July 8, 1958 F. J. FURMAN ET AL 2,842,250

RECORD FEEDING MEANS

Original Filed Dec. 31, 1954 8 Sheets-Sheet 1

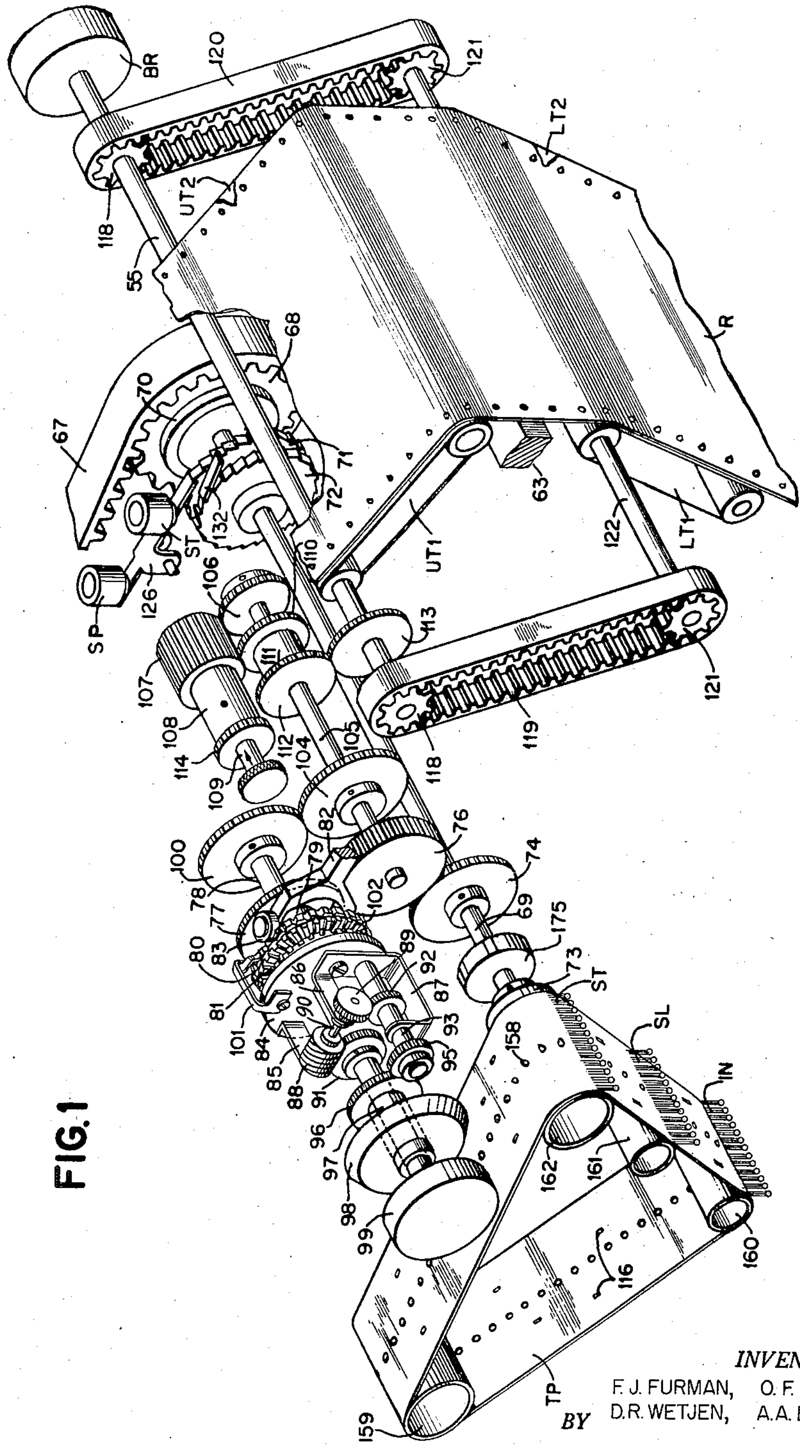

FIG. 1

INVENTORS
F. J. FURMAN, O. F. MONEAGLE
BY D. R. WETJEN, A. A. DOWD

J W Armbruster
ATTORNEY

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RECORD FEEDING MEANS

Original Filed Dec. 31, 1954 8 Sheets-Sheet 2

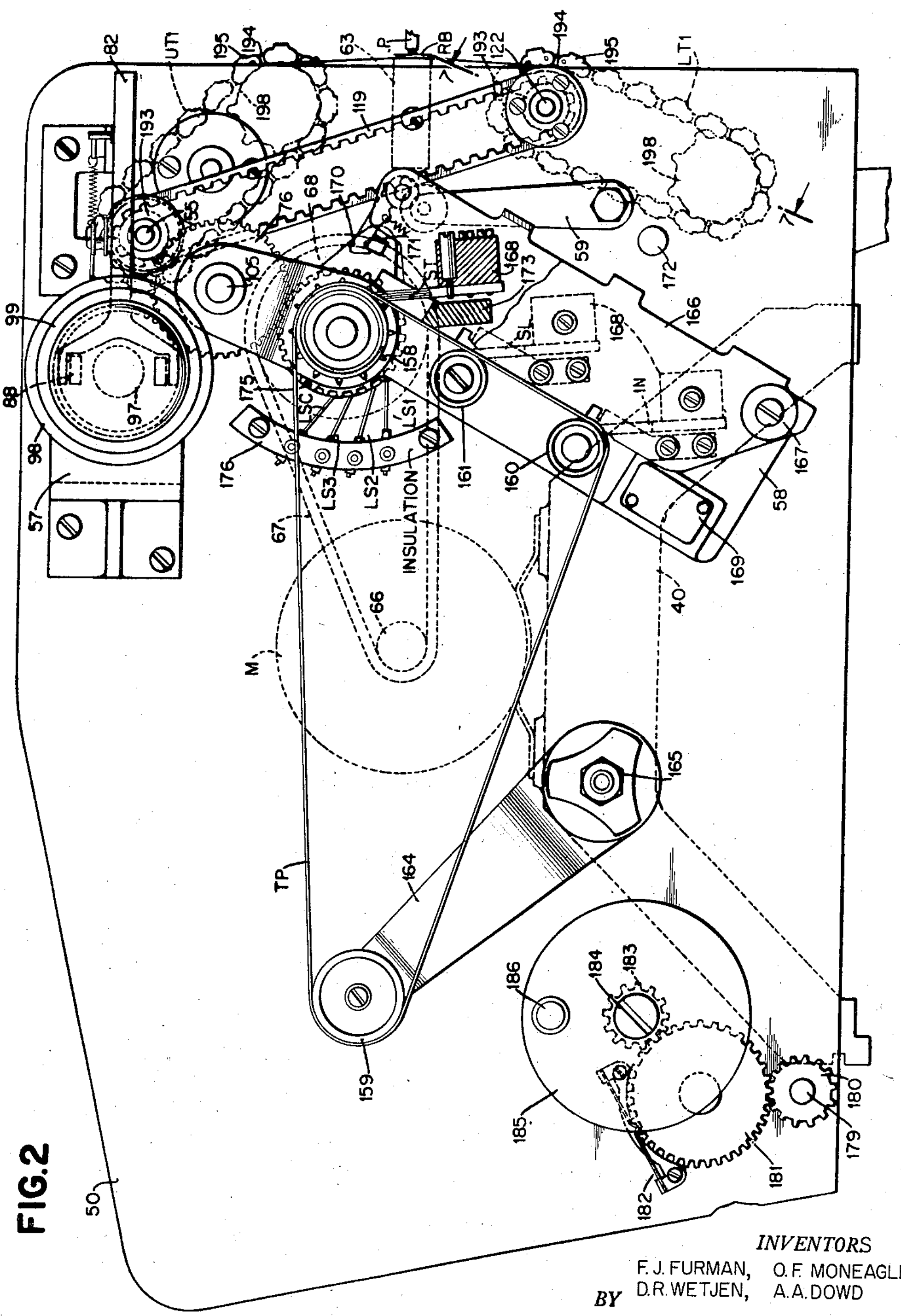


FIG.2

INVENTORS
F. J. FURMAN, O. F. MONEAGLE
BY D. R. WETJEN, A. A. DOWD

J W Armbruster
ATTORNEY

FIG. 3

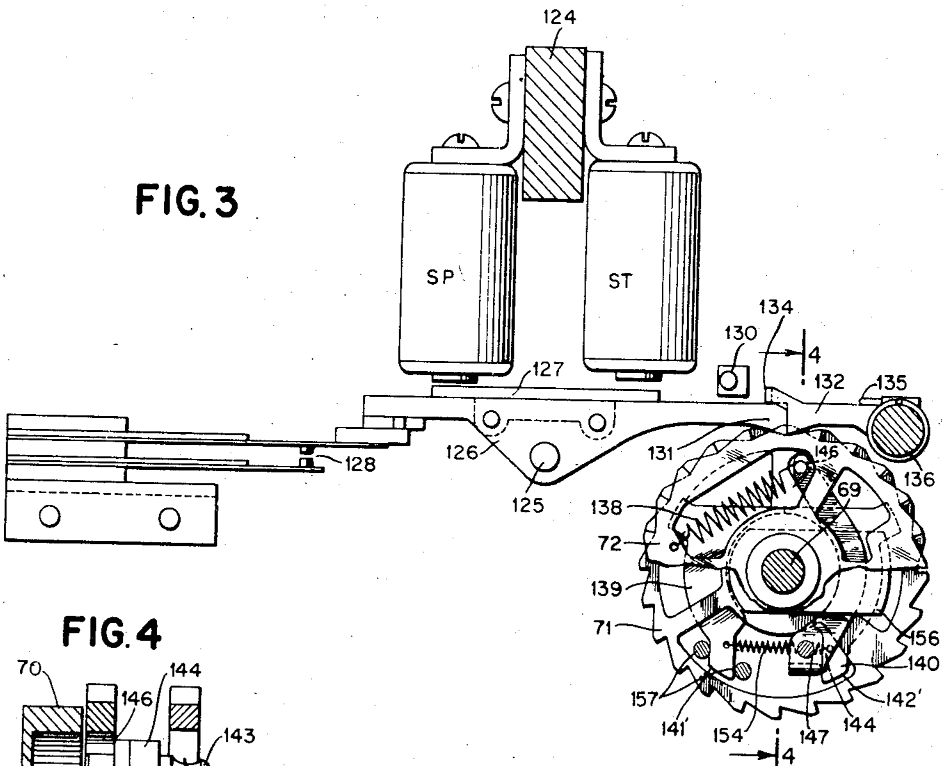


FIG. 4

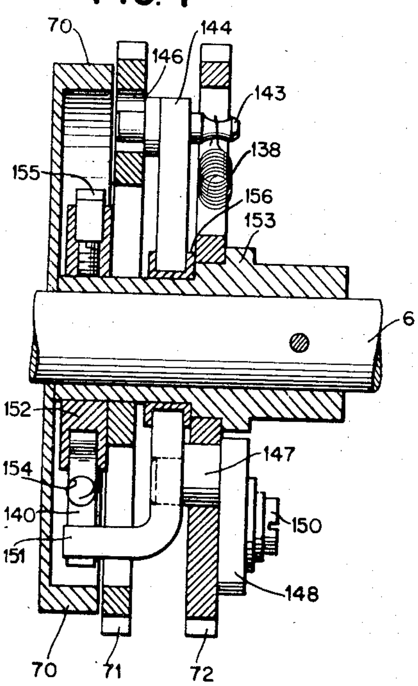
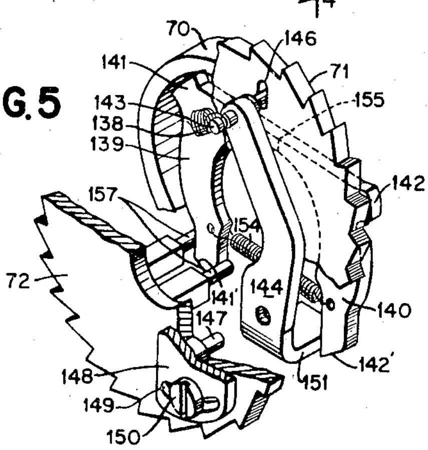


FIG. 5



INVENTORS
F. J. FURMAN, O. F. MONEAGLE
BY D. R. WETJEN, A. A. DOWD

J W Armbruster
ATTORNEY

July 8, 1958 F. J. FURMAN ET AL 2,842,250

RECORD FEEDING MEANS

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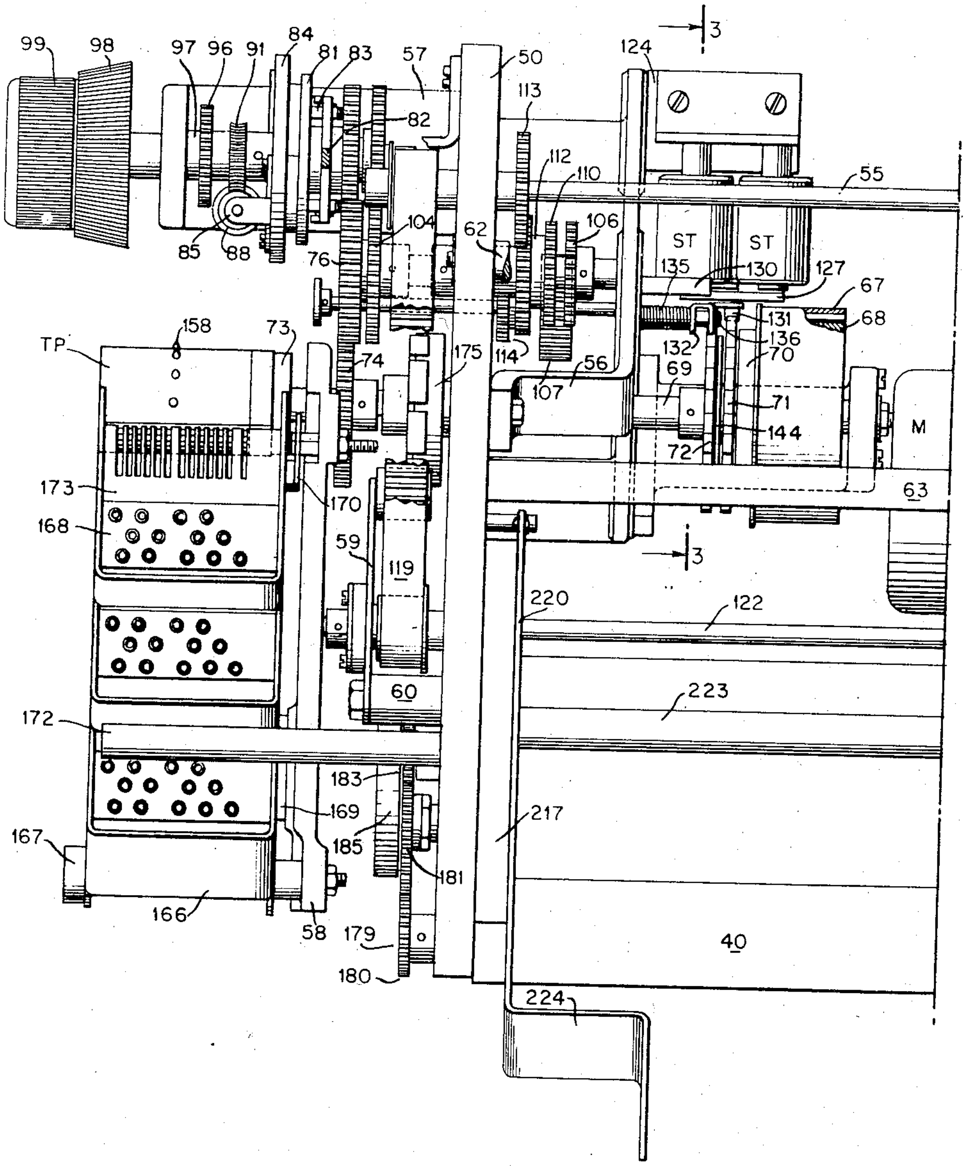
FIG.6a

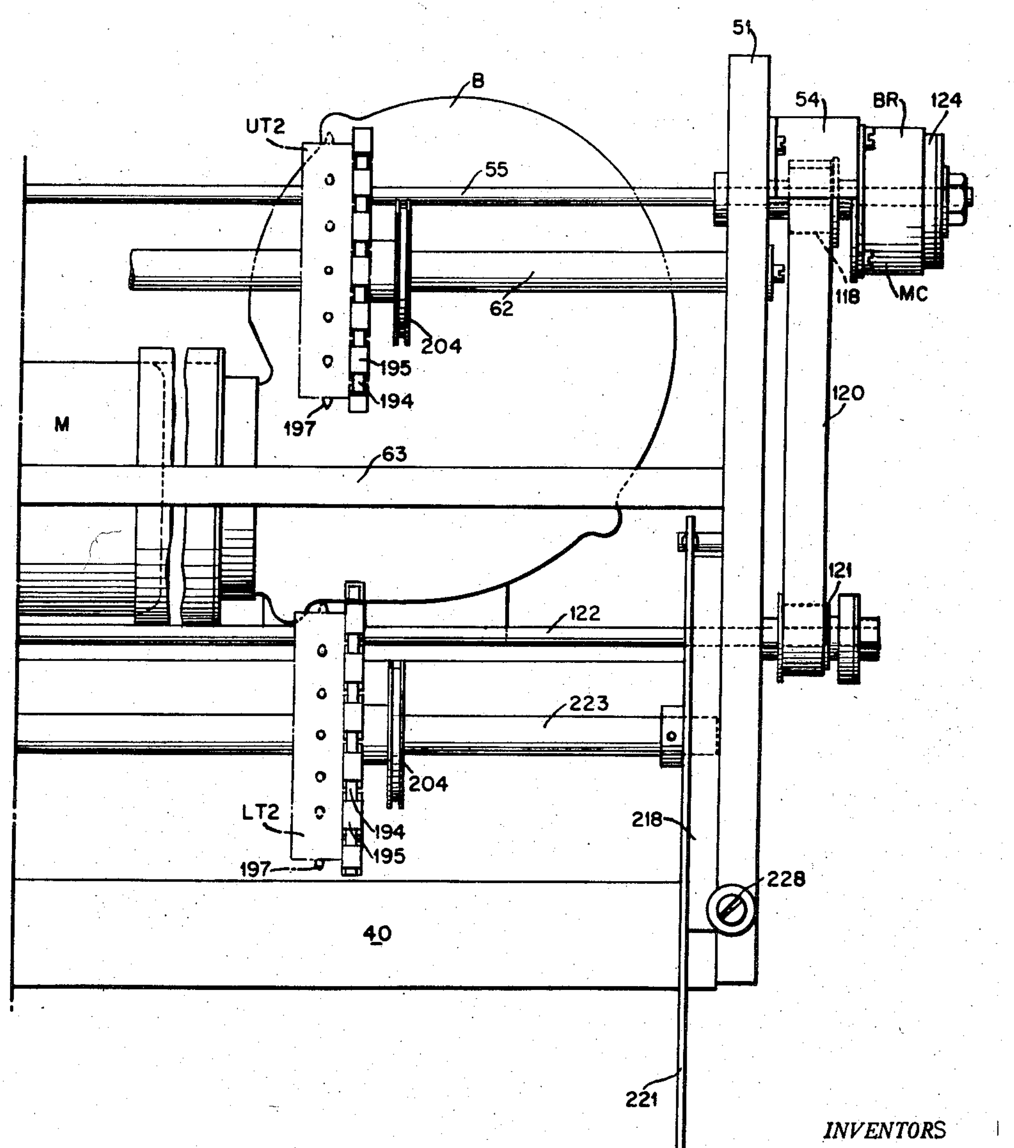


INVENTORS

F. J. FURMAN, O. F. MONEAGLE
BY D. R. WETJEN, A. A. DOWD

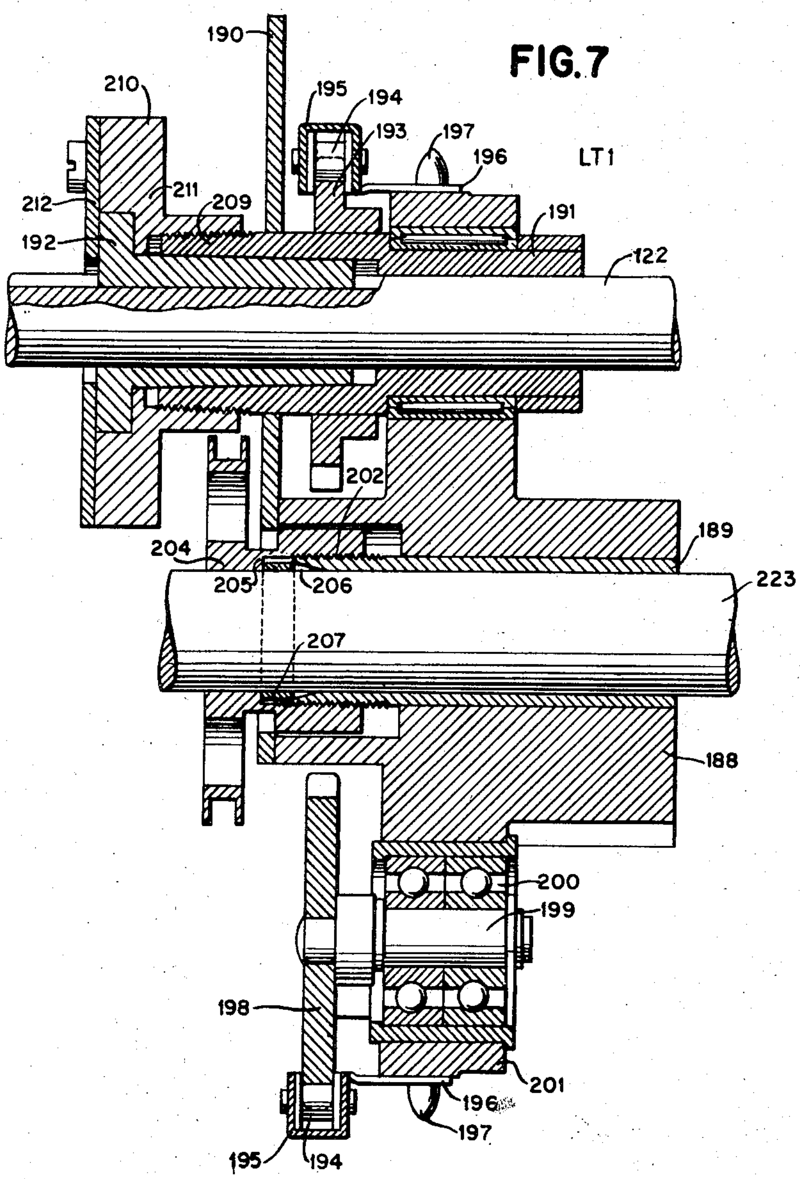
J W Armbruster
ATTORNEY

FIG. 6b



INVENTORS
F. J. FURMAN, O. F. MONEAGLE
D. R. WETJEN, A. A. DOWD
BY
J W Armbruster
ATTORNEY

FIG. 7



INVENTORS
F. J. FURMAN, O. F. MONEAGLE
D. R. WETJEN, A. A. DOWD
BY
J W Armbruster
ATTORNEY

July 8, 1958 F. J. FURMAN ET AL 2,842,250

RECORD FEEDING MEANS

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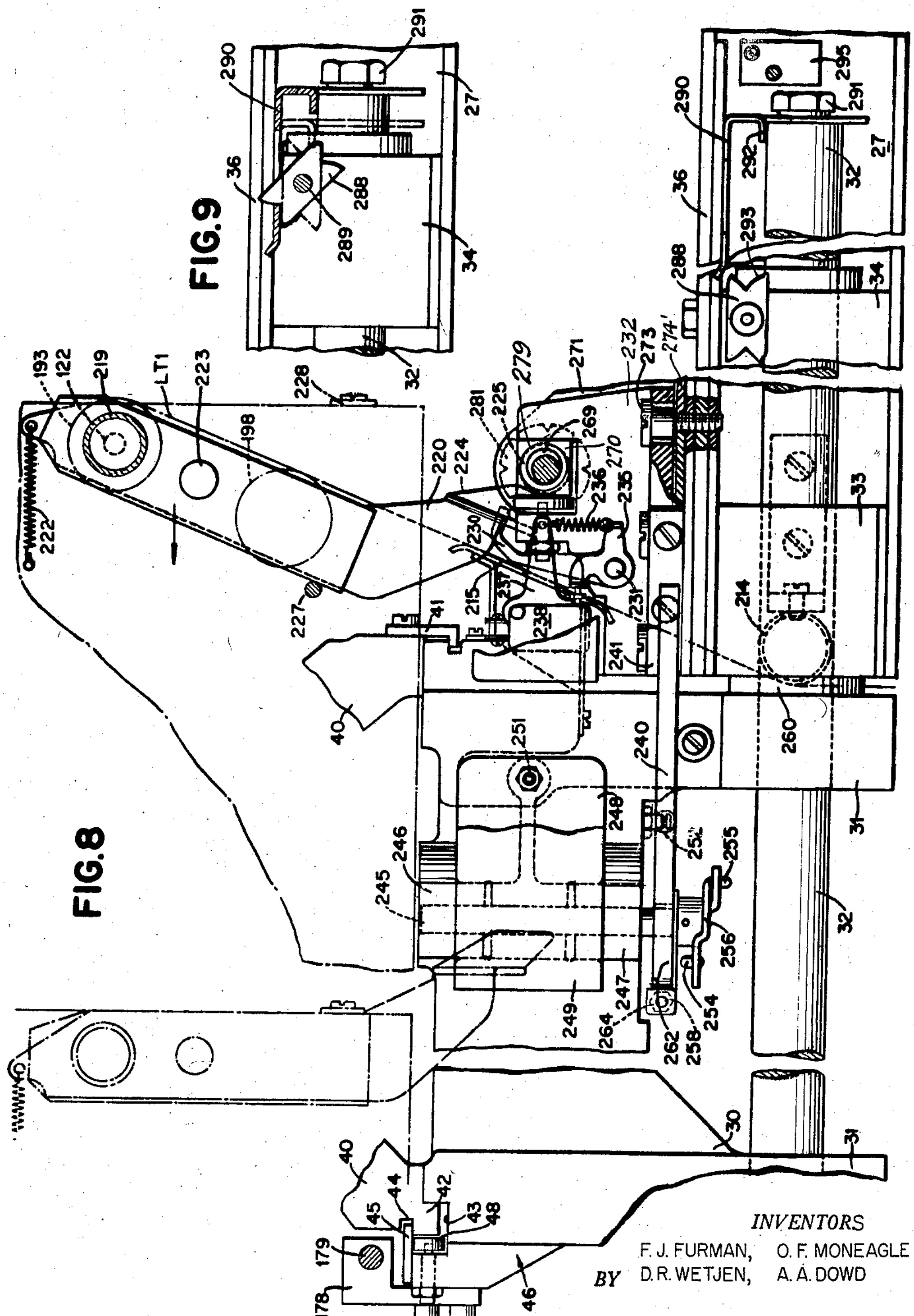

FIG.9

FIG.8

INVENTORS

F. J. FURMAN, O. F. MONEAGLE

BY D. R. WETJEN, A. A. DOWD

J W Armbruster

ATTORNEY

July 8, 1958 F. J. FURMAN ET AL 2,842,250

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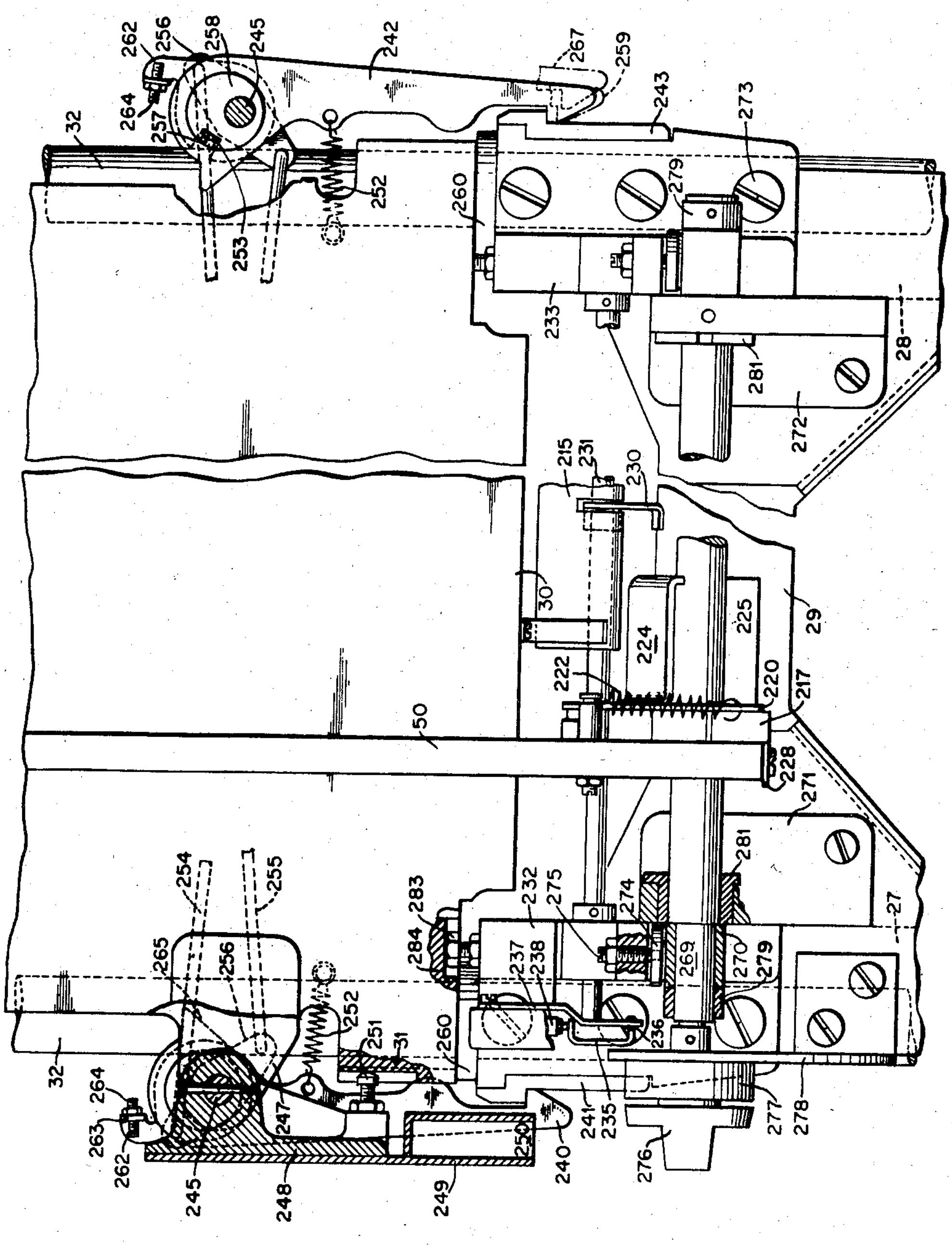

FIG. 10

INVENTORS

F. J. FURMAN, O. F. MONEAGLE

BY D. R. WETJEN, A. A. DOWD

J W Armbruster

ATTORNEY

United States Patent Office

2,842,250

Patented July 8, 1958

2,842,250

RECORD FEEDING MEANS

Frank J. Furman and Otto F. Moneagle, Endicott, Douglas R. Wetjen, Johnson City, and Albert A. Dowd, Vestal, N. Y., assignors to International Business Machines Corp., New York, N. Y., a corporation of New York

Original application December 31, 1954, Serial No. 479,062. Divided and this application February 28, 1956, Serial No. 568,340

11 Claims. (Cl. 197—133)

This invention relates generally to paper feeding devices and more particularly to continuous record form feeding means for operating at high speed in cooperation with a record controlled printing machine.

This is a division of the parent case, Serial No. 479,062, filed on December 31, 1954, by F. J. Furman et al., for Record Feeding Devices.

With the advent of high-speed printing devices such as the wire printers of the kind with which the present devices are illustrated, it becomes necessary to provide means for advancing record material rapidly and yet without sudden shock of starting or stopping operation. In other words there is required a sort of harmonic feed motion with a slow starting effect, rapid acceleration, and gradual stopping. In the present instance this improved form of movement is brought about by the ingenious use of a variable speed drive motor, a random type of engaging clutch and a perforated feed control tape which in effect gives a preliminary warning when a feed which is about to take place exceeds or falls short of certain spaced limits. The feed control tape is generally of the kind set forth in the Mills et al. Patent No. 2,531,885 and other patents of a similar nature, specifically, 2,569,829, 2,684,746, and 2,747,717. This present structure is of an advanced form in that in addition to other differences, cooperating with the tape there are three sets of feed control brushes. There are provided the usual set of stop control brushes which sense control indicia or hole positions in the tape, which is synchronized with the movement of the record material and thereby energize controls for stopping record movement wherever desired. In addition thereto are the other two sets of tape brushes which are forms of predictors engaged by a stop perforation before it reaches the stop brushes. The first set encountered by a perforation are called interlock brushes and they engage a tape perforation 3⅔ inches before it reaches the stop position. Controls are exercised by these interlock brushes for calling the printer back into operation after suppression, and for regulating the amount of time which the printer is held idle to allow time for record material movement. The second set of preliminary brushes are for the purpose of speed reduction, because whenever a skipping movement of the record material is of any appreciable extent the drive motor is driven at a fast speed (75 inches per second as contrasted with 25 inches per second at slow speed) and it is necessary that the speed be reduced before the feed control perforation reaches the stopping control brush. In other words, the second set of preliminary brushes operate motor controls to slow down the carriage movement before it comes to a stop. The result is a harmonic motion which operates through pin feed tractors to draw the continuous form rapidly without tearing the marginal perforations; and the motion is controlled further to come gradually to a stop without shock.

An object of the invention is the provision of an advanced form of positive feeding means for handling records of the multiple ply continuous form variety having marginal feed control perforations. The forms are transported by pairs of tractor pin feed chains which are driven through a random clutch and aided in stopping by a magnetic brake. The tractors are arranged in pairs, one pair below a platen and the printing line and another pair above the printing line whereby a secure hold is maintained on the webs of record material as they are transported at high speed. Novel forms of clamping arrangements are provided for keying the tractors on drive shafts and also for holding the driving chains in desired lateral positions.

Another object of the invention is the design of the feed device to be movable or retractable for ease of assembly of the record material therein and also for servicing. The feed device is mounted on a separate frame with a pair of extending slide rods which pass through holders in the printer frame. The slide rods are long enough to allow retraction of the feeding means over a distance of several inches so that the record holding tractors and platen which are normally spaced close to the printer heads may be drawn away far enough to allow manipulation of the record material over the feeding pins and access given to the feeding devices in general for repair and servicing. A unique form of connecting means is provided between the printer frame and the retractable feeding devices. The two units are held together with heavy latches and these latches are operated eccentrically so that there is a gradual release of the latching instrumentalities when it is desired to separate the two units. In connection with the latching means there is involved another feature of the invention which is provided to allow adjustment for various thicknesses of the record material which may vary from one ply to a substantial number of copies. In order to allow for thickness of the material, the latching block which normally holds the two units very closely spaced may be operated through an eccentric with a manipulative knob so that the connection between the two units is loosened or shifted relatively so that they are joined with a larger amount of spacing between them.

Another object of the invention is the provision of a means for shifting the record material slightly longitudinally so that the printing line may be made to coincide with prearranged block positions of the record material. This is done by the manipulation of a worm gear and worm wheel arrangement in the driving connections and interposed between the driving clutch and the feeding tractors. In the normal operation of the device the helical ridges of the worm gear are used as a planetary driving tooth in cooperation with a driven sun gear. When a slight adjustment is to be made, a vernier knob is turned and rotates the worm gear slightly for relative displacement.

Another object of the invention is to provide means for automatically untilting the lower pair of feed tractors when the feeding device is retracted to an open position. These lower tractors are normally in a backwardly slanted position and would be difficult to reach were they not pivoted and allowed to swing to a vertical position when the unit is retracted.

Other objects of the invention will be pointed out in the following description and claims and illustrated in the accompanying drawings, which disclose by way of examples the principle of the invention and the best mode which has been contemplated for applying that principle.

In the drawings:

Fig. 1 is a perspective view showing the main components of the feeding device and the drive connections thereto.

Fig. 2 is a left side elevation view showing the control tape and the three cooperating sets of control brushes. This view also illustrates the mounting of the drive motor and the connections therefrom to the pairs of tractor pin feed devices.

Fig. 3 is a side elevation view showing the random type clutch and the engaging and disengaging control magnets.

Fig. 4 is a sectional elevation view taken along line **4—4** in Fig. 3 and showing the interior construction of the clutch.

Fig. 5 is an exploded perspective view of the interior parts of the clutch showing the ratchet wheel control over the inner pry bar for engaging and disengaging the interior drive elements.

Figs. 6*a* and 6*b* when taken together provide a front elevation view of the entire width of the paper feed unit.

Fig. 7 is a sectional view taken along line **7—7** in Fig. 2 and showing the interior construction of one of the four tractor pin feed devices. This view illustrates the wedging action of a ring for clamping the unit in a lateral position to take continuous forms of a specified width. The view also shows the manner of keying the tractor drive sprocket to the drive shaft.

Fig. 8 is a side elevation view showing the latching means for connecting the paper feed unit to the printer and the means cooperating with the lower pair of tractor devices for tilting them when the feed unit is brought into the print receiving position.

Fig. 9 is a detail view in side elevation showing the latching device for holding the feed unit when it is drawn outward away from the printer and into a retracted position.

Fig. 10 is a plan view of the latching devices shown in Fig. 8 and further illustrates the manipulative eccentric controls for varying the latch plate positions in accordance with desired paper thickness selection.

The main framework portions of the feed unit are best shown in Figs. 2 and 8. In Fig. 8 it is seen that the base comprises a heavy casting **30** which is formed with four downwardly projecting legs **31** each of which is formed with a central opening through which two heavy shafts or extension slide rods **32** are fastened and project towards the right where they run into and through guide blocks **33** and **34** extending from the sides of the printer frame **36** which comprises side channels or heavy structural rails **27** and **28** (Fig. 10). In other words, the two projecting rods extending from the bottom of the feed unit are secured thereto and are thrust movably into stationary bearings in the printer frame. It is on these two shafts that the entire feed unit rests and is retractable away from the normally closed and latched print receiving position where it is shown in Figs. 8 and 10.

Slidably mounted laterally on the top of casting **30** is another heavy casting **40** which is formed in the shape of an arch as seen in Fig. 2. This upper casting **40** rests loosely on the top of the frame **30** but is keyed thereto as illustrated in Fig. 8 where it is seen that attached to the lower right end is an L-shaped member **41** which projects into a notch formed in the side wall of casting **30**. At the lower left end, casting **40** is formed with a double shouldered extension **42**, the lower part of which projects into a groove **43** and another groove **44** receives a projecting bar **45** which is attached to the top of a rearward extension **46** formed out of the rear of frame **30**. An adjustable confining block **48** holds frame **40** forwardly positioned in groove **43**. There is a manipulative means for adjusting the lateral shift of the carriage as a unit by shifting frame **40** relative to frame **30** as described hereinafter.

Turning again to consideration of the main framework of the carriage, it will be noted in Figs. 2, 6*a* and 6*b* that the main vertical side frames **50** and **51** of the feed unit are attached at the sides of frame casting **40** and spaced thereby to hold many of the feeding controls and the cross shafts between these main frames.

Attached to side frames **50** and **51** are a number of brackets for holding several sub-assemblies for different feed controls each of which is coordinated with the feeding devices in general. On the right side frame (Fig. 6*b*), there is a bracket **54** which serves to hold the magnetic brake housing MC which is in cooperation with the main tractor drive shaft **55**. Attached to the inner face of the left side frame (Fig. 6*a*) is a bracket **56** for supporting the parts cooperating with a drive clutch. On the outside of frame **50** are a number of supporting devices including a bracket **57** for holding the differential drive gearing including the worm gearing for the vernier line adjustment device. Another form of bracket or auxiliary frame **58** is the support for the three sets of tape sensing brushes and the cooperating contact rollers and driving pin feed drum for operating the tape. A third frame **59** is supported by studs **60** and it projects to form bearings for receiving projecting shafts to hold certain of the drive gears. Extending across the paper feed unit are several shafts and bars which not only support feeding devices, but also act as stiffening means between the frames. One such shaft is the shaft **62** which is the mounting means for the upper pair of tractor feed devices. Another such device is the bar **63** which acts as the platen to support the record forms when they are receiving the blows of the print recording heads.

The printer with which the paper feed is illustrated is of the kind involving a wire printer operating in serial order at high speed and is set forth in detail in copending patent applications Serial Nos. 479,106, filed on December 31, 1954, and 479,107, filed on December 31, 1954.

In Fig. 2 it is seen that the feed devices are driven by a motor M which is fastened to the top of the upper casting **40**. A blower B (Fig. 6*b*) keeps the motor cool. This motor M is of a special variable speed type which is disclosed more fully in the copending application Serial No. 476,655, filed on December 21, 1954, by W. F. Morgan. On the motor shaft is a pulley **66** for the main drive belt **67** (Fig. 6*a*), which is of the inner toothed type or Gilmer timing belt form for a more positive drive to a toothed pulley wheel **68** loosely mounted on the drive shaft **69** but connected to a clutch drum **70**. Through the action of the clutch control ratchets **71** and **72** and other parts, the drive of the continuously rotating drum **70** is at times communicated to the drive shaft **69** which extends to the left (Fig. 1) to the tape feeding pin wheel or drum **73** and a gear **74** which is the first of a train of gears in the drive.

The drive connections are not direct to the continuous strip advancement tractors but are made through two indirect connections for two main reasons. The first reason for indirection is to provide a planetary form of connection wherein vernier adjustments or slight variations may be made in record to printer relationship. And the second reason for the circumlocutionary drive is to provide means for a change from 6 to 8 lines per inch of spacing whenever closer printing is desired.

The drive continues from gear **74** and through a loose idler gear **76** which is in mesh with a gear **77** which is loose on line space adjustment shaft **78** but fastened to a hub **79** which also holds the loose continuously rotating part **80** of a toothed clutch **80—81** normally connected by the shifting action of a lever **82** which carries rollers **83** to open the clutch only on occasion for manual adjustment. The drive continues through clutch disk **81** which has on it a plate **84** with brackets **85**, **86** and

87 carrying planetary driving connections. A worm gear 88 and a helical gear 89 are on a short common shaft 90 suspended between brackets 85 and 86. The former is in mesh with a worm wheel 91 fastened to shaft 78, and the latter is in mesh with a mating helical gear 92 which is fastened to a shaft 93 extending through bracket 87 and carrying a spur pinion 95 which rolls around a gear 96 on a tube 97 fastened to the vernier adjusting knob 98 but loose on shaft 78. The outer line space knob 99 is fastened to shaft 78.

The drive is ordinarily through the worm gear 88 which is not then rotated on its axis but instead swung around bodily with shaft 78 as the center and the helix of the worm as a drive tooth of the gear 91. In other words the drive is through clutch 80—81, frame 84, worm 88, worm wheel 91, shaft 78 and over to a gear 100 also fixed to shaft 78, and then on further in the driving train.

At this point it is well to note how a vernier adjustment or slight variation in the position of the record material is made relative to the printing line. The vernier knob 98 is turned one way or the other to lift or lower the paper relative to the printer. When the knob 98 is turned, the connected gear 96 is also turned and communicates movement to the meshing pinion 95. Since pinion 95 is on shaft 93 with the helical gear 92, the latter is revolved and rotates the associated gear 89 which in turn rotates the worm gear 88. This motion serves to vary the angular relationship between the plate 84 which is the holder for the worm gear 88 and the worm wheel 91 which is fastened to the feed driving shaft 78. The planetary arrangement including worm 88 remains in constant readiness for ordinary line spacing and skip feeding movement regardless of the relative adjustment through the vernier knob.

A frictional type of spring finger or detent 101 is fastened to the side of plate 84 and carried around with clutch member 81. This detent extends over into contact with the periphery of a line space detent plate 102 fastened to the side of clutch member 80 and formed with a series of regularly spaced notches into which a V-shaped extension of detent 101 projects and is located as the knob 99 is turned by hand for line space adjustment. Detent 101 snaps into notch after notch when the line space knob is adjusted, and this serves for definite limitation of the desired number of manipulated spaces.

For line space adjustment, the driving train of gears is operated directly by the outer knob 99. Prior to this, the lever 82 is operated to open clutch 80—81. The knob 99 is fastened to shaft 78 and there is direct communication of the rotation given the knob to the drive gear 100 at the other end of the shaft.

Now that it has been seen how the driving motion is communicated indirectly from gear 74 to gear 100 (Fig. 1) through the intermediate planetary adjustment devices, it is possible to trace the drive further. Gear 100 is seen to be in mesh with another gear 104 secured to the shaft 105 which is the axis for the idler 76 already mentioned. This shaft 105 projects towards the right and, at that end carries another gear 106, which is fastened thereon and in mesh with a wide gear 107 fastened to a sleeve 108 slidably mounted on a shaft 109. Normally the wide gear 107 is positioned as shown to communicate the drive of gear 106 to another gear 110 which is loosely mounted on shaft 105 but connected to a collar 111 which also carries a slightly larger gear 112. Gear 112 meshes with gear 113 which is fastened to the shaft 55 already mentioned as being the driver for the two pairs of sprockets serving to actuate the pin feeding tractors. In other words, when wide gear 107 is positioned as shown, there is a rather direct communication of the driving motion through gears 106, 107, 110, 112, 113 and shaft 55. The driving connections mentioned are proportioned for spacing six lines to the inch on the record strip R adjusted by the feeding tractors.

When it is desired to change the relationship so that the motion is reduced to get a greater number of lines per inch, then the gear 107, and a pinion 114 connected thereto through the sleeve 108, is shifted to the right to disengage the connection to gear 110 and instead to establish a more direct connection with gear 112. This is done to get a spacing of eight lines per inch. The drive connections then may be followed from gear 106 through gears 107, 114, 112, 113 and sprocket shaft 55.

The choice between 6 and 8 lines per inch of spacing is made by the operator and the gearing 107, 114 is shifted manually before the machine is brought into operation and, therefore, the relationship between the spacing of print on the continuous record form R and the related feed control tape TP may be selected in the usual fashion by proper spacing of the feed control perforations 116 in the tape.

Whenever the drive shaft 55 is rotated, the motion is communicated directly to the upper pair of pin feed tractors UT1 and UT2 which have extending pins mounted on chains to engage several of the marginal pin feed openings along the sides of all plies of the continuous record material R. The motion of the tractor pins upward serves to advance the material upward past the printing line which is coincident with the platen bar 63. In order to communicate the driving motion to the lower pair of feed tractors, the shaft 55 is provided with a pair of attached sprockets 118 onto which is drawn a pair of belts 119 and 120 for driving on opposite sides of the feed device. These belts 119 and 120 are of the positive type which are formed with inner toothed construction to cooperate with precise timing relationships with the driving sprockets 118 and a similar pair of sprockets 121 which are fastened near the ends of a shaft 122 which is the driver for the lower pair of pin feed tractors LT1 and LT2. These lower tractors also each have several pins engaging simultaneously in the marginal openings of the record material. Thus the four tractors serve not only to carry the record material rapidly away from the platen, but also help to bring the material out of the magazine and into print receiving position without tearing the marginal areas when operating at high speed.

In order to aid in slowing down the rapid advance of the record material and to aid in bringing it to a stop with gradual deceleration, the driving means is provided with a brake at the end of the main tractor drive shaft 55. The brake serves to reduce oscillations and rebounding of the feed parts after they are stopped and during printing. In this way, paper shifting is avoided during the period of printing. On the right in Fig. 1 it is shown that the shaft projects into a brake unit BR. This brake construction is better shown in the right of Fig. 6*b* where it is noted that the bracket 54 on side frame 51 holds the stationary part of the brake unit. On the outer end of shaft 55 is secured the rotating disk 124 which is keyed thereon and is subject to axial movement when the interior coil MC of the brake is energized. The braking construction is similar to that shown in detail in Patent 2,747,717.

Now that the complete driving connections have been traced in a general way, it is believed advisable to return to consideration of how the main operating clutch 71—72 is constructed and controlled by the double coil start and stop magnets ST and SP. The parts for this clutch device are shown in Figs. 3, 4 and 5. It is pointed out hereinbefore that the left side frame 50 (Fig. 6*a*) is provided with a bracket 56, and it is on this bracket that a bar 124 (Fig. 3) extends to hold the pairs of coils constituting the start and stop magnets ST and SP for the clutch. Also extending from bracket 56 is a stud 125 which acts as the supporting means and axis for an armature pawl lever 126. The pivot 125 is centrally located on a line between the two control magnets. The armature plate 127 fastened to lever 126 is placed directly beneath the cores of the magnets on either side. When in the normal stopping control position, the lever 126 is rocked upward at the left by the stop control magnet SP and when operated for clutch engaging or starting control, the same assembly is rocked upwardly at the right in a counterclockwise direction by the action of start magnet ST. A contact 128 is closed by counterclockwise motion of lever 126 whenever the start magnet ST is made effective. The rocking motion of lever 126 is limited by an adjustable stop stud 130.

At the right end of lever 126 there is formed a tooth shape 131 which cooperates with the ratchet teeth on the wheel 71 which is one of a pair of relatively movable ratchet control clutch wheels 71 and 72. The companion ratchet wheel 72 has teeth facing in the opposite direction and is normally engaged by a toothed clutch pawl 132 which is formed with a bent lug 134 overhanging the top of lever 126 to partake of its movement. A coil spring 135 is coiled around the pawl shaft 136 and tends to hold the pawl 132 down into engagement with the teeth of ratchet wheel 72 and prevent it from rotating in a clockwise direction. When the lever 126 is operated counterclockwise by energization of the start magnet ST, it not only lifts the tooth 131 away from ratchet wheel 71, but it also actuates pawl 132 through the lug 134 to disengage 132 from the teeth of the other wheel 72.

The object of releasing the two clutch wheels 71 and 72 is to allow the heavy spring 138 to operate and tend to draw together the two wheels in opposite directions a slight amount which serves to exercise an outward camming action on a pair of inner wedges or operating dogs 139 and 140 which have outwardly projecting fingers 141, 141[1] and 142, 142[1] for engaging the inner circular area of the hollow clutch drum 70. Spring 138 is at one end connected directly to the wheel 72 and at the other end it is connected to a stud 143 which projects through a camming member or pry bar 144 and also projects into a slot 146 cut into the other ratchet wheel 71. Member 144 is pivotally mounted on wheel 72 by means of an eccentric stud 147 which is adjustably rotated and locked into position by an attached plate 148 which is formed with an arcuate slot 149 through which projects a screw 150 to tighten the plate as adjusted. The position of the eccentric pin 147 is critical because the lower end of pry member 144 is formed with an overturned projection or operating piece 151 which contacts with the left side of the lower end of the clutch engaging member 140. The two dog or shoe members 139 and 140 (Fig. 4) are loosely held in a container 152 which is secured to a bushing 153 fastened to the drive shaft 69 so that the two wedging shoes 139 and 140 are not provided with any fixed pivot but rather cling to the circular inner wall of ring 152 and are held in an inwardly clinging position by a weak spring 154. A similar grooved retainer 156 confines pry member 144 axially. The two wedging parts 139 and 140 are in an abutting engagement at the top as shown in Fig. 5 where the upper horizontal edges come together along the line 155. It is at this point 155 where the wedging members are rocked relatively to each other to in effect be spread out and cause the four fingers thereon 141 and 142 to come into firm engagement with the inner surface of the continuously rotating drum 70. The train of action may be followed by noting that release of the two ratchet wheels causes relative motion thereof with wheel 71 coming in a counterclockwise direction while wheel 72 moves slightly in a clockwise direction. The result is that member 144 through the action of the strong spring 138 is rocked slightly counterclockwise about pivot 147 and tends to pry wedging member 140 outward through the offset portion 151.

The pry bar 144 forces the shoe 140 against the drum 70. Since the shoe 140 makes angular contact with the drum, it tends to slide along the inside surface of the drum. This tendency is restrained by the other finger 142 which is forced into contact with the inside surface of the drum. This contact is also angular; therefore, shoe 140 tends to slide along the inside surface of the drum but is restrained by the shoe 139 due to the abutting projections meeting at the line 155. This process is repeated for shoe 139 to bring the lower part or finger 141' into contact with the drum by forcing it outward while guided by the studs 157. With an arrangement of this type, the forces are gradually accumulated at the four spaced fingers to provide the proper buildup of frictional forces to the required torque.

Motion of the drum 70 is communicated from the drum through the two shoes, and through the member 144 and studs 157 to the ratchet wheel 72 and attached bushing 153 and into the shaft 69 attached thereto. Then the clutch parts and shaft 69 are rotated in a counterclockwise direction as shown in Fig. 3 as long as the teeth 131 and 132 of the armature lever and pawl are held raised away from the ratchet wheels. However, as soon as the start magnet ST relinquishes control and the stop magnet SP is energized, the lever 126 is rocked in a clockwise direction and the two pawls are dropped into the ratchet teeth, whereupon tooth 131 stops the counterclockwise motion of wheel 71 and through the pin and slot connection 146 (Fig. 5) operates member 144 to rock it in a clockwise direction and shift the lower end 151 to draw away from the lower end of wedging member 140 and thereby free the connecting parts from the drum 70 which continues to move in a counterclockwise direction (Fig. 3). As this disengaging operation takes place, the other ratchet wheel 72 is carried along for a slight extent with one of the abutting teeth going beyond the left of pawl 132 but prevented from being retracted by the action of spring 138 because the pawl snaps into place before the wheel can move clockwise.

Although the various sections of the clutch parts have been referred to hereinbefore as upper and lower portions of the clutch members, it may be pointed out that the clutch parts are operable in all positions of rotation. In other words, the clutch is of the form known as a random engaging clutch wherein the parts have no fixed relationship relative to the driving drum, and the inner clutch parts are operated universally by outer engagement with any of the plurality of teeth on the ratchet wheels. For a high-speed device this is important because there is no necessity for any parts to return to a home position. The clutch is available to start from any position and to stop at any position. However, the ratchet teeth on the clutch wheels have a relationship with a line space movement of the drive connections, so that rapid operation of the start and stop magnets is productive of single line space movement. In order to produce such a rapid switch from the start to the stop operation, there is provided the latch contacts or clutch switch contacts 128 which are closed by lever 126 upon a slight counterclockwise start movement so that the clutch is barely released before contacts 128 are closed to call stop magnet SP into action for a single-space operation.

It is noted hereinbefore that a control tape TP is provided to furnish a flexible form of predetermined programming for locating the record forms with respect to the printing line so that heading print blocks, item print and total print are started and stopped wherever desired on the forms. There is a tape TP produced for each type of form and for the respective length of form. The tape TP as shown in Figs. 1, 2 and 6*a* is an endless paper band which is either equal in length to the related form or a multiple fraction of the form length in the cases of short forms. In Fig. 1 it is seen that the tape is a narrow paper band which is driven by the pin studded drum 73 with the pins 158 thereon cooperating with a central line of feed perforations punched in the tape. The tape is advanced in synchronism with the movement of the record strip R and describes a triangular path in moving around a sleeve 159 at the rear and then passing successively around contact rollers 160, 161 and 162, the latter being on the feed drum 73. The three contact rollers or cylinders 160, 161 and 162 are placed opposite three lines or sets of tape sensing brushes, interlock brushes IN, speed reducing or "slowdown" brushes SL and finally the upper set of stop brushes ST.

As shown in Fig. 6a the three sets of brushes and cooperating contact rollers are supported outside the left side frame on a separate small frame 58 fastened to frame 50 by extending studs and brackets. The drive shaft 69 extends through frame 58 and carries drum 73 which extends outwardly. The other two contact rollers 160 and 161 are supported at the inner end on bearings in the frame and project outwardly without support at the outer ends.

The tape TP (Fig. 2) is held taut by the holder for the rear sleeve 159 which comprises an arm 164 which is rocked to the proper angular position and secured to the side frame 50 by means of a nut and spring washer 165 acting on a hub of the arm. When it is desired to change the tape all that is necessary is to loosen the arm 164 and slip the tape outwardly over the four guide rollers, i. e., after all sensing brushes have been rocked out of cooperation with the tape. When a new tape is inserted, the arm is adjusted angularly to hold it taut.

In Fig. 2 it is also seen that the three lines or sets of tape sensing brushes are mounted in a separately movable frame 166 pivoted at 167 on a stud projecting from the frame 58. The frame 166 is in the form of a channel with a U-shaped cross section and has side plates for confining the ends of insulation blocks 168, three of which are spaced between the frame side plates to hold the sets of sensing brushes. When frame 166 is in the operating position it closes the contacts of a switch 169 fastened to frame 58 and it is in this position that a latch 170 pivoted on the top of the frame catches over a square stud 171 extending outwardly from one of the main side frames 50. When it is desired to change the tape, the latch 170 is lifted and then the frame 166 rocks clockwise until it abuts against a stop rod 172. In so doing it opens the contacts of switch 169 and this prevents operation of the feeding devices while the mechanism is out of the proper position.

Referring to Fig. 6a it is seen that, in addition to the insulation block 168 for holding the line of brushes, there is also a comb-shaped insulation member 173 which confines each sensing brush to a particular path on the tape. These paths around the tape are also termed channels and it is in these channels where the tape feed control perforations are placed differentially to predetermined various stop and start positions related to positions on the continuous record forms R. It may be noted that in the comb formation of guide block 173 there are 13 notches, 6 on one side of the tape feed pins 158 and 7 on the other side. The extra position, or 7th position at the extreme right, is used for a common contact brush which carries current to or from the contact roller. The other 12 brush positions are used mainly for several skipping controls and one is reserved for overflow control.

Since the tape TP is moved in a counterclockwise path (Fig. 2), a perforation 116 therein in any channel passes in succession first under the related interlock brush IN at the bottom and next passes the slowdown brush SL in the middle and finally reaches the stop control brush ST at the top. Since the tape is moved along with the record strip R during line spacing operation, the particular tape perforation of a certain channel may be anywhere short of the stop position brushes when a skip is initiated related to that particular channel. It is by means of these spacings of the three brush sets relative to the tape that the controls are preconditioned before skipping is initiated by the presence or absence of controls initiated by the particular tape hole passing or not passing the two lower sets of brushes. For example, if a certain channel is selected and it is immediately determined that the particular tape hole has not already passed the related lower brush IN, it is known immediately that the skip is going to be more than 3⅔ inches in length and therefore necessitates both movement at high speed and the omission of at least two subcycles of printing actuation to allow time for this long movement. On the other hand, should the skip initiation find that brush IN has been activated but that related brush SL has not exercised any controls, then it is known that the tape control perforation stands between the two brushes and the skip involved is longer than nine line spaces but shorter than twenty line spaces. Therefore, the skip is to start at high speed and involve a shorter loss of printer time. Should a skip initiation find both lower controls activated, then that is a sign that the skip is to be a very short one involving less than nine line spaces and it is to proceed at slow speed and involve a still shorter loss interval of printer time or no loss at all.

At this point it is well to comment upon the effect that the card reading printer has over the feed devices because it is the printer which responds to the punched record card control and prints on the record form according to how many lines of heading data, item data and classes of totals are called for by a particular group or groups of control cards. The printer has group control devices, heading card control by X and no X punchings in the cards and program controls for various classes of items and totals such as minor, intermediate and major controls. These controls originating within the card reader and printer are productive of impulses which may be used selectively to control the spacing or long feed skipping operations of the record strip feeding devices.

The channels of the tape TP are selected by the record card controls in the printer. As the cards feed they are sensed not only to select the data to be printed, but also the disposition of such printing by placement on a form. In most instances the printer initiates feeding for line spacing or skipping and the tape controls effect stoppage as determined by the holes in the tape. The exception is the overflow control whereby the tape both initiates and stops an ejection of the record material from the end of one form to the top of the next form. Tape channel selection is pluggable and of selective control from a number of card controlled sources. It may come from X holes, in heading cards, or digit selection holes in any card, or class of totals on total cycles, or by group changes without total printing. These forms of channel selection control are set forth at length in the Mills et al. Patent No. 2,531,885, issued on November 28, 1950. Other patents of the tape controlled feed device variety include Rabenda Patent No. 2,569,829, issued on October 2, 1951, Bakelaar et al. Patent No. 2,684,746, issued on July 27, 1954, and the Cunningham et al. Patent 2,747,717, issued on May 29, 1956.

It will be noted hereinafter with reference to the wiring diagram that the feeding controls for double space, triple space "skip to 1," "skip to 2," etc. are all pluggable to receive control impulses from the card reader and printer. They take precedence over each other in the order mentioned with single line spacing dominating all. The "skip to" controls refer to the tape sensing brushes as they are picked up in successive order so that when the "skip to 5" control is plugged, it means that the fifth tape brush is to sense a tape perforation and control the stop magnets regardless of tape perforations in all lower channel positions. Ordinarily it is for only the advances of four or more spaces that skip stop perforation control is put in the tape to determine where a heading is to start, where item impressions are to start, or where a total impression is to be placed.

When there are too many related items to be recorded on one form it is necessary to put the overflow items on a second form. In such cases the end sensing brush or twelfth brush of the stop brush set, in cooperation with a perforation at the side of the tape, determines where the overflow skip is to start. Any predetermined position may be chosen as the last line of a form and the control tape punched in the twelfth channel at a corresponding position to initiate overflow skipping.

The feeding devices operate at two speeds which are governed by the control over the variable speed motor which is operable at a record movement speed of 75 inches per second for skips of more than nine line spaces, end at the slower speed of 25 inches per second for skips of less than nine line spaces. These changes of speed since they are not abrupt are smoothed out in a sort of harmonic motion change or gradual variation from high to low speed. The demand for high-speed operation is automatically called for by a skip when a tape control perforation fails to make evident the passage beyond the "slowdown" brushes SL at the time the skip is initiated.

The feeding devices are provided with line spacing controls for single, double and triple spacing. The selection of control is made by operation of pluggable controls described hereinafter with relation to the wiring diagram. A single space control is the normal operation and will take place invariably in conjunction with serial order printing unless the feed controls are signaled otherwise.

The line spacing controls involve the use of the commutator **175** best shown in Fig. 6*a* where it is seen to be connected to shaft **69** and placed near the outer face of the side frame **50**. Cooperating with the commutator are four sensing brushes best shown in Fig. 2 where they are seen to project radially from an arcuate block of insulation **176** which is fastened to the outside of frame **50**. In Fig. 6*a* it is noted that commutator **175** has a continuous metallic band in one area and a regular series of separate segments or metal inserts spaced apart the equivalent of three line spaces. Cooperating with the continuous commutator band is a common line space conducting brush LSC (Fig. 2). The other three brushes LS1, LS2, and LS3 are spaced apart with their operating ends touching the commutator where it has the separated segments. One of these three brushes is always active and in contact with a segment and it may be any one of the three. When one is in the active position the other two are spaced one and two spaces respectively away from other commutator segments. The wiring controls later considered in connection with the wiring diagram are flexible so that upon a demand from the printer for one line space, such a demand is communicated to the particular one of the three line space control brushes which happens to be on an active segment. The wiring connections serve to initiate a pair of impulses to activate the start and stop magnets of the random clutch to cause the shift of one line space which also moves the commutator segments to pass from one control brush to another. In the event of a setting for double line spacing, then the control is varied to embrace the brush which stands one space removed from a conductive commutator segment. The double space control then calls for a stop impulse derived from the secondary control brush source and this necessitates the movement of the commutator and all connected controls including the record to a position involving two successive brush sensing stations on the commutator. In this same fashion a triple line space selection requires the cooperation of a spaced pair of line space brushes involving the brush which is on a segment and a brush twice removed, i. e., in a position which establishes contact only after two degrees of movement of the commutator and becomes effective for stopping after the spacing of three line spaces.

A device is provided for producing manually adjusted lateral movement of the record forms and the feed devices cooperating therewith by shifting the upper frame comprising the main side frames **50** and **51** and the arch-shaped casting **40** (Fig. 2) relative to the heavy lower casting **30** (Fig. 8). It is already noted hereinbefore that the upper portion is slidably arranged relative to the lower portion by means of the notched construction shown at the left in Fig. 8 and involving the projection **42** and the slotted formation **43** cut into the lower casting **30**.

Attached to the rear boss **46** on casting **30** is a bracket block **178** with a threaded section through which passes a long screw **179**, the end of which projects through the side frame **50** (Fig. 6*a*) and carries pinned thereon a gear **180**. In mesh with gear **180** (Figs. 2 and 6*a*) is an idler gear **181** having in cooperation therewith a spring detent **182** which is formed with a V-shaped portion extending between the teeth of the gear. Also meshing with idler **181** is a drive pinion **183** which is loosely mounted on a stud **184** extending from the side frame **50**, and connected to the pinion is an adjustment disk **185** from which there projects a handle **186**. When the handle **186** is grasped and rotated about the center **184**, the train of gearing drives the screw **179** and since the screw is immovable axially between the side frames **50** and **51** it merely revolves therein, but the threaded connection to block **178** (Fig. 8) causes the production of relative movement between the two main frames. In other words, the whole upper section of the feed unit is shifted laterally along the top of the lower frame **30** and in this way the sets of tractors and record strip R (Fig. 1) are shifted laterally with respect to the print heads of the printer. This form of adjustment makes it unnecessary to shift the four tractor units individually when it is merely a matter of centralizing or shifting the recording control generally. It is only when the form width is changed that a requirement is made to vary the positions of the feed tractors laterally.

An example is given in Fig. 7 of the construction of one of the pin feed tractor devices. This sectional showing also applies in general to the construction of the other three similar units. Assuming that the unit shown in Fig. 7 is a lower tractor unit LT1, then it is driven by shaft **122** and supported on shaft **223**. The unit is built around a heavy block **188** which has an inner section of tubing **189** slidable on the guide shaft **223**. Attached to one side of block **188** is a plate **190** which acts as a support for a cover, not shown. A bushing **191** on shaft **122** is supported by block **188** and loosely mounted with respect to plate **190** but guided thereby and keyed to the drive shaft **122** by a tapered slidable key **192**. Secured on the bushing **191** is a sprocket **193** over which is drawn the chain **194**, the regularly spaced links of which are formed with a U-shaped holder **195** having an extension **196** from which there projects a feeding pin **197**. At the lower end the chain **194** is drawn around another sprocket **198** which has affixed thereon a stud **199** carrying one section or inner race of a ball bearing **200**, the outer race of which is secured to the elongated frame portion **201** which is formed as part of block **188** and provides an elliptical form of support over which the propections **196** are slidable and which forms a sort of backing for the thin projections **196** carrying the feeding pins **197**.

The tractors are provided with means for placing them axially along the shafts **122** and **223** and clamping them there as well as providing for their shift or removal whenever desired. The inner end of sleeve **189** is formed with a thread **202** and cooperating therewith is a threaded adjustment nut **204** which is loosely mounted on shaft **223** and formed with a cooperating thread and also with an inner shoulder **205** which confines a split ring **207** of nylon which is suitable to be wedged into the tapered formation **206** formed as a flared end of the sleeve **189**. Thus the unit may be placed in any axial position along shaft **223** and then the nut **204** may be screwed down and tightened to cause the ring **207** to be biased into a wedging position against the flared formation **206** as forced by the shoulder **205**.

The upper sleeve **191** also has a section of threading **209** for clamping the tapered key **192** against the shaft **55**. Cooperating with this threaded section **209** is a nut **210** with an inner shoulder **211** passing behind the raised end formation of the key 192. For further confining the key and causing it to move with nut 210, there is secured on the outer face of the nut a circular plate 212 which has a restricted opening around shaft 122 and fastens in front of one end of the key. From the construction shown, it is evident that when the nut 210 is loosened, the key 192 is drawn along therewith to be pulled out of the key way in the sleeve 191 and shaft 122. However, when the nut is tightened in the other direction, the key is not only inserted, but also clamped towards the center of shaft 122 and held firmly in the driving position.

The lower tractor pair LT1 and LT2 (Figs. 1 and 2) is shown in the backwardly tilted positions which they occupy when the feeding unit is in operation. However, when the entire feed unit is retracted by pulling it away from the printer (Fig. 8) and sliding the rods 32 in the printer blocks and over to the left, then the lower tractors assume a vertical position as shown dotted at the left. This is done to make the feed pins more accessible and to insure that the record strip stays on the pins until it is drawn taut across an adjustable guide cylinder 214 which is fastened across the inside of the printer frame. When brought to the right and into the operating position, the lower tractor LT1 is seen to be slanted to agree with the angle of a paper guide plate 215 which is secured to the feed unit casting 30. It also agrees in position with a straight line path from where the record curves around the guide cylinder 214. Therefore, the hinging or pivotal construction of the lower tractors about to be described is furnished for the purposes of affording automatic angular adjustment of the lower pin feed chains as mentioned.

The lower tractor drive shaft 122 (Figs. 6*a* and 6*b*) passes through two rectangular blocks 217 and 218, one near the inner face of each side frame 50 and 51. The blocks are each pivoted on a bushing 219 (Fig. 8) extending from the side frame and concentric with the shaft 122. Thus the two blocks 217 and 218 are pivotally mounted with respect to the axis of shaft 122 without putting any burden or torque on the shaft. Attached to the inside faces of the blocks are spring holders and cam plates 220 and 221 to which are connected springs 222 tending to pull the blocks to a vertical position. The two blocks carry between them a shaft 223 which is the supporting means for the lower tractors and corresponds to shaft 62 of the upper tractors. It is shaft 223 and the tractors thereon which are swung in and out of the vertical position when the holder blocks are rocked about the bearings 219.

As noted in Figs. 6*a*, 6*b* and 8, the lower ends of cam plates 220 and 221 extend downwardly an appreciable extent, the former being bent offset at 224 and the latter extending straight down. Both lower plate ends are in the path of an adjustment rod or shaft 225 (Fig. 10) which extends across the printer frame. The arrangement is such that when the feed unit is pushed toward the printer to be latched thereon, the lower ends of plates 220, 221 strike against the side of shaft 225 and for the last inch or two, automatically swing the lower tractor frame of blocks 217, 218 and shaft 223, back to the angular position shown in full lines in Fig. 8. The purpose of studs 227 is to properly position the lower tractors in line with the paper path. After the blocks 217 and 218 have struck the stops, further motion on the part of the plates 220 and 221 will cause the plates only to pivot about the shaft 223 against the force of the spring 222 and two other springs, not shown, attached to the studs on the blocks 217 and 218. The purpose of this differential movement is to absorb the effects of tolerances and adjustments of the carriage position for various paper thicknesses. In order to prevent the blocks 217 and 218 from swinging too far under the urging of springs 222 and going beyond the vertical position, an extending washer 228 (Fig. 6*b*) is fastened on the front edge of frame 51 and projects to stop block 218 in the vertical position.

In order to detect a break in the record material, or the passage of the end of the continuous strip, there is provided a mechanical sensing finger or lever which ordinarily rides along the surface of the advancing record material and changes its position when there is a break or absence of the material. It is already noted with reference to Fig. 8 that there projects beyond the front of the base casting 30 of the paper feed unit, a sheet guide 215 extending across the feed unit front end position at an angle coinciding with the angle of the path of the record material. This guide 215 is a form of backing plate against which the record material rests and it is slotted vertically in one position opposite a detecting finger or sensing arm 230 attached to and rocking with a shaft 231 (Fig. 10) which is carried by bearings in two large brackets 232 and 233 adjustably fastened on the top of the rails 27 and 28 which are part of the printer frame. In other words when the feed unit and the printer are separated by retraction of the two along the heavy rods 32, the guide 215 (Fig. 8) moves along with the feed unit, while the sensing lever 230 remains behind because it is mounted on part of the printer frame.

The shaft 231 extends beyond the bracket 232 (Fig. 10) at the left and there it carries a bell crank lever 235 which is attached to the shaft and formed with a horizontal arm to which is attached one end of a spring 236 tending to rock it in a counterclockwise direction (Fig. 8). The upper end of spring 236 is attached to an extension 237 fastened to bracket 232.

The vertical arm of crank 235 is threaded and there extends from it an adjustable screw, the head of which cooperates with the plunger of a micro switch 238. The switch is fastened to the side of bracket 232 along with the extension 237.

From the arrangement of the parts as shown in Fig. 8 it is evident that as long as one or more webs of paper are present between the guide 215 and the sensing lever 230 it remains positioned to the right with the micro switch open. However, upon the absence of paper for any reason, the lever 230 is then free to rock counterclockwise into the opening in guide plate 215 under the urging of spring 236. When the lever is so moved, the bell crank 235 is moved along with the rocking shaft 231, and switch 238 is operated so that various controls in both the printer and feed unit may be signaled to cause stoppage or other control occasioned by the absence of record material.

Early in the specification it was pointed out how the feed unit is made retractable with respect to the printer by being slidable thereon through the heavy extending slide rods passing through the blocks fastened to the printer frame. Now it is appropriate to explain how the feed unit is latched in either of the positions, and the first one to be considered is the position wherein the feed unit is latched close to the printer and in position to receive printing impressions on the record material.

When the feed unit is pushed into cooperation with the printer and reaches the proper position, a pair of latches 240 and 242 (Fig. 10) engage with shouldered latching plates 241 and 243 attached to the sides of the blocks 232 and 233 already mentioned as being forms of adjustable brackets secured to opposite sides of the printer frame. The latches 240 and 242 are pivotally mounted to swing in a horizontal plane from the pivots provided in the base casting 30 of the feed unit. The side view of one of such pivotal mountings is shown in Fig. 8 and there it is seen that a vertical shaft 245 passes through a pair of extending ears 246 and 247 formed on casting 30. Between ears 246 and 247 there is pinned to shaft 245 an operating arm casting 248 which is shown in section in Fig. 10 and there it is noted that it has attached to it an extending operating handle 249 with an opening 250 into which four fingers may be inserted to grasp the handle and swing it in a clockwise direction to disengage the latches 240 and 242. An adjustable stop 251 projects from handle portion **248** and limits the counterclockwise position of the operating handle. Springs **252** tend to keep the latches rocked inward to the engaging positions.

The disengaging control of the single lever **249** is communicated from the left side latch **240** (Fig. 10) to the other latch **242** by means of a pair of rods **254** and **255** extending across the bottom of the feed unit. This is done by attaching to the lower ends of the two vertical shafts **245**, double ended levers **256** which are formed with holes to receive the ends of the rods **254** and **255** which are connected to the levers on the opposite shafts **245**. In Fig. 10 it is seen that the rods cross near the center of the feed unit and this is done because it is necessary to reverse the direction of movement of the latch operating parts because the latches swing inwardly in opposite directions.

The latches are released by movement of the handle in a novel manner by a combination of movements involving the eccentricity of the pivot and a positive rotary actuator. The eccentric manner of mounting the latches of shafts **245** is illustrated at the right in Fig. 10 where it is seen that the portion of the shaft **245** passing through the pivoting end of latch **242** is formed circular with a ring or crank portion **258** which is eccentric with respect to the long shaft portion **245** connected therewith. This offset arrangement **258** is also shown in dotted lines in Fig. 8. With this kind of construction it is apparent that when lever **249** (Fig. 10) is rocked clockwise, the eccentric mounting of both latches tends to rock forwardly and therefore the shouldered points of the latches are shifted forwardly to the partly open position as represented by the dotted line position **259** at the right in Fig. 10. In a converse fashion, when the feed unit is being assembled on the printer, the counterclockwise motion of the lever **249** will tend to draw backward on the latches and cause them to clamp tightly against the latch plate shoulders and thereby compress the soft bumper members or rubber washers **260** which are mounted on the slide rods **32** and presented between the abutting ends of the feed unit and printer unit castings.

However, it is not sufficient for withdrawal of the feed unit that the latches should be merely moved forward. It is necessary that they be rocked out of the path of the latch plates and this is performed by rocking means about to be described. Loosely pivoted on each shaft **245** (Fig. 8) is an arm **262** which is on the same hub with the double ended lever **256** and located just under the latch **240**. Arm **262** is formed with an upstanding lug or tab **253** which is keyed into a notch **257** in the eccentric portion **258** for ease of assembly and positive connection. This arm **262** (Fig. 10) is also formed with an upwardly positioned extension **263** on which there is an adjustment screw **264**. The screw end is in the path of a projection **265** formed on the latch **240** near the pivot. A similar arrangement of lever **262**, screw **264** and extension **265** is associated with the other latch **242** shown at the right in Fig. 10. After the lever **249** has rocked the eccentrics **258** through about 90 degrees of movement, the screw **264** on lever **262** then comes into an abutting relation with the extension **265** on the latch to swing the latch. The ensuing movement is represented at the right in Fig. 10 where it is seen that the second degree of movement of latch **242** is represented by the dotted line **267** showing the position of the latch after it has been operated both longitudinally and with rotation. Therefore the operation of the lever **249** through a swinging motion of about 90 degrees causes the latches to not only be retracted, but also rocked out of the path of the latch plates so that the paper feed unit is disengaged and free to be retracted.

The carriage latch is so arranged that the natural unlatching movement of the latch handle from right to left (Fig. 8) corresponds with the required carriage movement from right to left when opening. The carriage may be closed against the printer, regardless of the position of the latch handle with out danger of damage to the latch.

Rejoining the feed unit carriage to the printer is also a simple operation. When the lever **249** is rocked back near the home position the first thing that happens is that the springs **252** cause the latches to follow along after the arms **262** and the latches move inward ready for locking action. Then the two units may be brought together and finally the lever **249** operated to bring it to a closed position against the side frame of the feed unit and in so doing the latches are drawn backward and the two units are joined firmly with a clamping action exercising pressure on the bumpers.

In order to compensate for various thicknesses of the record material which may be comprised of one or more layers of continuous forms and carbon strips, there is provided a means for varying the joining position of the feed unit on the printer. This is done by shifting the latch plates **241, 243** (Fig. 10) so that the feed unit is held in a position allowing room for a variable number of strips between the ribbon of the printer and the platen bar **63** of the feed unit. In order to shift the position of the latch plates, the blocks **232** and **233** upon which they are mounted are shifted by eccentric portions such as section **269** shown as formed near one end of shaft **225** and passing through a block **270** which is held in a U-shaped opening in the top of block **232**. Although the parts will be described with reference to the sectional showing at the lower left hand corner of Fig. 10, it will be realized that the construction is duplicated at the opposite end of shaft **225** to shift the two latch plates in synchronism.

Turning again to the manner in which shaft **225** governs the thickness adjustment, it will be noted that this shaft is mounted in adjustable eccentric bushings **281** near either end, said bushings being in the vertical walls of a pair of stationary brackets **271** and **272** secured to the top of the base frame **29** of the printer unit. These eccentrics **281** are separately adjusted for an askew correction which is in addition to the common thickness adjustment control of shaft **225**. The shaft ends project beyond bushings **281** with two eccentric portions such as portion **269** which passes through the notch opening of the adjustable blocks **232** and **233**. Each of these blocks is held on a printer base by three large screws **273** which pass through slots in the brackets **232** and **233**. When it is proposed to make an adjustment, the blocks **232** and **233** may be shifted longitudinally under the shouldered screws **273**. Oversize holes are provided in these blocks to permit such movement. Blocks **232** and **233** are positioned and guided by strips **274'** (Fig. 8) fastened to the printer frame which fit into slots in the bottom of these blocks running parallel to the support rods **32**. The square blocks **270** which are formed with cylindrical openings through which the eccentric portions pass are seated in the U-shaped openings cut into the top of brackets **232** and **233**, and these square blocks **270** are held over to one side and made readily removable by a clamping piece **274** which is pressed into position by an adjustable screw **275** which passes through the one side of the U-shaped opening and has a lock nut for holding it and the block **270** in position.

In order to twist shaft **225** to variable angular positions and thereby rotate the eccentrics to shift the latch blocks back or forth, there is secured to the left end of shaft **225**, a manipulative knob **276** which extends beyond the left side of the printer. The extending portion of the shaft upon which the knob is fixed is supported in a detent block **277** which projects from a bracket **278** fastened to the rail **27** forming part of the printer frame. Near the ends of shaft **225** there are attached collars **279** for confining the shaft laterally. Detent block **277** has two diametrically opposite spring loaded ball detents projecting from its outer face against the inner face of the knob **276** which in turn has conical detent holes radially displaced therein so as to give controlled increments of spacing.

There are times when an adjustment other than the parallel motion provided by eccentrics **269** is required. Then the separate bushings **281** may be turned individually in the fixed brackets **271**, **272** and in that way either end of shaft **225** and the corresponding latch plate may be shifted to align the platen with respect to all print heads. Another position maintaining device cooperates with the bracket blocks **232** and **233** in all positions. This other device forms a sort of prop between the feed unit and the printer unit and takes the form of the bolt **283** (Fig. 10) which is threaded into one end of block **232** and provided with a lock nut for holding it in the adjusted position. The head of bolt **283** cooperates with a machined surface **284** cut into the side of the base casting **30** of the feed unit. The bolts **283** are adjustable in order to absorb tolerances in the carriage latch system. Thus the first operation is to adjust the stop bolts **283** so that the latch will draw up the carriage snugly against the printer and yet not require excessive handle pressure to latch. Once adjusted, readjustment of the bolts **283** is never required for changes in paper thickness or for skewed alignment of the platen.

It is explained hereinbefore how the feed unit is latched in place when it is in position to receive printing impressions. It is also required that the feed unit should be stopped and held in a certain position when it is retracted away from the printer unit. In other words, it is not enough merely to put enlarged portions on the ends of the sliding rods **32**, but there should be some assurance that when the units are separated and the operator has her hands between them that they should not come together. In order to provide such a stop and latch arrangement for the retracted position, there is pivoted a swinging latch dog **288** (Figs. 8 and 9) on the side of the printer unit and pivotally mounted on center **289** extending from the side of block **34**. A compression spring **287** between block **34** and the inside surface of dog **288** tends to hold it in the angular position to which it is turned. Cooperating with this dog **288** is a latching member **290** fastened to the end of the slide rod **32** by nut **291**. Latch member **290** is formed with a long upper section and has a cross-sectional area in the form of a reclining L-shape. The long upper portion of **290** normally slides over the top of dog **288** (Fig. 8) which is normally positioned in a horizontal manner, as shown, and the retracting member **290** is unobstructed in the movement to the left until the small lower extension **292** strikes against the lower portion **293** of the dog and rocks it in a clockwise direction. Then the dog assumes the position shown in Fig. 9 where a pointed portion at the upper left corner of the dog is projected through a slot in the top portion of the member **290**. Thus the retracting rod and member **290** is not only brought to a halt by the rubber bumper, but the dog **288** is also projected up into a latching position to prevent an immediate return movement of the feed unit. In order to impart a return movement of the feed unit to the closed position towards the printer, it is necessary to give the unit and the attached latching member **290** another short retracting movement to swing the dog **288** further clockwise to a vertical position in the slots, and then the feed unit is free for movement toward the right and in so doing again swings the dog 90 degrees more in a clockwise direction and back to the horizontal position of Fig. 8.

When the feed unit and the latching parts carried thereby are connected in the proper position ready to receive printing impressions, an indication is given that the printer may proceed to operate. This is done by the operation of a switch **295**, the operating member of which is struck by the end of a slide rod **32** when the feed unit is properly assembled as shown in the lower right hand corner of Fig. 8.

While there have been shown and described and pointed out the fundamental novel features of the invention as applied to a preferred embodiment, it will be understood that various omissions and substitutions and changes in the form and details of the device illustrated and in its operation may be made by those skilled in the art, without departing from the spirit of the invention. It is the intention, therefore, to be limited only as indicated by the scope of the following claims.

What is claimed is:

1. The combination with a printing machine and a record feed device cooperating therewith, of a device for adjustably connecting said record feed device to said printing machine comprising a pair of rods attached to the base of said feed device and extending therefrom with projecting unsupported ends, and a frame on said printing machine formed with two sets of aligned openings to receive said rod ends for sliding movement therein.

2. The combination set forth in claim 1 with latching means for holding said feed device in a closed position with respect to the printing machine ready for the record therein to receive printing.

3. The combination set forth in claim 1 with two latching devices for holding said feed device either in a closed print receiving position, or an open retracted position wherein the parts are accessible.

4. The combination with a printing machine and a record feed device cooperating therewith, of a device for adjustably connecting said record feed device to said printing machine comprising a printing device and a record feeding unit associated therewith, said feeding unit having a platen at one end, said printing device having printing instrumentalities on an end facing the platen, of a separable joining means between the feeding unit and the printing device including a pair of spaced latches on one and latch plates on the other which are engaged by said latches, and means for varying the positions of said latch plates, whererby adjustment is made to vary the space between the platen and the printing instrumentalities in accordance with the number of layers of record material comprising the record.

5. The combination set forth in claim 4 and shiftable blocks on which said latch plates are mounted, and manipulative eccentrics cooperating with said blocks to change the position of the blocks and latch plates.

6. The combination set forth in claim 5 and a shaft and separate adjustable eccentric bushings therefor, and wherein said eccentrics are on said shaft which in turn is mounted in said separate adjustable eccentric bushings mounted on opposite sides of the machine, whereby separate lateral aligning adjustments may be made to correct askew setting of the feeding unit relative to the printing device.

7. The combination set forth in claim 4 and a pivot rod for each latch having an eccentric portion whereon each latch is pivoted, an arm also mounted on said rod with a lost motion connection to said latch, and manipulative means for rocking said rod with two degrees of movement, the first movement serving to swing the eccentic latch pivot portion so that the latch is shifted away from a shoulder on the latch plate, and the second movement causing the arm to engage and swing the latch therewith away from the shoulder on the latch plate to release the feeding unit for retraction.

8. The combination set forth in claim 7 wherein said latches and pivot rods are duplicated on opposite sides of the unit, said manipulative means including a handle attached to one rod, and a pair of double ended levers on the rods with crossed connectors for transmitting the manipulative movement from one side to the other.

9. In a record feeding device, record advancing means comprising a line spacing device and means for making

minute adjustments of the record position relative to the spacing device including a set of planetary gearing between the driving and driven parts of said advancing means, said gearing including a worm gear the helical ridges of which act as gear teeth in planetary gearing, and manipulative means for rotating said worm gear to cause minute changes in the position of the planetary gearing and the record position.

10. In a record feeding device, a plurality of sets of pin feed tractors, said sets being arranged to define a confined record path of less than 180° with respect to a reference point on the path, a pivotal mounting for one of said sets, a retracting means for said feeding device, spring means tending to draw said pivoted set to a position wherein the record path is widened when the feeding device is retracted relative to an operator on the record, and an operating means for automatically swinging said pivoted set back to define the confined path when the feeding device is restored from the retracted position.

11. In a pin feeding device, a tractor pin feed unit with a pair of sprockets over which is drawn a chain with extending pins, a pair of shafts upon which said unit is mounted, one of said shafts carrying one of said sprockets for driving the unit, and the other shaft carrying a supporting frame for the unit, the other sprocket being mounted for rotation on said frame, means for locking said frame in an adjusted position on said other shaft comprising an annular wedge shaped ring on the frame and embracing said other shaft, a cylindrical split ring to be forced between the wedge ring and said other shaft, and a threaded nut on said frame for forcing said split ring between the wedge ring and said other shaft, said drive sprocket being keyed to the first-mentioned shaft by a tapered key with a head, and a shouldered nut on said frame to engage said key head and thereby serving to extract the key when it is turned.

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