact 361, movable contact 357 and conductor 407 connecting to the lower terminal of capacitor 404. When, however, relay 354 becomes de-energized so that movable contact 357 engages fixed contact 358, an energizing circuit is established for electromagnet 339 from the positive terminal 399 through conductor 408, fixed contact 359, movable contact 357, conductor 407, capacitor 404 and conductor 410, and electromagnet 339 to ground. Since capacitor 404 is completely discharged because of the connection previously traced in contact 361 of the relay, a large initial flow of current can take place through this capacitor and through the coil of electromagnet 339. This will result in the armature 338 being attracted to release the latch 335 from the bar 195. This will permit the bar to move upwardly under the influence of spring 341 and permit the release of rollers 160, 161 and 185 from the sheet material. The capacitor 404 is provided to prevent continued energization of the electromagnet 339 since only a momentary energization is necessary to release the latch 335. As soon as the condenser 404 begins to charge, the current through the winding of electromagnet 339 will decrease until the point is reached where it is effectively de-energized. This is particularly important when the apparatus is initially started up since the relay 354 will be in its de-energized position and it is not desired to maintain the electromagnet 339 energized so as to prevent the latch 335 from being effective. By the use of the capacitor 404, the start-up energization of the electromagnet 339 is only momentary.

In actual practice, the arrangement employing the light 349, the light sensitive cell 345, the amplifier 353 and the relay 354 is used to respond to the insertion of a paper or other sheet material into the slot 26. As long as the paper merely lies beneath the lens 37 and the rollers 160 and 161, the light sensitive cell remains illuminated and the relay 354 remains de-energized. When, however, the leading edge of the sheet reaches a point immediately underlying the roller 46, it interrupts the passage of light through lamp 349 to the light sensitive cell 345 with the result that the decreased current output of the light sensitive cell causes the voltage across resistor 351 to drop below the comparison input voltage to amplifier 353 to cause the operation of relay 354 if the main switch 266 is in its "on" position in which its switch 266a is closed. When the trailing edge of the sheet leaves the area just to

the right of point 348 and the light sensitive cell 345, the passage of light coming through belt 34 from lamp 349 to cell 345 is again no longer interrupted by the sheet material. This causes amplifier 353 to switch back to negative saturation, thus de-energizing the coupling relay coil 355 and its associated time delay components by back-biasing diode 369 so that the de-energization delay time cycle can begin for relay 354. As pointed out above, the output of cell 345 is less when roller 46 is holding belt 44 against belt 34 as in FIGURE 2 than it is when roller 46 is holding belt 44 away from belt 34 as in FIGURE 3, due to the fact that belt 44 on roller 46 is partially blocking the passage of the light rays coming through belt 34 from light 349 to the cell 345. This, however, is compensated for by the means previously described as involving resistors 377 and 391, which provide that the comparison voltage applied to the non-inverting input terminal of amplifier 353 when relay 354 is energized is less than that applied for comparison when relay 354 is de-energized. Thus compensation for the reduction in maximum intensity of illumination of the light sensitive cell 345 is automatic.

In addition to its use in combination with variable resistor 373 to cause a slight delay in the actuation of relay 354 as discussed previously, the capacitor 372 has the additional function of supplying current to delay the de-energization of relay 354. This is desirable since when the trailing edge of the sheet leaves the area between points 347 and 348, it still has a substantial distance to travel before passing over the roller 51. Consequently, it is desirable for the roller 46 to remain depressed for a short period of time after the trailing edge leaves the area between the light source 341 and the photocell 345 during which time the motion of belt 34 can carry the trailing edge of the sheet material to about the region above roller 51 as viewed in FIGURE 1. As previously pointed out, the capacitor 372 becomes charged to the voltage existing across relay coil 355. Capacitor 372 has a sufficiently high capacitance so that, following the de-energization of relay 354 by reason of the output terminal voltage of amplifier 353 becoming the same as that at terminal 364 of the power supply, the relay 355 will remain energized due to the flow of some of the discharge current from capacitor 372 through resistance 373 and relay coil 355. Another portion of this discharge current flows through variable resistor 371, thus bypassing the relay coil 355. So it is obvious that the discharge time of capacitor 372 and consequently the de-energization delay time afforded relay 354 can be increased or decreased by respectively increasing or decreasing the resistance value of variable resistor 371. This provides time for the sheet material to progress onwardly until substantially the entire sheet has passed over the roller 51.

The output from amplifier 353 can also be used to provide various signals indicative of the position of the sheet in the machine. It will be noted that the output of amplifier 353 is connected through conductor 412 to the input of a differentiator 413 having an output resistor 414 connected across the output thereof. As previously explained, during switching the output of amplifier 353 changes abruptly from a negative voltage equivalent to that of terminal 364 of power supply 365 to a suitably higher, more positive voltage and vice versa. Of course, differentiation of the output wave form of amplifier 353 produces a positive voltage pulse each time the output of the amplifier is abruptly increased and a negative voltage pulse each time the output is abruptly decreased. The numerals 415 and 416 are used to denote positive and negative pulses respectively, these pulses being indicative of the passage of the leading and trailing edges of the sheet material beneath the light sensitive cell 345. It is obvious that these pulses may be used for controlling various operations in connection with the sheet handling apparatus, particularly when processing such as scanning is to take place whenever sheet material is present or not

present in the H region on belt 34, as shown in FIGURE 2, between roller 48 and roller 56.

It will be noted that switch 305 referred to in connection with FIGURE 8 is in series with the relay coil 354. If the roller 46 is depressed so that the belt 44 is in engagement with belt 34, as shown in FIGURE 3, the opening of switch 305 by reason of the pushing down of push rod 297 will de-energize relay coil 354 to cause momentary energization of the electromagnet 339 to release the catch 335 and the tilt wheel carriage 162. It will also cause de-energization of solenoid 330 to release arm 334 to permit the rollers to move up to the position shown in FIGURE 3. The movement of rod 297 downwardly also removes the vacuum from chamber 60 and either applies pressure thereto or connects the same with the atmosphere. Thus, the actuation of push rod 297 removes from beneath the sheet material any suction applied through box 60, releases the tilt wheels 160 and 161, and releases the roller 46 so that the sheet material can either be adjusted manually or readily withdrawn from the apparatus.

In the foregoing explanation, reference has been made, at several places, to belt 34 as having apertures therethrough. In FIGURE 10, I have shown in section one possible form this belt may take. It will be noted that the belt has three layers, 420, 421 and 422. The base layer 422, which is the one which engages the various rollers, such as rollers 50 and 51, may be of a suitable homogeneous material having reasonably high tensile strength. One material which is suitable for base layer use is an oriented polyester film such as that commercially sold as "Scotchpar" made by Minnesota Mining and Manufacturing Company or "Mylar" made by E. I. du Pont de Nemours and Company. A metal, like stainless steel, can be employed as base layer 422 where one is to be particularly concerned with rigidity and toughness and/or the problem of eliminating static effects. Generally, the oriented polyester films are less subject to fatigue, however, than is stainless steel. The layer 422 is preferably about 10 to 25 mils thick and is provided on its underside with knurling or embossing in order to provide both a better friction grip with the soft surfaces of the rollers over which the belt rides, as well as to provide the minimum surface, smoothly curved "knurled peaks" to obtain a minimum friction effect where belt 34 passes over low friction material surfaces of pressure boxes 60, 62, and 126. The layer 421 may be of an epoxy type compound which has been pigmented with titanium dioxide, for example, for whiteness and with silver particles to give it some conductivity to reduce static effects. The outer layer 420 is held to layer 422 by layer 421. Layer 420 is formed of a cloth which may be of a white polyester fiber such as Dacron blended with cotton. In one particular example, I found the combination of 65 percent Dacron and 35 percent cotton as satisfactory. The fabric should have enough thread fuzziness to eliminate the glossy glare from individual fibers and to hide both the warp and woof threads as well as to minimize the visibility of the holes 423. The fabric should be treated with conductive material or antistatic material like certain fatty quaternary amine compounds so as to decrease effects producible by static electricity. The layers 421 and 422 are provided with a plurality of apertures 423 therethrough. It is through these apertures that the negative and/or positive pressures in chambers 60, 62, and 126 and the positive pressure from the nozzle in the end of tube 135 may be applied to the underside of the paper or the sheet material overlying the belt 34. Furthermore, it is due to the presence of these apertures 423 that it is possible to pass the light from lamp 348 to the light sensitive cell 345. While the apertures do not extend through the outer fabric layer 420, both a portion of the light and the desired pressure effects are able to pass through the porous layer 420.

A dewrinkling action which takes place in my paper feeding apparatus is described in my U.S. Patent No. 3,358,554.

The operation has been described somewhat in detail in connection with the various components of the apparatus. The overall operation will now be briefly reviewed.

Let it be assumed first that individual sheets of material are being inserted into the machine. The sheet is inserted through the slot 26 into the throat portion 27, shown in FIGURE 3. The main power switch has been actuated to turn on the various lights, the main drive motor 49, and the power supplies for the various amplifiers and control equipment. This main power switch has also placed into operation the positive pressure source and negative pressure source.

The sheet material will be inserted until it passes beneath the lens 37 as best shown in FIGURE 3.

With the sheet material clamped between belts 34 and 44, the sheet material is carried forwardly over the edge of the right-hand wall of chamber 60 under the roller 46, over the roller 51, over roller 52, (FIGURE 2) and under the roller 48.

After passing under roller 48, the sheet material being processed passes in front of box 62 where it is held onto the belt by reason of the air pressure differential acting through the openings through belt 34 and the open space between the vanes 65 and the front portion of the box 62. In this region, between rollers 48 and 56, the paper or other sheet material is held firmly and relatively flat. While the sheet material is passing in front of the box 62, it is operated on in any desired manner. For example, if the machine is a photographic device, it might be photographed at this time. In the particular embodiment shown, and for which the apparatus is particularly designed, there is intelligence on the sheet material which is scanned and fed to a logic mechanism to automatically detect and correct for the position of the intelligence and then read the intelligence. Referring to FIGURE 6, the vidicon camera tube 101, through the movement or fixed position of mirror 106, progressively scans varying or fixed portions of length ΔL of each line of intelligence within region L shown in FIGURE 6, the scanning action taking place by reason of electron beam deflecting means within the camera vidicon structure.

After leaving region H, the sheet material passes between belts 45 and 34 and then it is normally held in engagement with belt 34 by negative pressure in box 126 so that no sheet of input material leaves the carrier belt 34 until the sheet reaches the opening of the hopper 110. At this position, it is subjected to pressure through a tube 135 which blows the sheet away from the belt 34 so that it drops down into the hopper 110 where it stacks up in the lower portion 113 until removed.

The operator may observe that the sheet is defective in some way. Or in the case where the material handling apparatus is part of a character recognition system and there is realization that the intelligence on the sheet cannot be read, a signal to that effect will be received from the character recognition portion of the apparatus. When the operator recognizes that the sheet material requires rejection to hopper 111, he would depress knob 23 and thus actuate switch 137 (shown in FIGURES 2 and 8) via pin 290 and plunger 295. Where rejection is signaled automatically, the switch 137 of FIGURE 2 is closed at the proper time. Switch 137 actuates valve 128 to apply positive pressure instead of negative pressure to the chamber 126. Under these circumstances, as the sheet material is carried by belt 34 past roller 58, the pressure in chamber 126 keeps the sheet material blown away from the belt 34 causing the sheet to enter the hopper 111.

Whenever the sheet material has progressed to a point in its travel where the trailing edge of it has passed from the area between light 348 and light sensitive cell 345, the differential amplifier 353 is effective to respond to the increased intensity of illumination of light sensitive cell 345 to cause de-energization of relay 354. As previously pointed out, despite the fact that the lowering of roller 46 reduces the amount of light passing from light 341 to light sensitive cell 345, this is compensated for by changing the

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comparison voltage input to the differential amplifier 353. This voltage, to which the voltage from light sensitive cell 345 is compared, is changed, when the relay 354 was first pulled in, by switching this amplifier 353 comparison voltage input from a slider on potentiometer 377 to a slider on potentiometer 391.

In the foregoing explanation, it has been assumed that one sheet at a time is fed into the machine and that this sheet is allowed to move through the machine before another sheet is inserted. As has been pointed out above, the apparatus is designed to be operated so that the sheet material can be automatically fed. While I have shown no specific automatic feeding mechanism in the present application, one such mechanism can be coupled into my apparatus by removing plate 25 together with the rectangular frame 162, the rollers 160 and 161 carried thereby and by disconnecting the cable 235 from the shaft 175. When this is done, the automatic feeding mechanism may be fastened into place in the space previously occupied by this mechanism and by the space immediately behind the front panel of the apparatus. A second suitable automatic feeding mechanism can be mounted on cabinet surfaces 20 and 11 between knobs 20 and 24 so as to feed sheets directly and automatically into slot 27. Still another suitable automatic feeding mechanism, which involves a vacuum transfer drum positioned in tangential contact with belt 34 approximately one-third of the distance between roller 54 and roller 50 in FIGURE 2, can be mounted so as to project through a removable plate opening, not shown, in panel 11.

It will be seen from the foregoing that I have provided a novel feeding apparatus for sheet material in which provision is made for selectively directing the sheet material into either of various hoppers.

It will further be observed that I have provided a feeding apparatus for sheet material which is particularly adaptable for use in connection with a character recognition system.

I claim:

1. Apparatus for feeding sheet material having visible intelligence thereon, comprising:

a housing,
a passageway in said housing for passage of said sheet material,
a sheet material feeding means in said housing comprising a driven belt adapted to engage the sheet material during a portion of its travel through the apparatus after insertion into said passageway,
negative pressure means for normally causing said sheet material to remain in engagement with said belt,
a pair of aligned outlet passages positioned relative to said belt and in said chamber,
actuating means coupled to said negative pressure sheet material engagement means for controlling operation thereof to abruptly apply a positive pressure upon said sheet material to direct the leading edge of said sheet material away from said belt when the leading edge of the sheet material is adjacent one of the pair of outlet passages and it is desired to have said sheet material enter said one outlet passage,
and means positioned relative to the other of said pair of outlet passages for selectively abruptly applying a positive pressure upon said sheet material forcing the leading edge of said sheet material away from said belt when the leading edge of the sheet material is adjacent the other of said pair of outlet passages when it is desired to have said sheet material enter said other outlet passage.

2. The apparatus of claim 1 further comprising means operatively coupled to said actuating means and said selectively forcing means for controlling operation thereof depending on which of said pair of outlet passages the sheet material is to enter.

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3. The apparatus of claim 2 further comprising automatic means operatively coupled to said controlling means for sensing the leading edge of the sheet material when the sheet material is to be directed into said one outlet passage and for causing said controlling means to control said actuating means to direct said sheet away from said belt when said leading edge is adjacent said one outlet passage, said automatic sensing means being responsive to the trailing edge of the sheet material entering said one outlet passage to cause said controlling means to control said actuating means to enable said sheet material engagement means to maintain a subsequent sheet material in engagement with said belt.

4. Apparatus for feeding sheet material having visible intelligence thereon, comprising:

a housing,
a passageway in said housing for passage of said sheet material,
a sheet material feeding means in said housing comprising a driven belt adapted to engage the sheet material during a portion of its travel through the apparatus after insertion into said passageway,
a plurality of aligned outlet passages positioned relative to said belt and in said housing,
a pressure chamber immediately adjacent said belt opposite the surface thereof engaging said sheet material and extending over an area adjacent a first of said outlet passages,
said belt being sufficiently foraminous that the effect of the pressure in said chamber is transmitted through said belt wherein a negative pressure is capable of holding the sheet material against said belt and a positive pressure is capable of directing the leading edge of said sheet material away from said belt,
actuating means for selectively causing at least one of a negative pressure and a positive pressure to be maintained in said pressure chamber depending upon whether it is desired that the sheet material enter the first of said plurality of outlet passages,
and means positioned relative to one of the other of said plurality of outlet passages for selectively abruptly applying a positive pressure upon said sheet material forcing the leading edge of said sheet material away from the belt when the leading edge of the sheet material is adjacent said one of the other of said plurality of outlet passages when it is desired that the sheet material enter said one of the other of said plurality of outlet passages.

5. The apparatus of claim 4 wherein said selectively forcing means is a further positive pressure chamber adjacent said belt and adjacent a second of said outlet passages so that when the sheet material is maintained in engagement with said belt while passing the first of said outlet passages, it is forced away from said belt by said further positive pressure chamber after it enters the region of the second of said outlet passages.

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U.S. Cl. X.R.

271—74

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,452,981 Dated July 1, 1969

Inventor(s) J. G. Benjamin

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 4, line 12, "3" should read -- 6 --.

Column 5, line 37, "designed" should read -- designated --

Column 6, lines 17 and 38, "mith", each occurrence, should read -- with --.

Column 7, line 56, "suports" should read -- supports--.

Column 9, line 1, "it" should read -- is --; line 13, "19" should read -- 9 --; line 19, after "345" insert -- is --; line 21, "The" should read -- This --; and line 60, "deenergized" should read -- de-energized --.

Column 10, line 34, "flucturate" should read -- fluctuate --.

Column 12, line 45, "poriton" should read -- portion --.

Column 14, line 4, "is" should read -- it --; and line 67, "he" should read -- the --.

Column 15, line 18, "mecahnism" should read -- mechanism --; and line 43, "pasageway" should read -- passageway --; and "pasage" should read -- passage --; line 48, "passpageway" should read -- passageway --; line 50, "reamin" should read -- remain --; line 54, "operationn" should read -- operation --; line 59, "pasages" should read -- passages --.

SIGNED AND
SEALED
MAR 24 1970

(SEAL)

Attest:

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