

[54] **PAPER HOLD DOWN AND
PENETRATION CONTROL
CONSTRUCTION FOR HIGH SPEED
PRINTERS**

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[22] Filed: **Sept. 9, 1970**

[21] Appl. No.: **70,792**

[52] U.S. Cl. 197/133 P, 197/149, 226/83

[51] Int. Cl. B41j 11/34

[58] Field of Search 197/133 R, 133 P, 133 F, 132, 197/127 R, 127 A, 131, 132, 135, 136, 142, 144, 149, 84; 101/93 R, 287, 193, 288, 43, 45, 44; 226/75, 79, 82, 83, 174, 179

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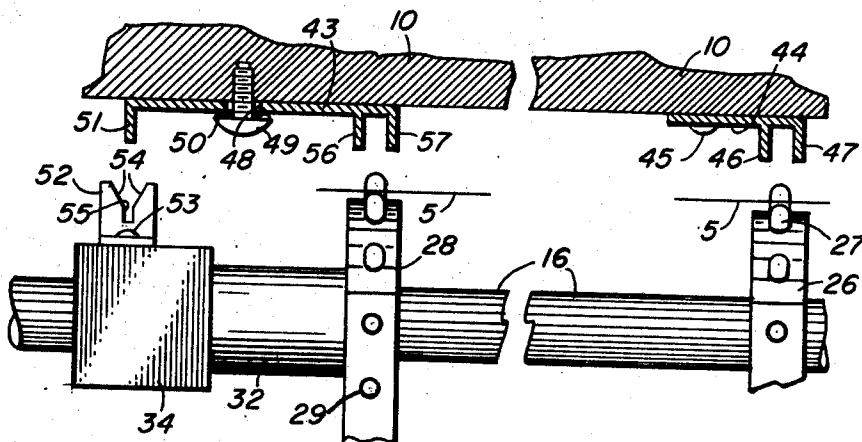
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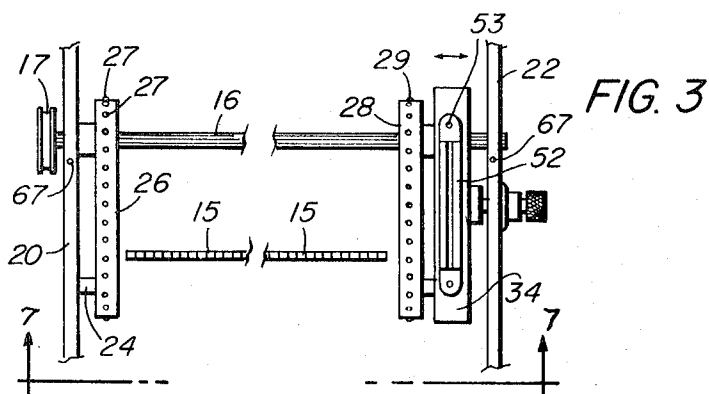
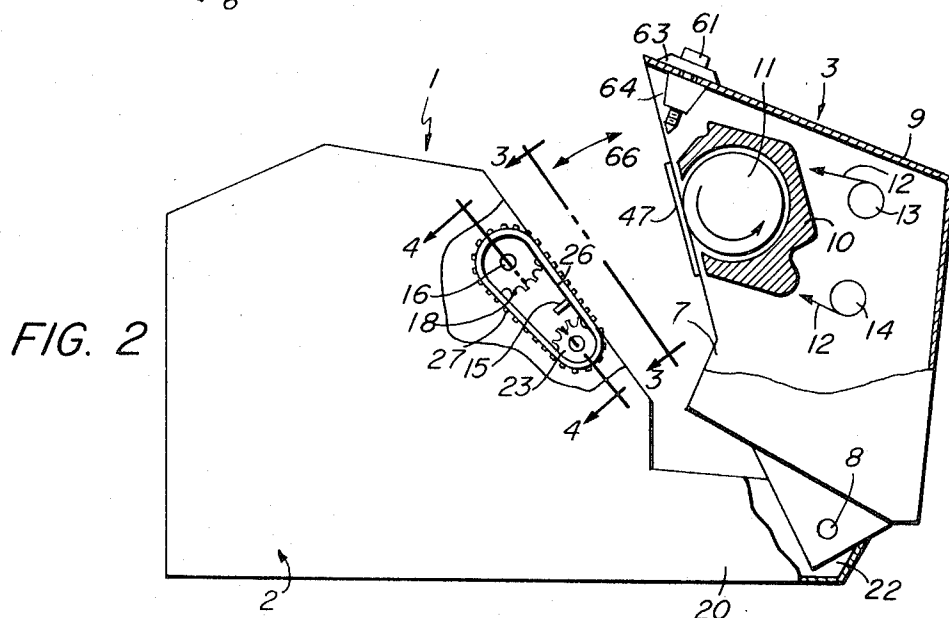
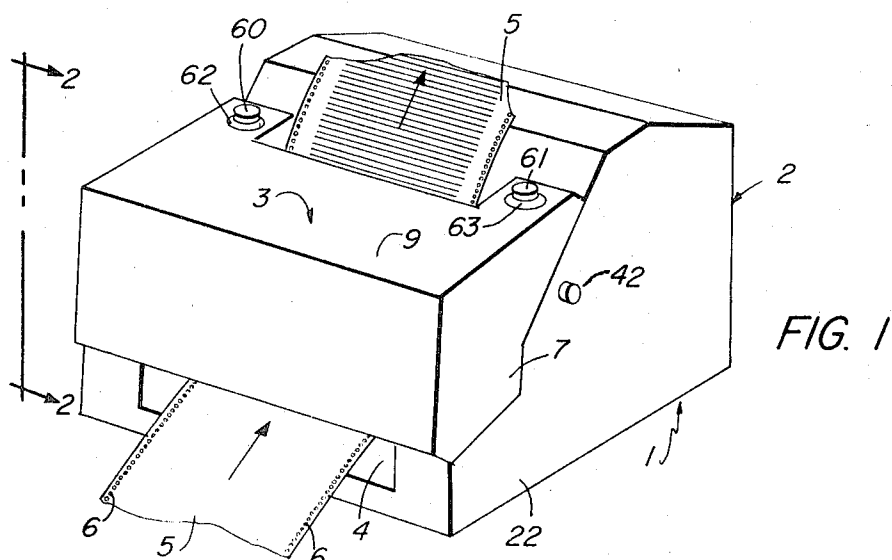
[57] **ABSTRACT**

A paper hold down and penetration control for high speed printers in which the print drum is carried on a yoke pivotally attached to the frame in which the hammers are supported, comprising adjustable means for controlling the nearest approach of the print drum to the hammers, and a paper feed and hold down assembly comprising tractors mounted on the main frame and hold down plates connected to the yoke.

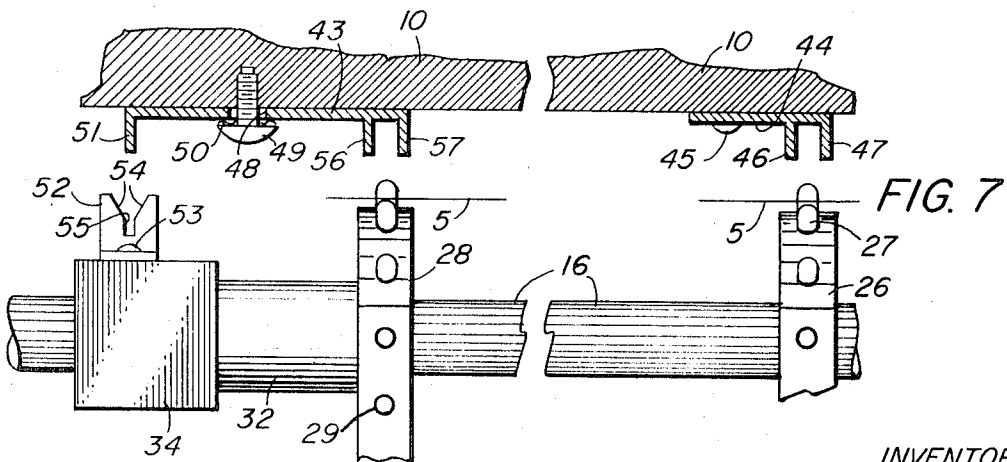
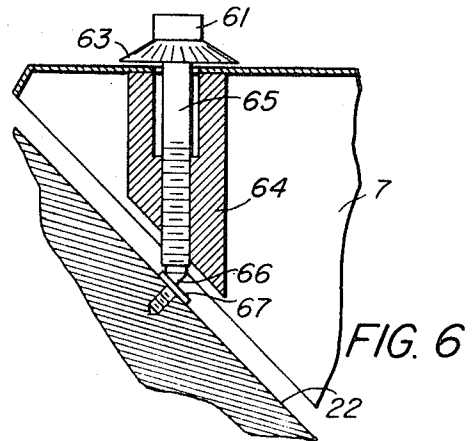
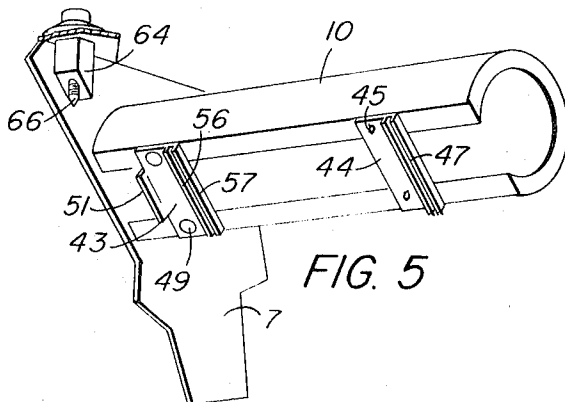
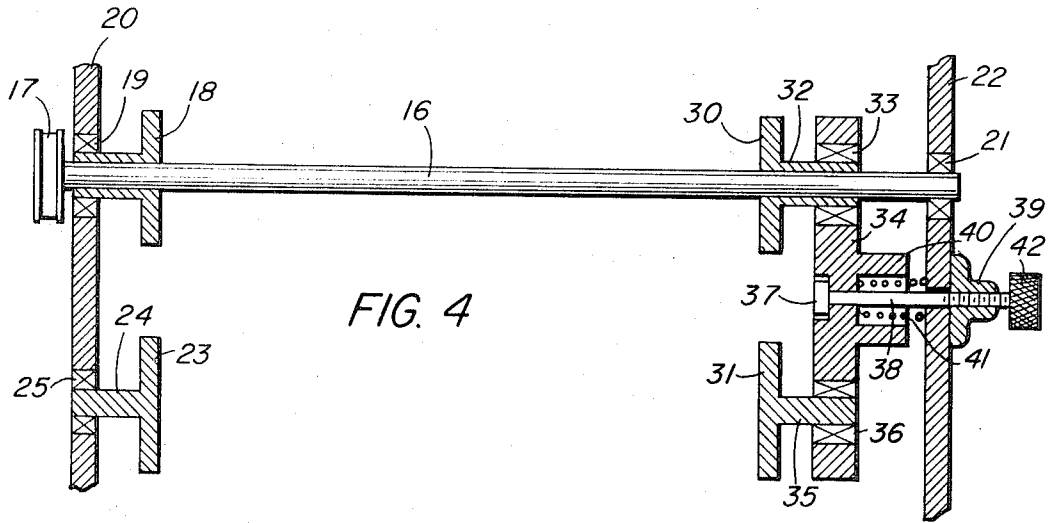
The lateral spacing of the tractors is adjustable to accommodate variations in paper width, and the hold down assembly is automatically adjusted by cam means operated by pivoting the yoke, to maintain proper alignment with the tractors.

9 Claims, 7 Drawing Figures





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PAPER HOLD DOWN AND PENETRATION CONTROL CONSTRUCTION FOR HIGH SPEED PRINTERS

Our invention relates to high speed printers, and particularly to a novel paper feed and penetration control assembly.

In high speed printers of the line at a time type, the distance between moving type carrier and the bank of print hammers is critical to the print quality produced. If the spacing is too small, undesirable embossing of the printing paper may occur. If it is too large, inadequate print density may be produced. Proper spacing is further affected by the thickness of the forms on which printing is done; i.e., single part or multiple part forms, and varies with the depletion of ink in the inked ribbon that makes the impression on the top copy.

Closely related problems are associated with the feeding of paper to the print station. Paper is advanced from line to line, at speeds of typically 600 lines per minute, by means of paper feed tractors provided with paper engaging pins protruding through holes formed on the sides of the paper. Hold down plates are conventionally associated with the paper feed tractors, to prevent the paper from jumping off the pins, and to exert a slight downward pressure on the paper to aid in guiding it and to some extent damping the noise that occurs when the hammers strike the paper. The proper gap between the hold down plates, and tractors as well as the distance between the print drum and the hammers, depends on the number of copies to be printed, together with intervening transfer sheets, such as carbon paper or the like.

A third factor that it must be taken into account is that the distance between the sprocket holes on the sides of the paper forms may vary with temperature or humidity, or because of variations in manufacture. Such variations may cause a set of forms to be jammed or torn in a printer that is otherwise set up properly simply because the distance between the centers of the sprocket holes is not the same as the distance between the paper engaging pins in the feed tractors.

The objects of our invention are to facilitate the adjustment of a high speed printer to accommodate forms of varying thickness and slightly varying dimensions, while at the same time simplifying the control of the spacing between the paper and the print carrier to attain uniform print quality.

Briefly, the above and other objects of our invention are attained by a high speed printer construction in which the paper feed tractors are mounted on either side of a bank of print hammers in a main frame. A yoke pivoted on the main frame carries the rotating type carrier. Hold down plates adapted to cooperate with the paper feed tractors are mounted on the yoke, so that they will be properly spaced from the tractors with a given form thickness at a particular separation of the print drum from the bank of hammers that is appropriate to the form thickness. Adjustable stops are provided on the yoke for engaging fixed stops on the main frame to control the approach of the yoke to the main frame so that the proper spacing can be selected. By this arrangement, the desired paper hold down gap is automatically selected at the same time as penetration control is effected.

At least one of the feed tractors is adjustably positioned laterally so that the exact spacing between the tractors can be adjusted to accommodate variations in the distance between the sprocket holes in printing paper from various batches. The hold down plate which cooperates with the movable feed tractor is mounted in laterally movable relation on the yoke. Cooperating cam means on the hold down plate and the tractor serve automatically to align the former with the latter as the yoke is pivoted toward the frame to bring the print drum into operative relation to the bank of print hammers. This automatically insures proper alignment of the hold down plates with the tractors, regardless of changes in the paper width adjustment.

Once the apparatus is properly set up for form width and thickness, appropriate adjustments can be made from time to time to accommodate for depletion of the ink in the printing ribbon. A number of adjustments which are inter-related, and difficult to correlate if made independently, are made simultaneously with uniform results.

DESCRIPTION OF THE DRAWINGS

The apparatus of our invention, and its mode of operation, will best be understood in the light of the following detailed description, together with the accompanying drawings, of a preferred embodiment thereof.

In the drawings,

FIG. 1 is a schematic perspective sketch of a high speed printer in accordance with our invention;

FIG. 2 is a schematic end view, with parts broken away and parts shown in cross section, taken substantially along the lines 2—2 in FIG. 1;

FIG. 3 is a schematic fragmentary plan view, with parts broken away, taken essentially along the lines 3—3 in FIG. 2 and showing the paper feed and printing station of the printer of FIGS. 1 and 2;

FIG. 4 is a simplified schematic view, with parts showing in cross section, of the apparatus of FIG. 3 on an enlarged scale, taken substantially along the lines 4—4 in FIG. 2, and showing the paper feed apparatus with the belts carrying the paper engaging pins removed;

FIG. 5 is a schematic perspective sketch of a portion of the yoke forming a part of the apparatus of FIGS. 1 and 2;

FIG. 6 is a schematic fragmentary cross-sectional sketch of a portion of the apparatus of FIG. 2 illustrating the construction of the adjustable penetration and form thickness control stops; and

FIG. 7 is a schematic plan view, taken substantially along the lines 7—7 in FIG. 3 but including the portions of the yoke to which the hold down plates are secured.

Referring to FIGS. 1 and 2, we have shown a high speed printer generally designated 1 having a main frame 2 and a yoke 3 pivotally secured to the main frame. FIG. 2 shows the yoke swung away from the frame, as for paper loading, and FIG. 1 shows the yoke in printing position.

The framing construction of the printer has been simplified for clarity, the primary object being to show the basic framing members without the inclusion of details of auxiliary cover panels, fastenings and the like. As shown in FIG. 1, the main frame 2 of the printer is provided with a bay 4 to admit printing paper 5 provided with feed pin engaging holes 6 at the sides. The paper 5 may comprise a number of sheets of printing paper with intervening transfer sheets, such as carbon paper or the like, or it may be a single sheet. As indicated, the paper 5 passes into the bay 4 and up under the yoke to emerge from the top of the printer.

Referring to FIGS. 1 and 2, the yoke is provided with end plates 7 pivoted at 8 to the side plates 20 and 22 of the main frame. The yoke has a cover panel schematically indicated at 9. The end plates 7 of the yoke are held together by a casting 10 that also acts as a ribbon guide and as a shroud over the type carrier. The type carrier is here shown as a print drum 11 of any conventional construction that can be rotated at a constant speed by conventional means, not shown.

An inked ribbon 12, shown in part in FIG. 2, has ends secured to a pair of mandrels 13 and 14. The ribbon 12 passes around the shroud 10 and over the face of the print drum 11 so that when the print hammers, located as suggested at 15 in FIG. 2 and more amply shown in FIG. 3, create an inked impression on the top sheet of paper 5 by striking the paper and ribbon against the print drum 11 in a conventional manner well known to those skilled in the art.

Referring to FIGS. 2, 3, and 4, the paper feed assembly comprises a splined shaft 16 to which a drive pulley 17 is affixed. The pulley 17 is arranged to be driven by a conventional paper feed drive motor, not shown. A first paper feed drive sprocket 18 is received on the splined shaft 16 to be driven by the shaft, and the sprocket 18 is received in conventional bearings schematically indicated at 19 in the side frame 20 forming a part of the main frame 2. The shaft 16 is journaled its other end in conventional bearings 21 in the opposite side frame 22 forming a part of the main frame 2.

A second paper feed sprocket 23, as shown in FIGS. 2 and 4, has a shaft 24 journaled in conventional bearings 25 in the

frame 20. As shown in FIGS. 2 and 3, a belt 26 is driven by the sprockets 18 and 23 and carries projecting paper engaging pins 27 to engage a row of perforations along one side of the printing paper.

On the opposite side of the bank of hammers 15, as shown in FIG. 3, a second drive belt 28 carrying paper engaging pins 29 is adjustably mounted on the splined shaft 16. Referring to FIGS. 3 and 4, the belt 28 is carried on sprockets 30 and 31 corresponding to the sprockets 18 and 23, respectively. The sprocket 30 has a hub 32 machined to accept the splined shaft 16 to be driven thereby but slidable axially therealong. The hub 32 is carried in bearings 33 mounted in a metal block 34. Similarly, the sprocket 31 has a shaft 35 journaled in bearings 36 mounted in the block 34.

A bolt having a head 37 and a threaded shank 38 passes through an aperture in the block 34, through a corresponding clearance hole in the frame 22, and into threaded engagement with a boss 39 secured to the frame 22. A stop 40 is formed integral with the block 34 to control the closest approach of the block 34 to the frame 22.

A spring 41 urges the lock 34 and tractor carried thereby to the left in FIG. 4. A form width adjustment knob 42, shown in FIGS. 1 and 4, is fixed to the end of the bolt shank 38, as with a set screw, not shown. It will be apparent that upon rotation the knob 42, the block 34 and the tractor carried thereby can be moved to the right or to the left, as for a total travel of, for example, one-eighth of an inch, to accommodate minor variations in form width.

Referring to FIGS. 2, 5, and 7, a pair of hold down plates 43 and 44 are mounted on the ribbon guide casting 10 for cooperation with the paper feed tractors in a manner to appear. The plate 44 is fixedly mounted on the shroud 10 by conventional means such as bolts 45. A pair of depending guide lips 46 and 47 are formed integral with the plate 44, and extend outwardly to cooperate with and guidingly receive the paper engaging pins 27 on the fixed tractor belt 26 when the yoke 3 is swung into position adjacent the frame 2.

The hold down plate 43 is adjustably mounted on the yoke 10 by means of elongated slots 48 receiving screws 49 with clearance to permit transverse motion of the plate 43. A spring element 50 between the head of the screw 49 and the plate 43 serves to yieldingly urge the plate 43 against the shroud 10.

The adjustable plate 43 is provided with a guide lip 51 adapted to cooperate with a locating cam 52 secured to the movable block 34 by means such as screws 53 (FIGS. 3 and 7). As best shown in FIG. 7, the cam 52 is formed with downwardly sloping sides 54 converging to a slot 55 that accepts the guide lip 51. Thus, in any adjusted position of the block 34, within the range of adjustment provided, the lip 51 will enter the cam 52 and engage one of the sides 54 causing the plate 43 to be moved into alignment with the lip 51 engaging the slot 55. That action positions a pair of guiding lips 56 and 57 formed integrally with and depending from the plate 43 so that they will properly register with the projecting pins 29 carried on the tractor belt 28.

The approach of the print drum 11 to the hammers 15 is controlled by a pair of manually adjustable knobs 60 and 61 located on top of the yoke as shown in FIG. 1. The knob 60 is connected to a graduated dial plate 62 that cooperates with an index marked on the top of the yoke 3 to indicate the rotated position of the knob 60. A similar dial plate 63 is connected to the knob 61. The knobs 60 and 61 and their associated controls are identical; thus, only the knob 61 will be described in detail.

Referring to FIGS. 2, 5, and 6, a support block 64 is formed integral with each of the yoke end plates 7, and threaded to cooperate with a threaded screw 65 fixed to the knob 61. The screw 65 terminates in a conical end 66 that protrudes from the block 64 and is adapted to engage a hardened steel button 67 secured to the side plate 22. Engagement of the side of the conical portion 66 with the flat on the button 67 provides line contact that gives better support than a point contact engage-

ment with the stop 67. It will be apparent that upon rotation of the knob 61, the approach of the yoke to the main frame can be accurately controlled. The dial plates such as 63 are preferably labeled with numbers so that both the knobs 60 and 61 can be set exactly to the same positions. Two adjustable stops rather than one are used so that the yoke can be supported at both sides.

Operation of the apparatus of our invention will be generally apparent from the above description. Briefly, with the yoke 3 swung open in the position shown in FIG. 2, and there held by suitable limit stops with respect to the frame, not shown, paper 5 comprising a selected number of forms is put into the bin 4, FIG. 1, and passed up over the sprockets on the paper feed tractor. The left hand side of the form, as seen in FIG. 1, is engaged with the pins 27 on the fixed tractor, and the form width adjustment knob 42 is rotated until the pins 29 on the adjustable tractor are properly registered with the sprocket holes on the other side of the sheet. The yoke is then lowered into operating position, with the projections such as 66 on the screws such as 65 engaging the buttons such as 67 of FIG. 6. The lip 51 on the adjustable hold down plate 43 will now slide into registry with the cam 52, allowing the lips 56 and 57 to register with the sprocket pins 29. Initial settings for the knobs 60 and 61 may be made on the basis of experience and determined by the number of copies in the form. Final adjustments can then be made to prevent paper jamming, light printing, smudging, or embossing. The knobs are adjusted to move the print drum away from the hammers, and correspondingly reduce the gap on the record forms by the hold down plates 43 and 44, if the forms tend to jam of if it is desired to avoid a tendency to emboss on very thin forms. Also, it may be desired to increase the spacing somewhat when the ribbon is installed, to avoid smudging. Closer spacing between the print drum and the hammers is needed for average form thickness, or to maintain density as the ribbon becomes depleted. It will be seen that as the yoke is moved away from the frame to accommodate for thicker forms, the gap increases between the hold down plates and tractors.

While we have described our invention with respect to the details of the preferred embodiment thereof, many changes and variations will occur to those skilled in the art upon reading my description, and such can obviously be made without departing from the scope of our invention.

Having thus described our invention, what we claim is;

1. In a high speed printer, first and second feed means each having projecting pins adapted to engage holes formed along the opposite edges of a record sheet and drivable to move the pins in a closed path to advance the record sheet in a longitudinal feeding direction;

means mounting said first sheet feed means in a fixed position laterally of the feeding direction;

adjustable means mounting said second sheet feed means for adjustment of the lateral spacing thereof from said first sheet feed means to accommodate record sheets of various widths;

first and second sheet hold down plates constructed and arranged for cooperation with said first and second sheet feed means, respectively, to prevent sheet engaged with said pins from escaping;

means mounting said first hold down plate in fixed lateral relation to said first sheet feed means;

means mounting said second hold down plate for movement laterally of the feeding direction;

said second sheet feed means and said second hold down means being provided with cooperating cam means for automatically aligning said second hold down means with said second sheet feed means in adjusted positions thereof laterally of the feeding direction.

2. A high speed printer as recited in claim 1 including a main frame mounting said sheet feed means and said mounting means therefor, and a yoke pivotally mounted on said frame and bearing said hold down plates and said mounting means therefor, said yoke means being pivotal about an axis

extending laterally of the feeding direction of said record sheet for movement between a first position operatively relating said hold down plates with said sheet feed means, and a second position separating said hold down plates from said sheet feed means; said cam means being engageable by pivotal movement of said yoke means from said second to said first position for automatically aligning said second hold down plate with said second sheet feed means as said yoke means is moved toward said first position.

3. A high speed printer as recited in claim 2, in which said second hold down plate is slidably mounted on said yoke means for movement laterally of the sheet feeding direction, said second hold down plate being formed with a guide lip forming a first portion of said cam means; said second sheet feed means being provided with a second portion of said cam means having a laterally enlarged slot for accepting said guide lip in positions of said second hold down plate laterally misaligned from said second feed means, said slot being formed to guide said lip into a position aligning said second hold down plate with said second feed means as said yoke means is pivoted into said first position.

4. A high speed printer as recited in claim 2, together with an adjustable penetration control comprising

a first stop, means mounting said first stop on said frame, a second stop and means mounting said second stop on said yoke in position to engage said first stop in said first position of said yoke,

one of said mounting means being adjustable to control the closest approach of said yoke means to said frame and thereby determine the gap between said hold down plates and tractors.

5. A high speed printer as recited in claim 4, together with a bank of print hammers mounted on said main frame,

a print drum rotatably mounted in said yoke for cooperation with said hammers in positions in the vicinity of said first position of said yoke means,

said adjustable mounting means serving to adjust the force with which said hammers engage said print roll, simultaneously with adjustment of the gap between by said hold down plates and tractors.

6. In a high speed printer having a main frame in which a bank of print hammers is mounted, a pair of sheet feed tractors mounted on said frame on opposite sides of a path over

said print hammers along which a sheet is to be fed for printing, said tractors comprising drive pins for engaging perforations formed along the opposite edges of the sheet, a yoke pivotally mounted on said frame for movement between first and second positions with respect to said frame, and a print drum rotatably mounted in said yoke for cooperation with said hammers in positions in the vicinity of said first position of said yoke;

a pair of paper hold down plates, means mounting said plates in laterally spaced relation on said yoke each in position to prevent a sheet engaged by the pins on a different one of said tractors from escaping from said pins in positions adjacent said first position of said yoke;

an adjustable penetration control comprising a first stop, means mounting said first stop on said frame, a second stop, and means mounting said second stop on said yoke in position to engage said first stop, one of said mounting means being adjustable to control the closest approach of said yoke to said frame and thereby determine the gap between the hold down plates and tractors and simultaneously adjust the force with which the hammers engage the print roll.

7. A high speed printer as recited in claim 6, at least one of said hold down plates being mounted for movement laterally of said path, a corresponding one of said tractors being adjustable laterally of said path to accommodate sheets of various widths, said one hold down plate and said one tractor being provided with cooperating cam means for aligning said one hold down plate with said one tractor in adjusted positions of the latter.

8. A high speed printer as recited in claim 7, said cam means being engageable by pivotal movement by said yoke toward said first position thereof.

9. A high speed printer as recited in claim 8, said one hold down plate being formed with a guide lip forming a first portion of said cam means; said one tractor being provided with a second portion of said cam means having a laterally enlarged slot for accepting said guide lip in positions of said one hold down plate laterally misaligned from said one tractor in adjusted positions thereof, said slot being formed to guide said lip into a position aligning said one hold down plate with said one tractor as said yoke is pivoted into said first position.

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