

Jan. 31, 1961

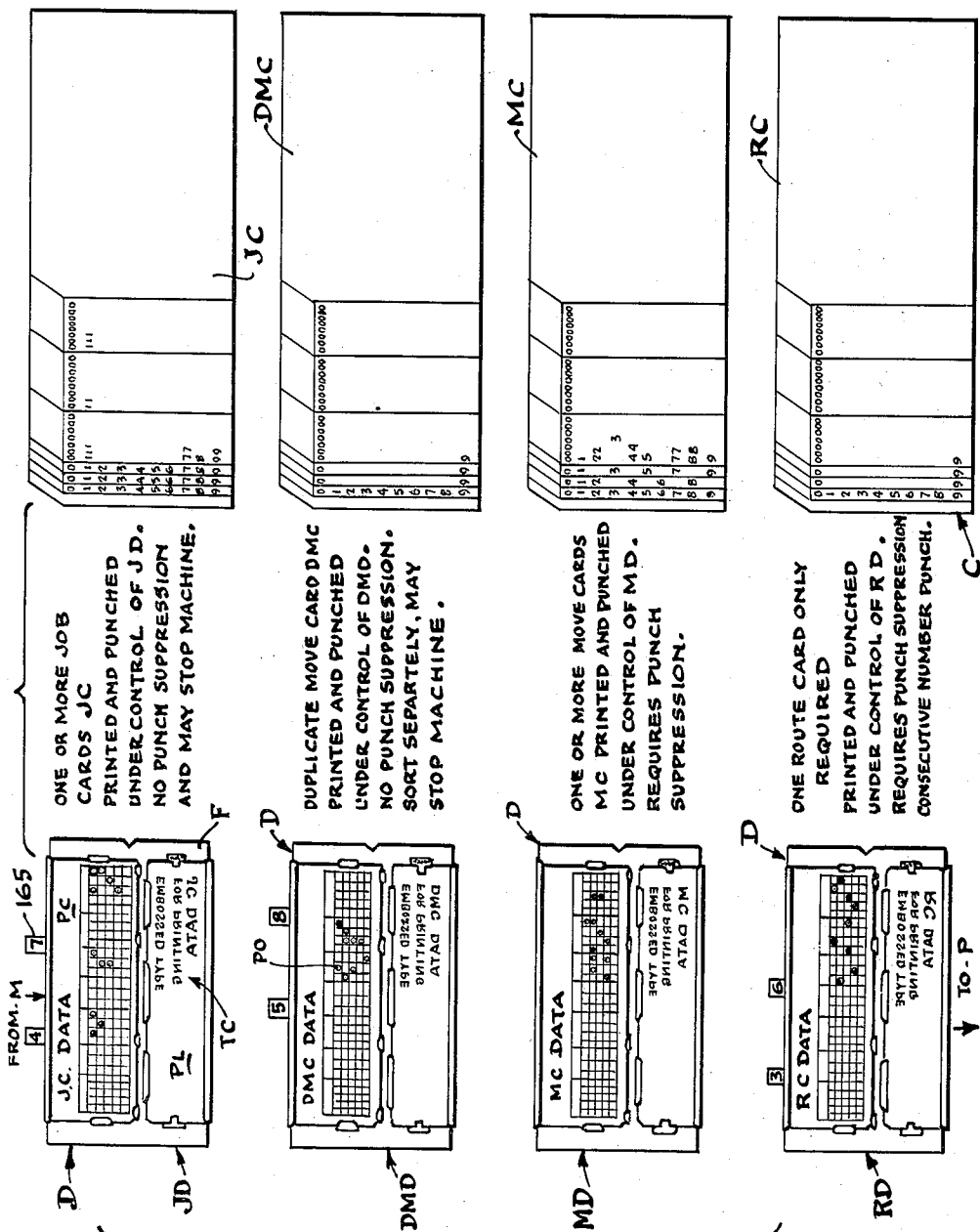
C. F. RUDD ET AL

2,969,727

SELECTIVE PRINTING AND PUNCHING MACHINES

Filed Dec. 1, 1958

7 Sheets-Sheet 1



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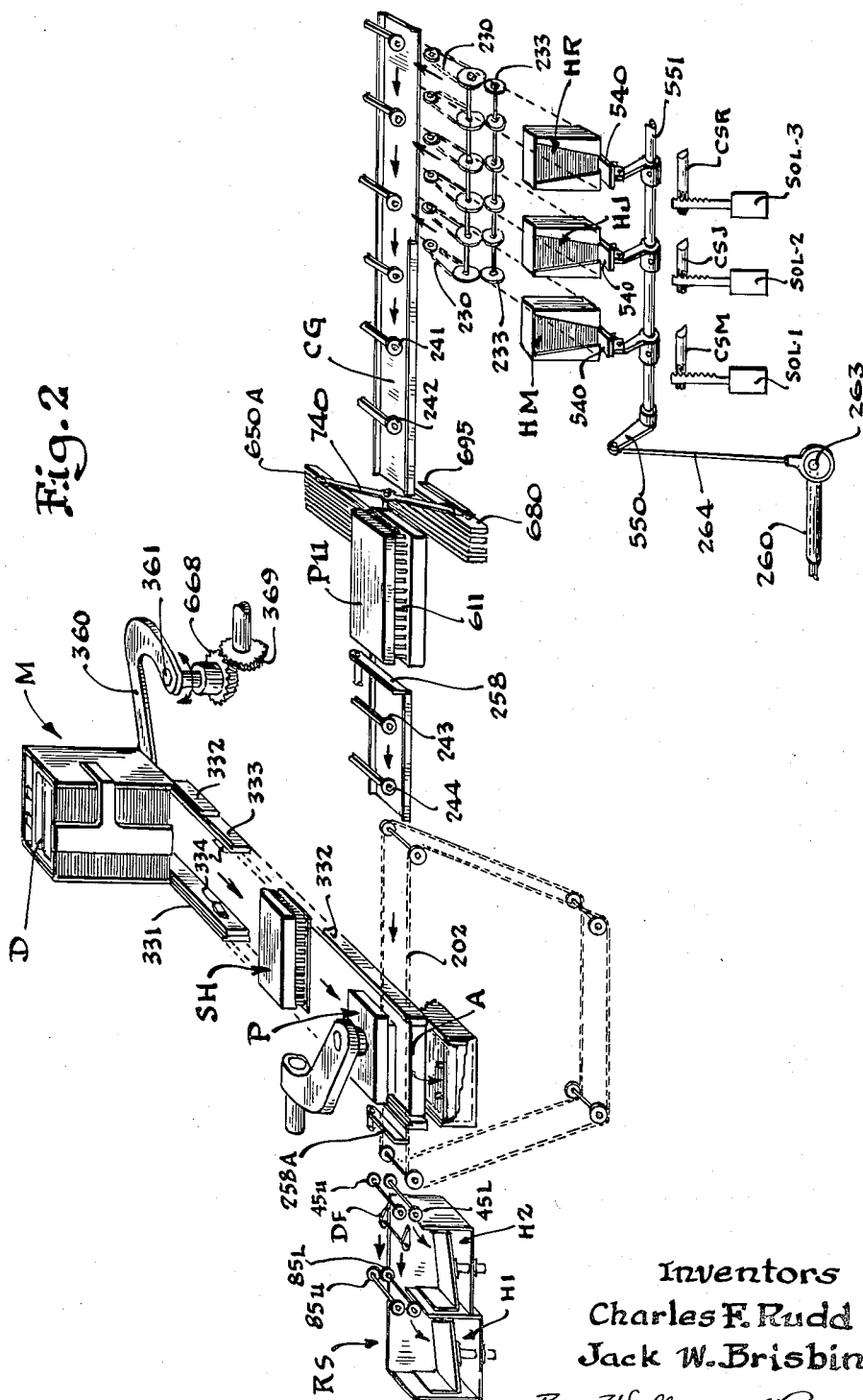
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7 Sheets-Sheet 2



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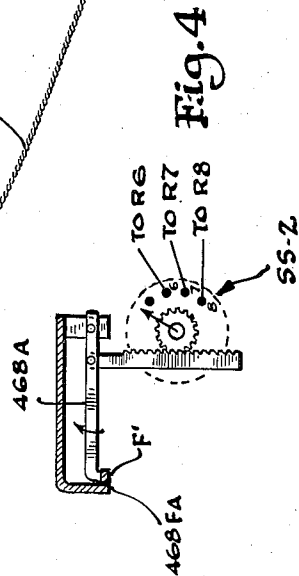
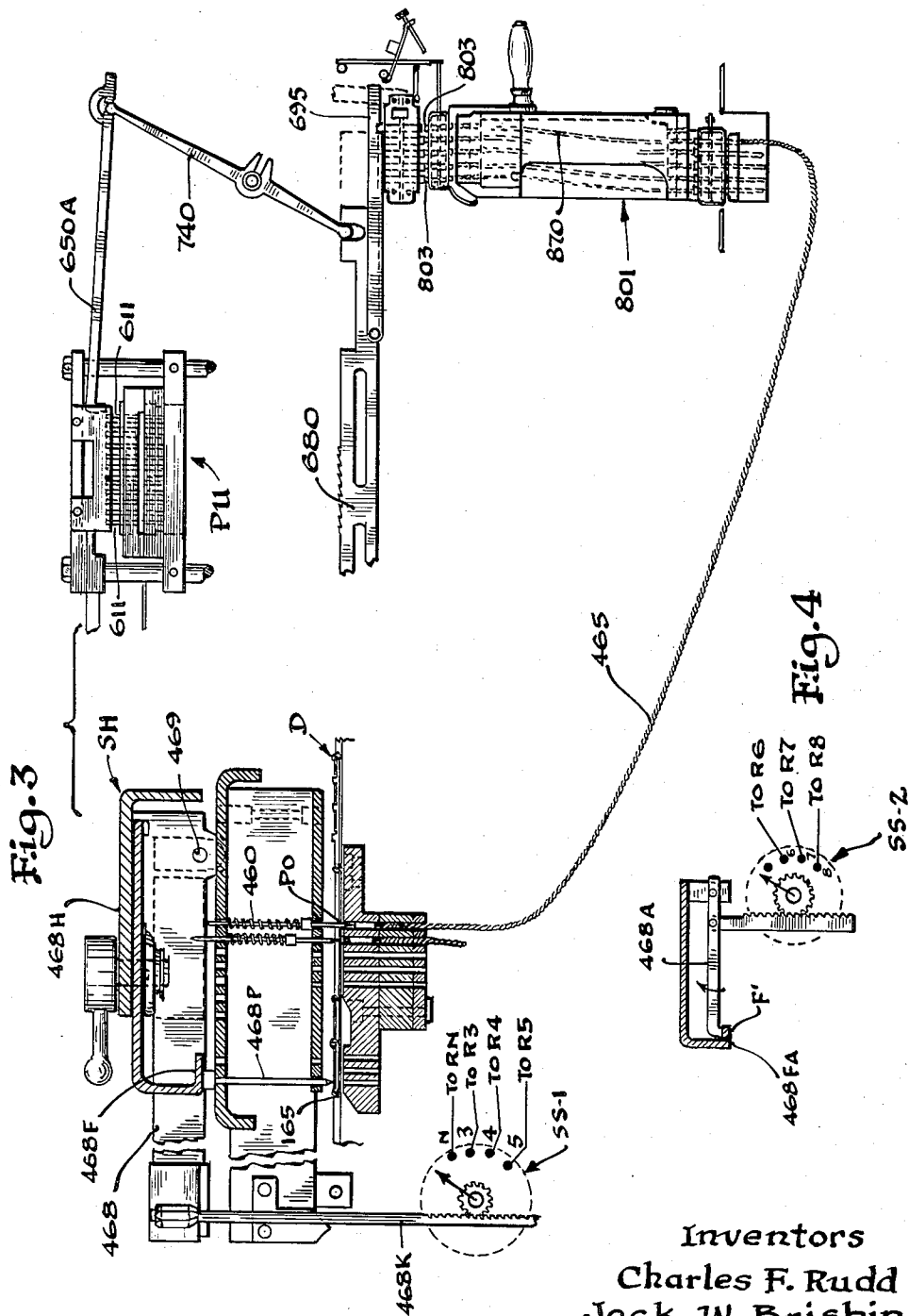
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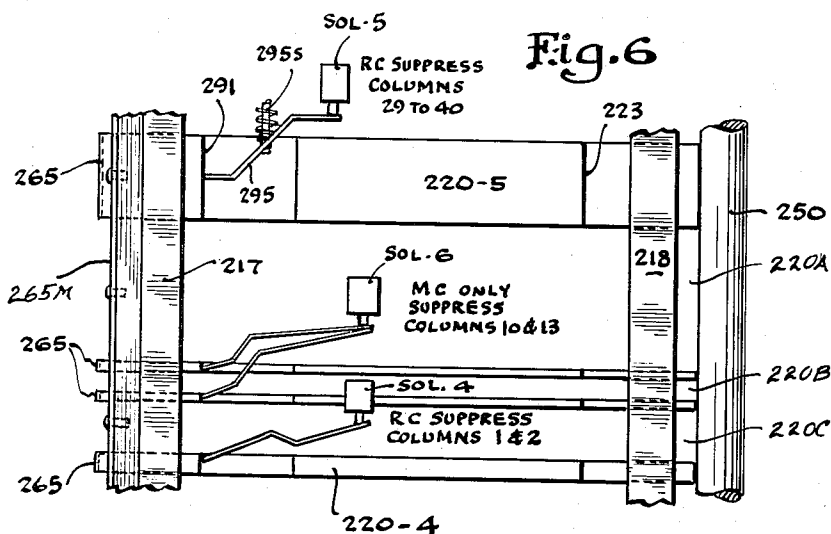
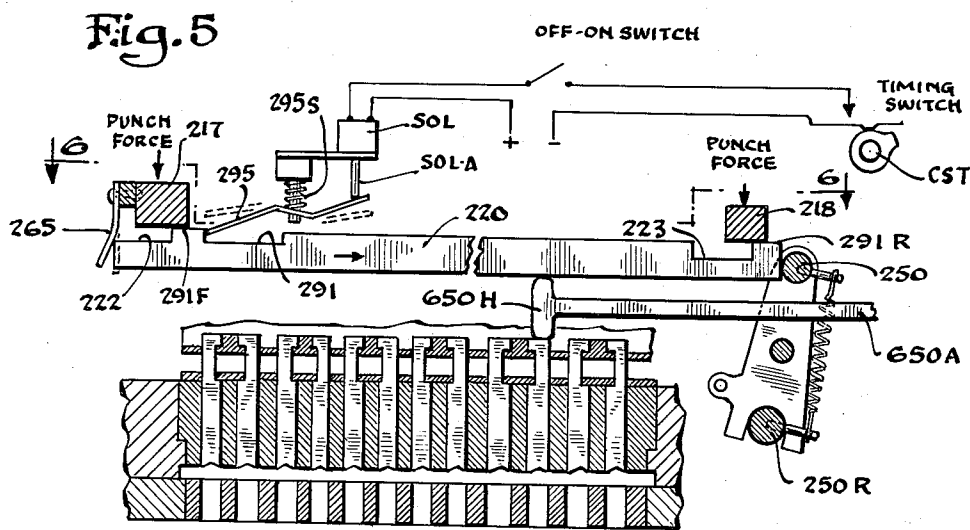
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SELECTIVE PRINTING AND PUNCHING MACHINES

Filed Dec. 1, 1958

7 Sheets-Sheet 4



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SELECTIVE PRINTING AND PUNCHING MACHINES

Filed Dec. 1, 1958

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Fig. 10

DEVICE	CONTROL TAB	CONTROL SWITCH CONTACTS	ENERGIZE RELAY	ACTUATE SOLENOID OR UNIT	FEED CARD	PUNCH SUPPRESS
RD	NO. 3	SS-1 NO. 3	R 3	SOL. 3 SOL. 4 SOL. 5	RC	YES
JD	NO. 4	SS-1 NO. 4	R 4	SOL. 2	JC	NO
DMD	NO. 5	SS-1 NO. 5	R 5	SOL. 1 SOL. 8	DMC	NO
RD	NO. 6	SS-2 NO. 6	R 6	SOL. 7 COUNTING UNIT CU		
LAST IN EACH DECK	NO. 7	SS-2 NO. 7	R 7	PRE-SET COUNTER STOP PSC		
ANY	NO. 8	SS-2 NO. 8	R 8	RC		
MD	NONE	SS-1 N	R N	SOL. 1 SOL. 6	MC	YES

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7 Sheets-Sheet 7

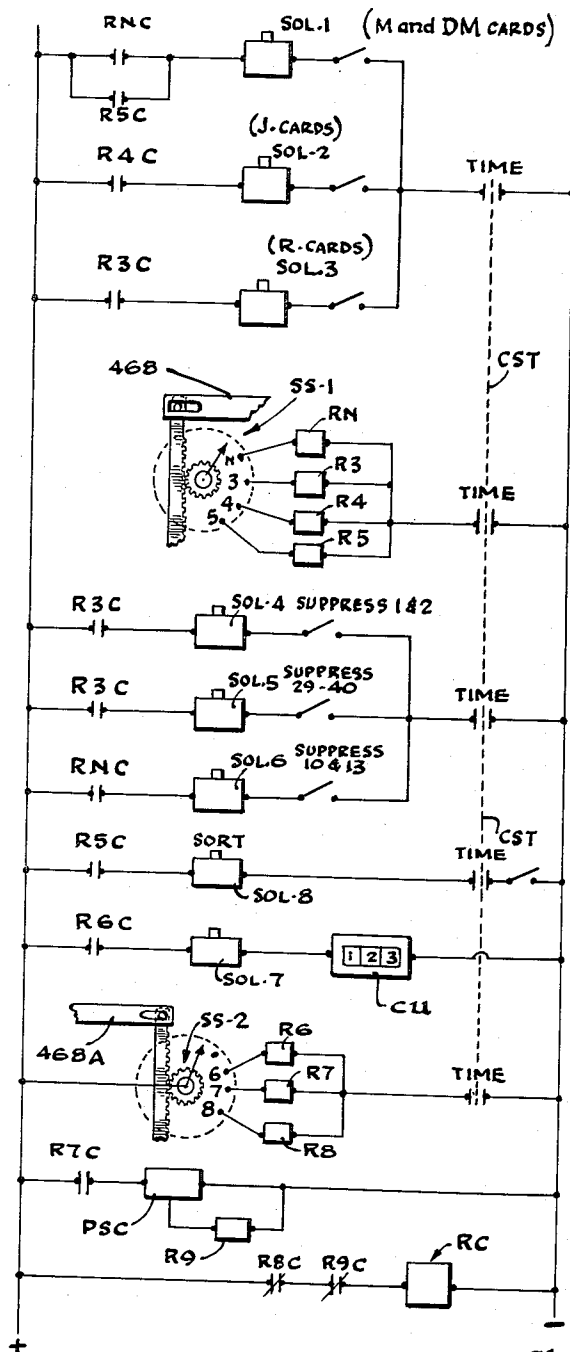


Fig. 11

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SELECTIVE PRINTING AND PUNCHING MACHINES

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Filed Dec. 1, 1958, Ser. No. 777,331

9 Claims. (Cl. 101—19)

This invention relates to machines for producing and processing information forms, and in particular relates to a printing machine wherein the forms produced are printed and punched under control of devices passed through the machine.

In expediting manufacturing processes and parts assemblies, and in processing data related to shipping schedules and inventories where information is to be furnished to traffic control personnel, department heads, foremen and supervisors, so-called systems printing methods have been proposed, that is, the information to be available is printed on individual forms such as cards or the like in accordance with a predetermined system. In some instances, information of this kind is easily set up using relatively small office-type printing machines such as offset duplicators and the like, but there are other instances where the amount of information to be handled is of such magnitude and complexity that such cannot be turned out with the smaller office type printing machines or duplicators.

The present invention is concerned with systems printing of a complex nature, and an aircraft overhaul and repair center, where component parts and assemblies are to be processed, is typical of a situation where a large amount of precise and accurate information incidental to the manufacturing and repair processes needs to be handled and passed among numerous persons involved. Further typical of situations of the kind under consideration would be the handling of inventory and cost information relative to completed jobs, and one of the primary objects of the present invention is to prepare accurately and expedite the handling of complex information typified by the foregoing illustrative situations.

The machine of the present invention includes many of the parts of and is related to the machine disclosed in United States Patent No. 2,710,406 wherein business instruments are printed and punched under control of information carried by printing and control devices. Thus, printing and control devices of a well-known kind are employed in the machine disclosed in the aforesaid patent, and these devices are adapted to carry embossed type characters which can be used for printing information forms at a printing station. Such devices also are adapted to carry punched-hole numerical data which can be used as a source of numerical data to be punched in the forms. Hence it will be seen that a machine of this kind readily lends itself to the preparation of information forms of the sort discussed above.

Now to continue with the consideration of systems preparation of information forms in accordance with the present invention, it should be explained that the entailed information forms necessarily are to fall into different groups or categories. Thus, while it may be that all the forms are to carry data of an identical kind identifying the over-all job for instance, the situation will be that a particular sub-assembly, repair of a sub-assembly or like sub-operation, is the responsibility of one department, while still other departments are responsible for remain-

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ing operations. Consequently, in expediting relay of information to different departments involved and in assuring that there are no ambiguities in the information, the information forms should be differently grouped and categorized accordingly as there is concern only with portions of the over-all information pertaining to the entire job.

Of course there are numerous analogies to the foregoing, and the handling of data relative to the current inventory situation and cost accounting after completion of a particular manufacturing process is another example where it is advantageous to group the information forms according to departments, the different forms bearing in-common data and some data not in-common.

In accordance with the present invention, information forms falling into different groups are arranged in their respective groups at a plurality of supply stations, and feed means are provided to properly advance the forms in a pre-determined order from the supply stations toward the punching station. Control over such feeding is accomplished by control data on the corresponding printing devices that are used to print the forms and control punching thereof. The printing and control devices each have numerical data in the form of punched openings which represent data to be punched in the information forms, but in accordance with the present invention the punching of data in certain columns of the forms is to be suppressed in predetermined columns depending upon which kind of information form happens to be at the punching station, and the accomplishment of this is one of the specific objects of the present invention.

The machine is constructed to enable the information forms to be stacked in mutually exclusive groups in as many number of supply hoppers, and each such hopper has associated therewith a feed finger or slide plate which is normally ineffective to feed a form therefrom. However, depending upon the control data carried by the printing device for which a particular form is to be fed to the punching station, the feed finger for that particular form is activated and the feed means for the remaining hoppers are held disabled, and simultaneously the punching unit is set up so that this particular form will only be punched numerically in predetermined operative columns even though the related printing device may carry numerical punched hole data in excess of the operative columns at the punching unit. When the next printing device of another kind is to be operably run through the machine, a form from its related group is to be advanced to the punching station, and the punches are operative in other predetermined columns.

Other and further objects of the present invention will be apparent from the following description and claims and are illustrated in the accompanying drawings which, by way of illustration, show a preferred embodiment of the present invention and the principle thereof and what is now considered to be the best mode contemplated for applying that principle. Other embodiments of the invention embodying the same or equivalent principle may be used and structural changes may be made as desired by those skilled in the art without departing from the present invention and the purview of the appended claims.

In the drawings:

Fig. 1 shows a systems association of printing devices and related information forms under the present invention;

Fig. 2 is a schematic perspective view showing the over-all organization of the present machine;

Fig. 3 is a sectional view showing elements at the sensing station and the punching station;

Fig. 4 is a detail view showing certain parts of the control;

Fig. 5 is a sectional view, partly schematic, showing

the manner in which the punches are operated and arranged to be suppressed;

Fig. 6 is a plan view taken substantially on the line 6—6 of Fig. 5 and showing the arrangement of punch suppression plates arranged in the machine in accordance with the set-up shown in Fig. 1;

Fig. 7 is a detail perspective view showing the parts for disabling a card feed plate;

Fig. 8 is a detail sectional view illustrating the construction of a counting unit which is used to control consecutive number punching;

Fig. 9 is a somewhat schematic perspective view of sorting mechanism used in the machine;

Fig. 10 is a chart of controlled operations; and

Fig. 11 is a wiring diagram of the control used in the present machine.

The present system

Printing and control devices used in the present instance are indicated generally at D in Fig. 1, these being of a well known kind. Each such device includes a frame F, and a printing plate PL and a punched card PC are removably mounted on the frame. Each plate is embossed with reverse reading type characters TC, and each card PC is punched with holes PO arranged in a known code to represent numerical data.

The manner in which these devices are moved through the machine will be described below, and the direction of movement from the supply magazine M to the platen P at the printing station of the machine, Fig. 2, is indicated by arrows in Fig. 1. This direction of movement and the arrangement of the four devices D shown in Fig. 1 is of significance as will be explained. Each frame F is adapted to carry at what amounts to its trailing edge one or more selectively locatable control tabs 165. These tabs represent control data which serve in part to control the operation of the present machine. Thus, as will be explained, each of the devices is halted at a sensing station in the machine where the punched openings PO are sensed incidental to setting up punches for punching the information forms. At the sensing station, the location of the control data represented by the tabs 165 is also sensed, and incidental to sensing of the latter the main control of the machine is set up to control the feeding of the information forms, here represented by cards C, Fig. 1, and simultaneously the punching thereof.

As mentioned above, there are four kinds of devices generally indicated by D in Fig. 1, and there are four kinds or groups of cards generally indicated at C, and the description of these will impart an understanding of systems operation under the present invention. Thus, the four devices D in the present instance represent one deck or group, and there will be numerous decks of this kind which contain other devices D. In any event, the first device in each such group passing through the machine is a route device RD which is used to print and punch a corresponding route card RC. There is only one such route device, and the printing plate on the device RD has embossed thereon the data that will be printed on the route card RC. Thus, the embossed type on the device RD reads "Embossed Type for Printing RC Data." The devices MD, DMD and JD are embossed in like manner for their cards as will be pointed out. Likewise, the device RD has numerical data punched in the card PC, and some or all of these data will be punched in the card RC depending upon the particular circumstances involved. Under some circumstances, it may be that none of the punched data carried by the device RD will appear on the related card RC, and this should be borne in mind in connection with the other devices to be described.

It should now be pointed out that Fig. 1 is set up on the basis of what is involved in handling information at an aircraft overhaul and repair center, and the device RD is to show all the routing through the center for a particular repair or assembly component item.

Following the device RD through the machine is a so-called move device MD which carries information relative to the sequence of moves of the repair or assembly component part in the factory. Such device is to have some or all of its punched hole information appearing on the related move card MC. There may be as many as six move cards MC required, and of course as many move devices MD are used.

There is to be a duplicate move card DMC for each move card MC, and the cards DMC will be printed and punched under control of their corresponding devices DMD. The number of the latter will be exactly that of the number of devices MD. However, as will be explained, the move cards MC and the duplicates DMC are to be separated in the machine after preparation.

The last device in the group or deck is a job device JD. There may be one or more of these, and the number may be different than the devices MD. The job device carries over-all information relative to each job performed, and there is a job card JC processed for each job device JD. In a deck, therefore, there are four fundamental kinds of devices, and there is an information card or like form for each such device. There is but one route device and card, but there are a variant number of the others.

All cards are to be printed at the printing station by the embossed type characters on the related devices D. As to punching, it should first be mentioned that the punching unit embodied in the present machine has forty columns of twelve punches each, so that it is possible to have punched numerical data appearing in any one of forty pre-arranged columns on the information forms. The punch columns are tied up in a pre-arranged manner with the columns of punched hole data on the cards PC carried by the printing devices D, but so far as the route card RC is concerned any punches that are set up for operation in punch columns 1 and 2 and 29—40 to punch data in the card RC are to be suppressed and thereby rendered inactive in a manner to be explained. The move card is to be accompanied by suppression of punch columns 10 and 13 at the punching unit, but there is to be no punch suppression so far as the duplicate move cards and the job cards are concerned, and therefore all punched hole data carried by the devices DMD and JD will be represented at the punching unit and will be punched in the cards DMC and JC.

General organization of the machine

In Fig. 2 of the present drawings, the over-all relationship of the essential components of the present machine is illustrated, and in general this particular figure is similar in many respects to Fig. 6 of Patent No. 2,710,406. Reference can be made to this patent for many of the drive connections which will not be explained in detail herein, and many of the reference characters used in Fig. 2 of the present drawings are those of the aforesaid patent to enable the various parts to be easily related.

The printing and control devices D are arranged in a supply magazine M at the back of the machine. Extending forwardly from the bottom of supply magazine M are a pair of guide rails 331 and 332. These guide rails extend past and beneath a sensing head SH located at the sensing station as will be described in more detail below. The guide rails terminate at a printing anvil A which is located beneath a stamper type platen P. The guide rails have shoulders on the inner faces thereof, and the frames F of the printing devices are adapted to rest on these shoulders so as to be properly guided from the magazine M in one cycle of the machine to come to rest beneath the sensing head. In the next cycle of the machine the particular printing device is sensed and in the same cycle is moved on to the anvil A at the printing station. Printing of a card C by a printing device D occurs in the next cycle of the machine, and in the following cycle both are passed to receiving or collecting stations.

It should be pointed out that carrier bars are arranged

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for reciprocation adjacent the inside faces of the guide rails 331 and 332. These carrier bars are provided with one-way feed dogs or pawls 334 which during reciprocation of the bars 333 engage the rear edge of a printing device in moving the same to the sensing and printing stations. The carrier bars 333 are reciprocated by a drive arm 360. This arm is oscillated by a shaft 361 which in turn is oscillated by a Scotch yoke (not shown) in turn driven by a pair of bevel gears 368 and 369 as explained in the aforesaid patent.

As explained in the aforesaid patent, the platen P is raised and lowered by a rocker mechanism which is cam operated, and this operation is under control of a one-revolution clutch which can be held disengaged if desired to prevent operation of the platen P and thereby any printing. Likewise, the shaft which drives the bevel gear 369 is connected to a one-revolution clutch which in turn can be disabled to interrupt feeding of printing devices from the magazine M, and there is also a clutch for disabling the card feed drive shaft. These clutches and the various feed rollers and bands to be described hereinafter are connected as described in the aforesaid patent to a main motor-driven shaft.

In the present instance, the information forms C are represented by tabulating cards of the well-known kind, and these are arranged in three groups in as many supply hoppers HM (move and duplicate move cards) HJ (job cards) and HR route cards as shown in Fig. 2. These forms or cards are arranged in vertical stacks in their respective hoppers, and it is the bottom-most form which is fed out in each instance. Such feeding is accomplished by feed slide plates 540 allocated to the respective hoppers HM, HJ and HR. These plates, unlike those of the aforesaid patent, are normally ineffective and are actuated selectively only under special circumstances as will be explained. It can here be pointed out, however, that individual drives for the plates 540 are mounted in spaced relation on a rocker shaft 551 which is oscillated by an arm 550 in turn under control of a drive link 264 as described in the aforesaid patent. The link 264 is operated by an eccentric 263, and this eccentric is rotated by a drive shaft 260.

In the cycle of the machine in which a printing device is advanced from the magazine M to the sensing station, a related card is fed from its hopper into a guide way CG and from thence directly to the punching unit PU where this card is stopped by a stop finger 258, Fig. 2, and punched in the next cycle.

The feed means thus employed in the present instance are substantially identical to those described in the aforesaid patent. Thus, a card advanced from its hopper is directed to a pair of related feed belts 230 which direct the card to the guide way CG where feed rollers 241 and 242 are effective to direct this card into the throat of the punch blocks so as to be positioned between the punch elements 611 and their related punch dies disposed therebeneath. Thereafter, the stop finger 258 is raised, and feed rollers 243 and 244 and a feed belt 202 are effective to pass the punched card to the printing station where the underside thereof to be printed overlies the upwardly disposed type characters on the related printing device at the printing station. The card to be printed is accurately oriented at the printing station by means including a stop finger 258A.

In the following cycle of the machine, the printed card is passed to a collecting or receiving station RS, Fig. 2, and may undergo sorting as will be explained.

The sensing station and the punching unit

Referring to Fig. 3, a printing device D is illustrated in a condition to undergo sensing by the parts associated with the sensing head SH at the sensing station. The sensing head is raised and lowered during the course of the sensing cycle and mounts a plurality of sensing pins

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460 which are adapted to enter the punched openings PO that may be provided in the device D being sensed. In the event that a sensing pin encounters a solid part of the card PC of the printing device, no punch is set up at the punching station, but in the event that a sensing pin 460 passes through such an opening, the lower end of such an active sensing pin activates a Bowden cable 465 as described in the aforesaid patent. This cable extends to the transfer unit 801, and the motion of the cable 465 is translated into upward setting movement of a transfer cable 870. The cable 870 in turn positions a transmitting pin 803. The pins 803 that are thus set at the punching unit represent the numerical data for which there are punched openings PO sensed at the sensing station, and the pins 803 in turn control the setting of rack bars 680 which are adapted to reciprocate left and right as viewed in Fig. 3, the extent of motion corresponding to the numerical data. Motion of the racks 680 in turn is transmitted accurately to punch interposers 650A, such occurring through the medium of connecting levers 740 that extend between the rack bars 680 and the interposers 650A as shown in Fig. 3. Referring to Fig. 5, it will be noted that each interposer has a head 650H adapted to engage the heads of the punches 611, and the interposer heads will be accurately positioned incidental to sensing in accordance with the numerical representation PO on the printing device.

The heads of the interposers are located beneath the lower faces of punch suppressor plates 220, Fig. 5, which are arranged for right hand setting movement beneath a pair of ram bars 217 and 218. Normally, the punch suppressor plates 220 have front and rear shoulders 291F and 291R that are in contact with the ram bars 217 and 218, such that when the latter are driven downwardly under the impulse of the punch forces delivered thereto, this punching force is exerted on the heads of the set interposers which in turn drive the related punches 611.

The upper face of each suppressor plate 220 is notched at 222 and 223 sufficiently to enable the ram bars 217 and 218 to move thereinto in the event that a suppressor plate is shifted to the right as viewed in Fig. 5 to present the notches 222 and 223 to the ram bars. Such right hand movement of each suppressor plate into suppressing position is produced by a related leaf spring 265. Thus there are as many leaf springs 265 as there are suppressor plates, and the leaf springs 265 have the same column width as that pre-selected for the related suppressor plates as will be explained.

Disposed in holding engagement with the rear faces of the suppressor plates is a restoring bail 250 which is locked to a rock shaft 250R. The rock shaft 250R as explained in Patent No. 2,766,827 is arranged for controlled rocking motion such that when allowed to rock clockwise as viewed in Fig. 5 the restoring bail 250 is moved rearward which releases the plates 220 for suppressing movement if this condition is permitted as will now be explained.

Each suppressing plate 220 is under control of related solenoids as indicated generally by the solenoid SOL in Fig. 5. The armature SOLA of this solenoid engages one bent end of a Z-plate 295 which represents the element for normally holding the related suppressing plate in an unsuppressed or punch actuating position. Each suppressing plate 220 is formed with a notch 291 on the upper face, and the control plate 295 has the forward end thereof disposed in the notch to engage the rear side of the forward shoulder 291F. This is a strong holding action afforded by a spring 295S, and the parts are so dimensioned. However, upon an impulse delivered to the solenoid SOL, its armature is driven down, pivoting the holding plate 295 clockwise as viewed in Fig. 5 and releasing the same relative to the notch 291. When this situation prevails, the related spring 265 will shift the suppressing plate 220 to the right as viewed in Fig. 5 upon rearward movement of the bail 250, and

hence when the ram blocks 217 and 218 are driven downward they will pass freely into the notches 222 and 223 as an idle motion. Accordingly, even though an interposer 650A may be in position to set up a punch for operation, thus punch will not be active, nor any of the other set-up punches beneath the plate 220 in its suppressing position. As with many of the other electrically controlled elements included in the machine, the circuit for the solenoid SOL includes a timing switch operated by a cam on a timing switch cam shaft CST, Fig. 5, so that punch suppression will occur at the proper time in relation to a card at the punch unit. Moreover, the circuit for the solenoid SOL has an off-on switch, Fig. 5, so that the machine can have punch suppression of any form cut in or cut out.

It was mentioned above that the particular systems method of operation under consideration is one wherein there is to be suppression in certain columns of the information forms, and this varies among the different groups of forms. This condition is represented in Fig. 6 where it will be noted that there is a solenoid SOL4 associated with a suppressing plate 220-4 allocated to columns 1 and 2 of the punch unit. Likewise there is a solenoid SOL6 associated with a pair of suppressing plates allocated to columns 10 and 13 of the punching unit. Further, there is a solenoid SOL5 associated with a suppressing plate 220-5 allocated to columns 29 to 40 in the punching unit. Each such solenoid operates in the manner described above in connection with the solenoid SOL, and as will be described below the solenoids SOL-4-5-6 are selectively energized in accordance with the controlled feeding of the information cards from the supply hoppers.

In addition to the sensing pins 460 which are used to set up the punches, and which of course are arranged in rows and columns according to the field on the cards of the printing devices, the sensing head SH also includes control pins 468P, Fig. 3, which are located in one or more rows corresponding to the location of the control tabs 165 carried by the printing devices. These pins 468P are selected as being of different length, long, short and medium for example, and the heads underlie the flange 468F of a plate which is associated with a rocker head 468H which is part of the sensing head. This rocker head is adapted to pivot at 469, and secured to the head 468H for rocking movement therewith is a switch operating arm 468 which has fixed to one end thereof a switch operating link 468K. If one of the pins 468P encounters a tab 165 on the printing device being sensed when the sensing head is lowered, the head of that pin is effectively raised and rocks the head 468H clockwise a predetermined extent, and depending upon this extent of movement the link 468K will accordingly set a control switch SS-1 which is one of the main control elements in the present instance. Thus, the main control switch SS-1 can be of different forms, but is schematically represented in Fig. 3 as being of the rotary type with the wiper contact thereof rotated through a rack and pinion drive associated with the switch setting link 468K. The setting of this switch relative to the several contacts thereof indicated in Fig. 3 will thus depend not only upon whether or not there is a tab 165 to be contacted by a pin 468P, but also by the selected length of the pin 468P. Aspects of this will be explained in more detail below.

In addition to the rocker arm 468, the head 468H also includes another rocker 468A, Fig. 4, which is formed at one end with a flange F' which is located to also overlie control pins as 468P. To enable this to be accomplished, the flange 468F is cut away at 468FA to enable the flange F' to be associated with selected of the control pins 468P which are not allocated to the rocker 468. The arm 468A operates similar to the arm 468 and is used to set another control switch SS-2, Fig. 4, in a manner similar to that in which the switch SS-1 is set.

The card feed hoppers

The main drive for the feed slides 540 emanates from the rock shaft 551, but as has been explained the feed slides are normally disabled and are selectively operated under special circumstances as will now be described. Referring to Fig. 7, each slide plate has a latch arm 540L pivoted on a stud 540P supported at the underside thereof, and each slide plate is properly guided at the bottom of its related hopper so that a feed finger 540F formed at the rear edge thereof will be in position to advance the bottom-most card in the related hopper to the feed bands 230, Fig. 2, when the slide plate is moved in a forward direction toward the front of its hopper. The latch arm 540L has a hook at the forward end opposite the stud 540P on which it is pivoted, and this hook is normally disposed in an upper released position relative to a drive stud DS carried on a drive arm 550D which is fast on the rock shaft 551. The lower edge of the latch arm 540L just forward of the pivot 540P normally engages a high part of a related control shaft CS. The control shaft has a flat face CSF just forward of the pivot 540P, and when this flat face is presented to the latch arm 540L the latter is released and submitted to the action of a spring 540S so as to be disposed in the path of the drive stud DS. Such releasing of the latch arm results in the related feed slide being operated to feed a card from its hopper.

The above feed slide arrangement is of course repeated for each of the hoppers HR, HM and JH, Fig. 2, and there is a control shaft in each instance, namely, CSM, CSJ and CSR.

Each of the control shafts is individually controlled by a related solenoid indicated generally at SOLH in Fig. 7. Each such solenoid has an armature which is adapted to drive a rack bar HA having teeth in engagement with a gear portion of the related feed slide control shaft. Thus, when such a solenoid is energized, the rack bar HA is pulled down, Fig. 7, rotating the related control shaft clockwise and presenting the flat face of the latter to the latch arm 540L thereby conditioning the related feed plate 540 for operation. As shown in Fig. 2, the three solenoids which thus operate the control shafts CSM, CSJ and CSR are indicated at SOL1, SOL2, and SOL3 respectively allocated to the feed slides for hoppers HM, HJ and HR. The control for these three solenoids as well as for the solenoids used for punch suppression will be described below.

The consecutive number punch, numbering unit, pre-set counter and stop

Depending upon the nature of serial numbering that may be involved or desired, a predetermined number of columns in the punching unit are allocated to consecutive number punching of the first card through the machine for each deck of printing and control devices, and this is the route card RD, as will be recalled. The corresponding route device RD is tabbed in its No. 6 position, and the control switch SS-2 has a contact related thereto.

Referring to Fig. 8, the machine is equipped with a consecutive number punch control of the kind described in Patent No. 2,765,849 to which reference can be made for the details of the construction involved in the generalized description which follows. Thus, the number punch control includes decimal number indicating discs 190 having ten faces that are recessed at 215R in accordance with the numbering code explained in Patent No. 2,765,849. These discs are provided with ratchets 190R for stepping the same around, and the numbering discs are assembled for individual rotation on a shaft 179 which is adapted to be raised and lowered by a suitable cam and follower arrangement as indicated in Fig. 8, such raising and lowering occurring through a cam control arm 179A. Lowering of the shaft 179 causes pins 210 to be set in accordance with the number repre-

sented by the recesses in the faces of the discs which are lowered into contact with the upper ends of number registering pins 210. The pins 210 in turn actuate Bowden cables 209, and these cables are used to set up the stop pins as 803, Fig. 3, which control interposer setting movement of those slide racks 680 which are allocated to the columns of punches in the punch unit used for consecutive number punching of the route cards in predetermined columns of the latter.

The numbering discs 190, as mentioned, include stepping ratchets, and these are associated with a pawl mechanism for advancing the ratchets, tens carry also being provided for. This pawl mechanism is generally identified at PM in Fig. 8 and is described in detail in Patent No. 2,765,849. The pawl mechanism in this patent is, however, normally effective in each cycle, but in the present instance, since the route cards only are to be serially punched, the operating arm PMA of the pawl mechanism is to be pulled counterclockwise as viewed in Fig. 8 only when a route card is at the punch unit. Hence, the operating arm PMA can be considered for present purposes as operatively connected to the armature of a solenoid SOL7 which, when energized, produces the desired rocking one-step motion of the pawl mechanism PM causing a unit movement of the numbering discs 190.

Referring to Fig. 11, the machine is equipped with a conventional numbering and counting unit CU which is also to be pulsed one digit upon the occurrence at the sensing station of a device RD bearing a No. 6 tab. Hence, the numbering unit can be wired in series with solenoid SOL7 as shown in Fig. 11.

As explained in Patent No. 2,710,406, the various one-revolution clutches which extend drive to the plate and card feed, the sensing head, the platen, the punch unit and so on are relay controlled, such that when the main relay control of the machine is in a stop setting, the machine itself is effectively stopped so far as the essential machine operations are concerned. In Fig. 11, this relay control and associated clutches are generally indicated at RC, being set in a stop state in the present instance upon energization of a relay R8 or a pre-set counter relay R9 as will be explained. Thus, it may be desirable to interrupt machine operations by a predetermined one of the devices D passing through the machine, and it may be desirable to also interrupt machine operations after a predetermined number of decks of printing and control devices have been advanced from the supply magazine M. The pre-set counter associated with relay R9 will be set up, prior to a machine run, with the number of decks of devices D to be processed, and when this number is registered relay R9 is energized, this being well known in the art.

Sorting of the duplicate move cards

The duplicate move cards are to be separated from the remainder of the information forms processed in the machine. Thus, referring to Fig. 2, two collecting hoppers H1 and H2 are provided. The duplicate move cards are to be collected in hopper H2 and the remainder passed into hopper H1. A sorting arrangement enabling this to be accomplished is disclosed in application Serial No. 490,836, filed February 28, 1955, now U.S. Patent No. 2,868,115, but in accordance with the present invention such sorting is under control of switch SS-1 which, as will be explained, controls energization of a sorting solenoid SOL8, Fig. 9, and this solenoid in turn is used to position deflector fingers DF, Figs. 2 and 9. The deflector fingers DF are associated with hopper H2, and when in a released position constitute nothing more than a support over which all cards with the exception of the DMC cards move and pass into the bite of feed rollers 85U and 85L, Fig. 2, which feed these cards to hopper H1 where they are collected. The deflector fingers are carried on a rock shaft 81, Fig. 9, identified

by like reference character in the above-identified application. Rock shaft 81 is linked to the armature of solenoid SOL8 as shown in Fig. 9. When this solenoid is energized, a control arm 81A on shaft 81 is rocked counterclockwise as viewed in Fig. 9, and the deflector fingers DF are raised to a blocking position so as to direct the duplicate move cards into hopper H1 as described in the above-identified application and as indicated by the dashed lines in Fig. 9. Since this deflector finger action occurs in advance of a duplicate move card reaching the receiving station, means are provided for latching arm 81A in its actuated position. Thus, arm 81A is associated with a spring biased latch arm LA, Fig. 9 which has a notch for holding the toe of the arm 81A when the latter is raised under control of solenoid SOL8.

Solenoid SOL8 is timed in its operation so as to be energized just as a duplicate move card approaches hopper H2, but even though solenoid SOL8 is released in the cycle in which it is energized the latch arm LA is effective to hold the deflector fingers up so as to deflect the duplicate move card into the hopper H2. However, since the next card passed to the receiving station may not be a duplicate move card, it is necessary to release the latch arm to allow the deflector fingers to drop down to their normal position to guide this next card to the feed rollers 85U and 85L, Fig. 2. This releasing of the latch is accomplished through the feed rollers 45U and 45L which are directly in front of and disposed outward of the deflector fingers as shown in Fig. 9. The rollers 45U and 45L are normally engaged in a friction drive relation, but the upper set 45U is carried on a vertically movable idler shaft 46U which operates a latch releasing arm 45A. Thus, the latch releasing arm 45A is pivoted at one end and at the opposite end engages the latch arm LA so as to pivot the latter counterclockwise as viewed in Fig. 9 when a duplicate move card passing through the rollers 45U and 45L is effective to slightly raise the shaft which carries the rollers 45U. Accordingly, the notch in arm LA is withdrawn from the deflector finger control arm 81A, allowing the fingers DF eventually to assume the normal full-line position shown in Fig. 8 whereat the deflector fingers are normally located to direct forms other than the duplicate move cards to the hopper H1. After the trailing edge of the duplicate move card emerges from the rollers 45U and 45L, the latch arm LA assumes its normal position.

The control and machine operation

The reference character 165 has been used to identify generally the control tabs representing the control data carried by the printing devices D. These control data, as has been explained above, are used to properly set the control switches SS-1 and SS-2, and depending upon the setting of these switches the machine is conditioned for operations including the proper feeding and punching of an information form related to the printing device that was sensed. In the present instance, a route card is to be fed from its hopper HR as the first card, and simultaneously the punch unit is to be set up for suppression of punch columns 1, 2 and 29 to 40. These two relationships, namely, feeding of a route card from hopper HR and related punch suppression of the punch unit, are established incidental to the sensing of a tab 165 located in the No. 3 position on the corresponding route device RD, and the control pin 468P in the No. 3 position on the sensing head will be of a predetermined length so as to set switch SS-1 in a state identified with the presence of the route device RD at the sensing station. In order to clearly identify the setting of the control switches with respect to the control tabs on the printing devices, the contacts of the switches are numbered in accordance with the tab positions under consideration. Thus, when a No. 3 tab is sensed, switch SS-1 is set on No. 3 contact. When a No. 6 tab is sensed, switch SS-2 will be on No. 6 contact. When no tab is sensed, switch SS-1 is on its N

contact and switch SS-2 can be assumed to be on a disconnected contact and so on.

Referring to the wiring diagram in Fig. 11 and the operation chart in Fig. 10, a relay R3 in the sensing and control unit is energized when switch SS-1 is on its No. 3 contact. It will be noted that there are three other relays associated with switch SS-1, namely, RN, R4 and R5. The purpose of these other relays will be described below, and it will be noted in Fig. 11 that the cam shaft CST which carries the various cams for controlling the timing switches has been indicated.

Relay R3 when energized closes contacts R3C which extend circuit to solenoids SOL3, SOL4 and SOL5 which, when energized in the proper time sequence, cause feeding of a route card from its hopper and establish suppression of the punches in columns 1, 2 and 29 to 40 of the punch unit.

The route device RD is also to cause consecutive number punching of the corresponding card RC at the punching unit and is to advance the consecutive numbering unit. A tab in No. 6 position on a route device RD controls these two operations through switch SS-2. Thus, when the sensing pins associated with arm 468A, Fig. 4, encounter No. 6 tab, switch SS-2 is set on its No. 6 contact, Fig. 11. A corresponding relay R6 is energized in time sequence causing closure of its related switch contacts R6C. This completes circuit to solenoid SOL7 and the numbering unit CU.

Next in sequence through the machine are the move and duplicate move cards which are stacked in hopper HM. The move devices, Fig. 1, have no control tabs, and hence the control switch SS-1 can be assumed to be on its N contact when there is absence of any tab on a device at the sensing station indicating that this device is a move device MD. When the control switch SS-1 is in its N position, the solenoid SOL1 is to be energized to feed a move card to the punch unit, and solenoid SOL6 is to be energized to suppress columns 10 and 13 of the punch unit. Thus, relay RN is energized through contact N of switch SS-1, closing its contacts RNC to complete circuit to solenoid SOL1 (feed out MC) and solenoid SOL6 (suppress 10 and 13).

The duplicate move device is tabbed at No. 5 position, and upon the sensing of such tab the control is to be effective to again energize solenoid SOL1 but there is to be no punch suppression which means that all punch suppressing solenoids are to be maintained de-energized. In addition, the duplicate move card is to be sorted in its separate hopper H2, Fig. 2. Thus, relay R5 is energized when a device DMD is sensed. This relay closes contacts R5C in a shunt circuit to solenoid SOL1 (feed DMC), and also closes associated contacts R5C which extend circuit to the sorting solenoid SOL8 which positions the deflector associated with sorting hopper H2 so as to direct the card DMC thereto when it is passed from the printing station.

The last device in the deck will be a job device JD, and as explained there may be one or more of these and as many cards JC. The job device is tabbed at No. 4 position as shown in Fig. 1, and the control switch SS-1 is so set as to enable a card JC to feed from hopper HJ for each job device passing through the machine. There is to be no suppressing of punches for the job card. Thus, when on its No. 4 contact, switch SS-1 extends circuit to relay R4 which when energized closes contacts R4C to extend circuit to the card feed control solenoid SOL2.

The last device D in each deck or group of printing and control devices, which will be a device JD, is to pulse the predetermined counter stop PSC for one count. Referring to Fig. 1, it is assumed that the device JD is such a device, and is provided with a tab in No. 7 position. When this tab is sensed, switch SS-2 is moved to its No. 7 contact, Fig. 11. Relay R7 is connected to this No. 7 contact so as to have circuit extended thereto and when

energized closes its related contacts R7C to extend circuit to the pre-set counter stop. When the predetermined number set in unit PSC is reached, a relay R9 is energized opening its contacts R9C associated with the main relay control RC, and this can be considered as placing the main relay control of the machine in its stop setting as explained above.

It is advantageous and important in certain circumstances to also stop the machine through the main relay control RC at certain intervals so far as the devices passing through the machine are concerned. Thus, as shown in Fig. 11, the main relay control RC is also adapted to be placed in a stop setting upon opening of contacts R8C. These contacts are under control of a relay R8 which is connected to contact No. 8 of switch SS-2. Switch SS-2 is to have circuit extended to contact No. 8 when a device D is sensed as having a stop tab in No. 8 position, and for purposes of disclosure, the duplicate move device DMD, Fig. 1, is illustrated as bearing a No. 8 tab for this purpose.

It will be realized that there is to be suppression in selected columns only of the punch unit. In other words, there are some columns where there will be no suppression at all, and these columns are common to all forms passing through the machine. As to these columns, there will be transmitting plates 220A-B-C, Fig. 6, beneath the bars 217 and 218 effective on their interposers at all times, but these plates will either have no notches 222 and 223, or, as shown in Fig. 6, there is provided a master spring plate 265M which is cut out to afford the individual springs 265 with blanks between which amount to a bias for the plates 220A-B-C for imparting continuous unsuppressed activity thereto at all times.

Conclusion

It will be seen from the foregoing that the present machine is capable of processing information forms that fall into a plurality of different groups on the basis of different information marked thereon as by punching the forms in predetermined columns under control of the printing devices D, and it will be realized that such punched hole data are but one form of marks that could be made. Thus, it will be recalled that printed information is also marked on the forms under control of the printing devices D and this takes place at the printing station.

The information forms are of course essentially of identical configuration, and the groups are determined essentially by the control indicia on the devices D, since these indicia are what determine the order of sequence of the forms through the machine and the extent of data marked thereon at the data marking station represented by the punch unit in the present instance. Advantageously, and to facilitate sorting, the forms can be of different color, and this is especially helpful in manually separating the cards which eventually are stacked in the receiving hopper H1. In this connection it will be recalled that one group of forms, namely, the duplicate move cards, are separately sorted in the receiving hopper H2, but it will be clear that there could be even further sorting of this kind simply by adding as many more collecting hoppers as are required and extending the principle of the sorting control solenoid SOL8.

It will be recognized that insofar as indicating, as a result of sensing, the different orders or groups of control indicia represented by tabs on the devices D, other kinds of control indicia can be used such as punched hole data located at different positions on the devices, and additionally there can be wide variance in the form of the settable means at the sensing station settable in different states for indicating the order of the control indicia. These settable means in the present instance are disclosed as including pins as 468P, Fig. 3, the set position of which in turn is translated into positioning of the main control switch SS-1 or SS-2, and it will be appreciated that a completely idle state can be utilized as one of the set

states of the means used to indicate the order of device at the sensing station.

In any event, the essential purpose of indicating the order of a device as D at the sensing station is to enable the data to be marked on the information forms to be varied depending on what is required for a particular form at the data marking station. The speed and effectiveness of the machine is greatly enhanced by having the punches or data marking means normally effective to mark on a form fed to the marking station all of the data representations carried by the corresponding device D unless the suppressing means have been rendered operable by the requirement that the particular device D calls for suppression whole or in part of the punches already set up in accordance with such data representations. The condition of suppression or no suppression, as the case may be, when considered in light of a predetermined column of punches is simultaneously determined and established in accordance with whichever (and there can be only one) of the separately actuatable feed fingers and assigned to the feed hoppers is rendered operable.

Hence, while we have illustrated and described a preferred embodiment of our invention, it is to be understood that this is capable of variation and modification, and we therefore do not wish to be limited to the precise details set forth, but desire to avail ourselves of such changes and alterations as fall within the purview of the following claims.

We claim:

1. In a printing machine of the kind described wherein at least two different groups of forms are to be selectively punched and printed respectively at punching and printing stations in the machine, and wherein the punching and printing operations are to be under control of printing and control devices bearing control data and printing data: means for feeding said forms one by one to said punching and printing stations, and means for feeding said printing devices one by one to said printing station; means for sensing the control data on the devices; a control settable in at least two different states incidental to the sensing of said control data; at least two supply stations where said forms of the two different groups are to be arranged for sequential feeding therefrom; selectively operable separate feed means respectively allocated to said supply stations for advancing a form from its supply station to the feed means which feed the same to the punching station; a plurality of selectively operable punch elements at said punching station and operable to punch data in said forms advanced thereto one by one from said form supply stations; and means responsive to the setting of said control in one state to render effective but one of said separate form feed means while rendering operable selected of the punch elements, and responsive to the setting of said control in another state to render effective only the other of said separate form feed means while rendering inoperable certain of said selected punch elements.

2. In a printing machine of the kind described wherein at least two different groups of forms are to be selectively punched and printed respectively at punching and printing stations in the machine, and wherein the punching and printing operations are to be under control of printing and control devices bearing control data and printing data and numerical data: means for feeding said forms one by one to said punching and printing stations, and means for feeding said printing devices one by one to said printing station; a sensing head at a sensing station in the machine and including a sensing pin for sensing the location of control data on the devices; a control switch settable in at least two different states in accordance with the sensing of said control data; sensing pins at said sensing station and settable in accordance with the numerical data to represent the same, and means for transferring the representations to said punching station; at least two supply stations where said forms of the two different

groups are to be stored for sequential feeding; selectively operable separate feed means respectively allocated to said supply stations for advancing a form from its supply station toward the punching station; a plurality of selectively operable punch elements arranged in columns at said punching station for punching data in said forms advanced thereto one by one from said form supply stations; means to set up the punches for operation in accordance with the numerical representations transferred thereto; means effective to drive the punches when set up; means to suppress operation of the punches in certain columns even though set up for operation; and means responsive to the setting of said switch in one state to render effective but one of said separate form feed means while rendering said punch suppressing means ineffective, and responsive in another setting of said switch to render effective only the other of said separate form feed means while rendering effective said punch suppressing means.

3. In a machine of the kind described wherein at least two different groups of forms are to be selectively punched at a punching station in the machine, and wherein the punching operations are to be under control of control devices bearing control data: means for sensing the control data on the devices; a control settable in at least two different states incidental to the sensing of said control data; at least two supply stations where said forms of the two different groups are to be arranged for sequential feeding therefrom; selectively operable separate feed means respectively allocated to said supply stations for advancing a form from its supply station to the feed means which feed the same to the punching station; a plurality of selectively operable punch elements at said punching station and operable to punch data in said forms advanced thereto one by one from said form supply stations; and means responsive to the setting of said control in one state to render effective but one of said separate form feed means while rendering operable selected of the punch elements, and responsive to the setting of said control in another state to render effective only the other of said separate form feed means while rendering inoperable certain of said selected punch elements.

4. In a machine of the kind described wherein at least two different groups of forms are to be selectively punched at a punching station in the machine, and wherein the punching operations are to be under control of control devices bearing control data, and bearing and numerical data to be punched in the forms: a sensing head at a sensing station in the machine and including a sensing pin for sensing the location of control data on the devices; a control switch settable in at least two different states in accordance with the sensing of said control data; sensing pins at said sensing station and settable in accordance with the numerical data on the control devices to represent the same, and means for transferring the representations to said punching station; at least two supply stations where said forms of the two different groups are to be stored for sequential feeding; selectively operable separate feed means respectively allocated to said supply stations for advancing a form from its supply station toward the punching station; a plurality of selectively operable punch elements arranged in columns at said punching station for punching data in said forms advanced thereto one by one from said form supply station; means to set up the punches for operation in accordance with the numerical representations transferred thereto; means effective to drive the punches when set up; means to suppress operation of the punches in certain columns even though set up for operation; and means responsive to the setting of said switch in one state to render effective but one of said separate form feed means while rendering said punch suppressing means ineffective, and responsive in another setting of said switch to render effective only the other of said separate form feed means while rendering effective said punch suppressing means.

5. In a printing machine of the kind described wherein

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at least two different groups of forms are to be selectively punched and printed respectively at punching and printing stations in the machine, and wherein the punching and printing operations are to be under control of printing and control devices bearing control data and printing data; means for feeding said forms one by one to said punching and printing stations, and means for feeding said printing devices one by one to said printing station; means for sensing the control data on the devices; a control settable in at least two different states incidental to the sensing of said control data; at least two supply stations where said forms of the two different groups are to be arranged for sequential feeding therefrom; selectively operable separate feed means respectively allocated to said supply stations for advancing a form from its supply station to the feed means which feed the same to the punching station; a plurality of selectively operable punch elements at said punching station and operable to punch data in said forms advanced thereto one by one from said form supply stations; means responsive to the setting of said control in one state to render effective but one of said separate form feed means while rendering operable selected of the punch elements, and responsive to the setting of said control in another state to render effective only the other of said separate form feed means while rendering inoperable certain of said selected punch elements; and means responsive to the setting of said control to separate the forms into two groups after passage through the machine.

6. In a machine of the kind described wherein at least two different groups of forms are to be selectively punched at a punching station in the machine, and wherein the punching operations are to be under control of control devices bearing control data: means for sensing the control data on the devices; a control settable in at least two different states incidental to the sensing of said control data; at least two supply stations where said forms of the two different groups are to be arranged for sequential feeding therefrom; selectively operable separate feed means respectively allocated to said supply stations for advancing a form from its supply station to the feed means which feed the same to the punching station; a plurality of selectively operable punch elements at said punching station and operable to punch data in said forms advanced thereto one by one from said form supply stations; means responsive to the setting of said control in one state to render effective but one of said separate form feed means while rendering operable selected of the punch elements, and responsive to the setting of said control in another state to render effective only the other of said separate form feed means while rendering inoperable certain of said selected punch elements; and means responsive to the setting of said control to separate the forms into two groups depending upon the different punching thereof.

7. In a printing machine of the kind described wherein at least two different groups of forms are to be selectively punched at a punching station in the machine, and wherein the punching operations are to be under control of control devices bearing control data and numerical data: means for feeding said forms to said punching station; means for feeding said devices one by one to a sensing station in the machine where the control data on the devices are to be sensed; a control switch settable in at least two different states in accordance with the sensing of said control data; sensing means at said sensing station and settable in accordance with the numerical

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data to represent the same, and means for transferring the representations to said punching station; at least two supply stations where said forms of the two different groups are to be stored for sequential feeding; selectively operable separate feed means respectively allocated to said supply stations for advancing a form from its supply station toward the punching station, and normally disabled drive means for each of said feed means; a plurality of selectively operable punch elements arranged in columns at said punching station for punching data in said forms advanced thereto one by one from said form supply stations; means to set up the punches for operation in accordance with the numerical representations transferred thereto; means effective to drive the punches when set up; normally inactive suppressing means to suppress operation of the punches in certain columns even though set up for operation; and means responsive to the setting of said switch in one state to render effective the drive means for but one of said separate form feed means while holding said punch suppressing means inactive and responsive in another setting of said switch to render effective only the drive means for the other of said separate form feed means while rendering active said punch suppressing means.

8. In a machine of the kind described for producing information forms falling into a plurality of different groups on the basis of different information marked thereon: a plurality of supply hoppers for containing, and being respectively allocated to, the different groups of forms; a supply hopper for containing devices which carry data representations of the information to be marked on the forms and which carry control indicia of different order identifying the devices on the basis of said groups; means for feeding said devices one by one to a sensing station in the machine; means at the sensing station settable to different states for sensing said control indicia and for indicating by their set state the order of the control indicia; a data marking station in the machine including data marking means normally effective to mark on a form fed to the marking station equivalents of the data representations carried by a device corresponding thereto; suppressing means effective when rendered operable to suppress action of said data marking means; feed means to feed the forms from the respective form hoppers to the data marking station and including a plurality of separately actuatable feed elements each assigned to a respective form hopper; and control means responsive to the setting of said settable means in one state to render operable the suppressing means and simultaneously only one of said separately actuatable feed elements, and responsive to the setting of said settable means in another state to render inoperable said suppressing means and simultaneously only another of said separately actuatable feed elements.

9. A machine according to claim 8 wherein there are a plurality of receiving hoppers for the forms and wherein sorting means are associated therewith, said sorting means being under control of said control means.

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