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MATRIX ELEMENT POSITIONING MECHANISM

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2 Sheets-Sheet 1

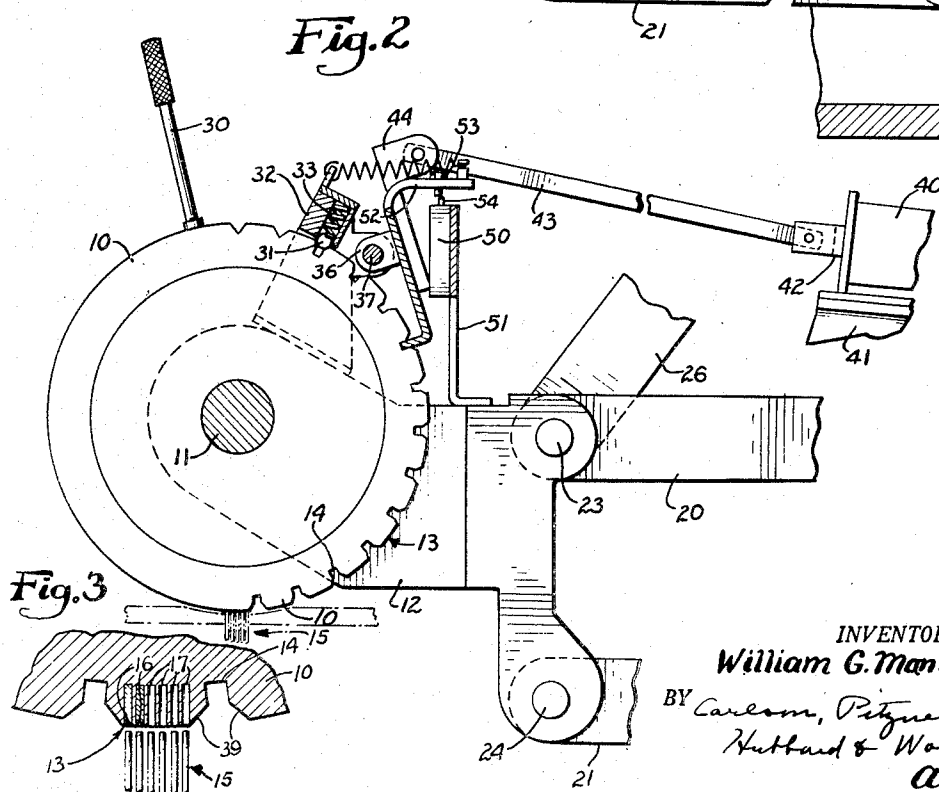
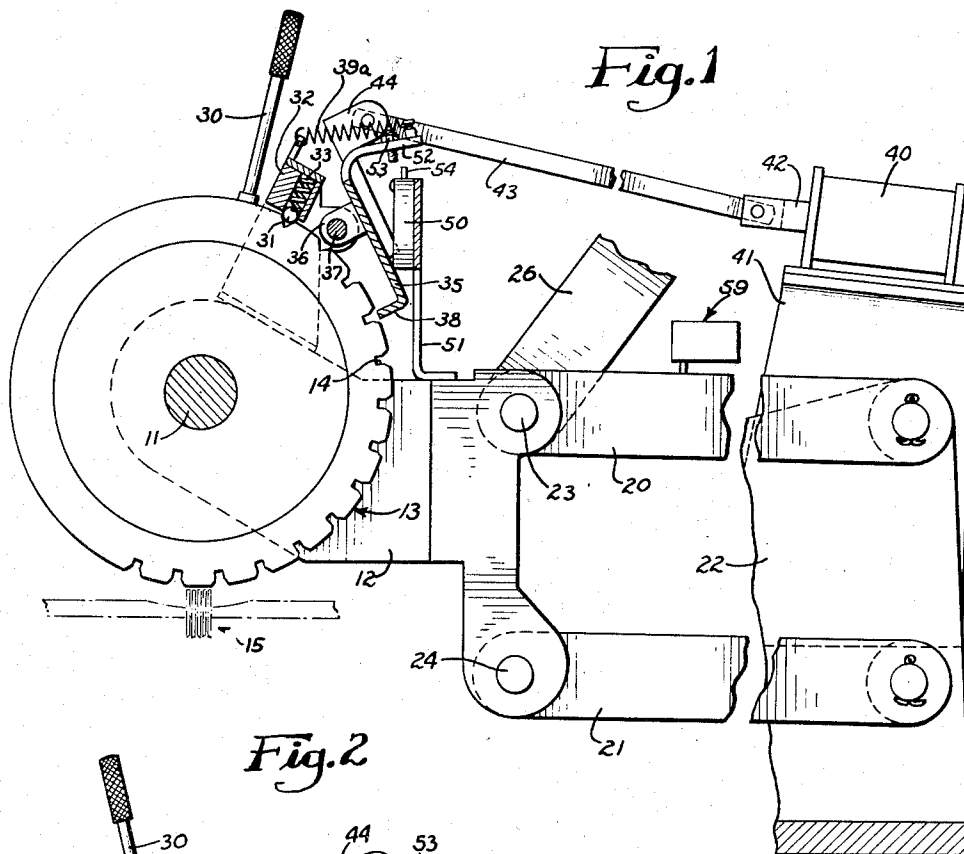
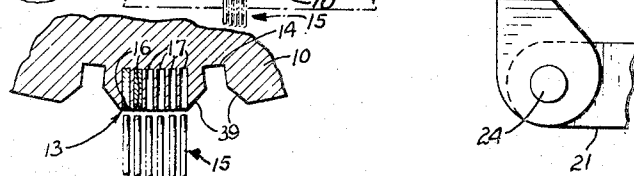


Fig. 3



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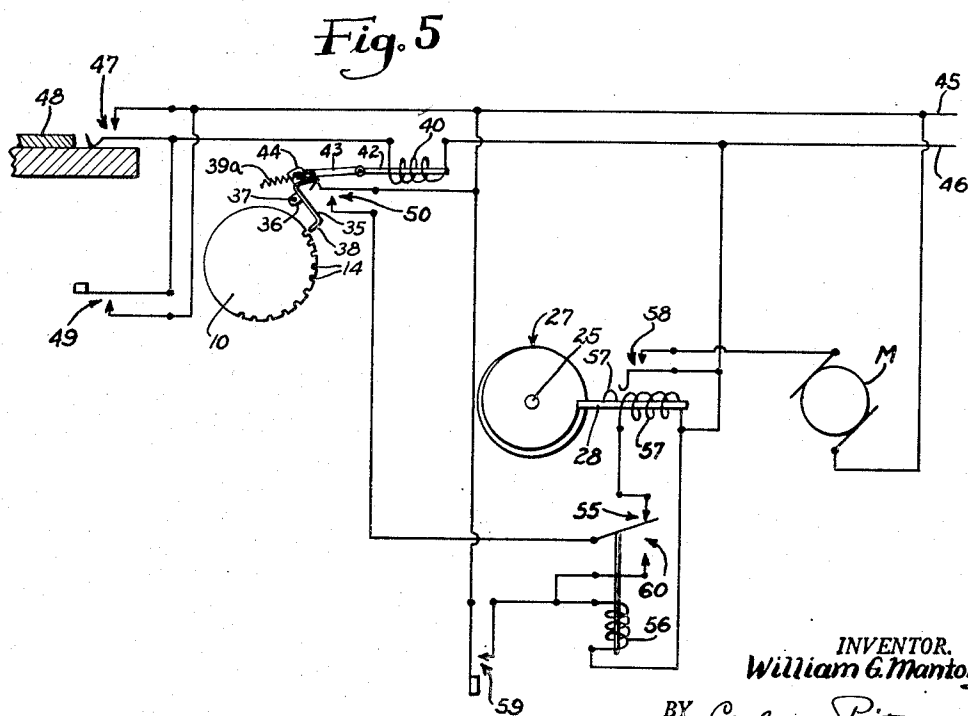
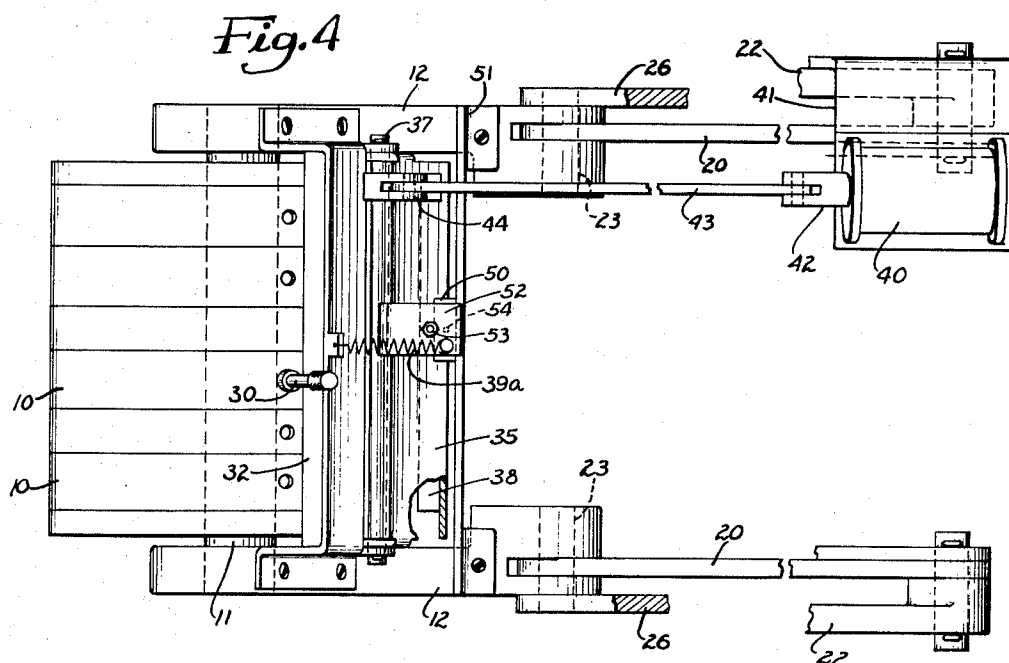
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MATRIX ELEMENT POSITIONING MECHANISM

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2 Sheets-Sheet 2



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MATRIX ELEMENT POSITIONING MECHANISM

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5 Claims. (Cl. 164—111)

The invention relates to machines for perforating or otherwise impressing numerals, letters or other indicia in or on sheet material, and more particularly to an improved mechanism for insuring accurate positioning and alinement of the indicia carrying matrix elements in each operating cycle of the machine.

One object of the invention is to provide for power operated means for shifting improperly positioned matrix elements to aline them accurately with adjacent elements and for delaying the machine cycle until all elements have been accurately alined.

A further object is to provide a matrix element alining mechanism which leaves the elements completely free for manual positioning during the idle period of the machine.

Another object is to provide a normally inactive alining mechanism comprising a member common to all of the matrix elements and operative when shifted into an active position relative to such elements to initiate a machining cycle.

Other objects and advantages of the invention will become apparent from the following detailed description of the preferred embodiment illustrated in the accompanying drawings, in which:

Figure 1 is a fragmentary longitudinal sectional view of a perforating machine embodying the features of the invention, the matrix head being shown in its retracted or inactive position.

Fig. 2 is a view similar to Fig. 1 showing the matrix head in the advanced or operated position.

Fig. 3 is an enlarged fragmentary sectional view of a matrix element and associated punch group.

Fig. 4 is a fragmentary top view of the machine.

Fig. 5 is a diagrammatic view of the electrical operating and control circuits of the machine.

While the invention is susceptible of various modifications and alternative constructions, I have shown in the drawings and will herein describe in detail the preferred embodiment, but it is to be understood that I do not thereby intend to limit the invention to the specific form disclosed, but intend to cover all modifications and alternative constructions falling within the spirit and scope of the invention as expressed in the appended claims.

For purposes of illustration the invention has been shown as incorporated in a machine of the type commonly used for perforating indicia in sheet material, as for example, canceling checks, receipting bills, etc. The indicia perforated is determined by selective adjustment of a series of matrix elements in the form of rings 10 arranged in side by side relation and supported for independent rotation on a shaft 11 carried by a reciprocable matrix head 12.

In the above organization the matrix rings are provided on their peripheral surfaces with a plurality of matrix faces 13 (Figs. 1 and 2) separated by locating notches 14. The matrix faces of each element are adapted to cooperate with a group of punch rods 15 to advance them selectively for perforating as an incident to the movement of the matrix head to the operative position. As shown in Fig. 3, each matrix face is formed with a series of sockets 16 and holes 17 alined with the respective punch rods and arranged in patterns effective to advance selected ones of the rods in combinations corresponding to letters, numerals or other preferred indicia.

In the particular machine illustrated, the head 12 is supported and guided for reciprocation in a substantially vertical path by upper and lower sets of links 20 and 21

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member 22 constituting a part of the stationary machine frame. At their free ends the links are pivotally connected to the head 12 by cross shafts 23 and 24. Reciprocation of the head is effected by power driven actuating means of any suitable and well known construction, including in the present instance a crank shaft 25 (Fig. 5) connected with the head by rigid links 26. The shaft 25 is driven by an electric motor M through a conventional single revolution clutch 27 engaged to initiate rotation of the shaft by withdrawal of a latch bolt 28. In its single revolution the crank shaft advances the head 12 to operated position and then returns it to retracted position in readiness for the next operating cycle.

Accurate alinement of the holes and sockets of the matrix faces with the punches 15 is essential to the proper operation of the machine. Any slight misalinement may at the least result in a failure to perforate the desired indicia and may even cause the punches to be bent or otherwise damage the machine.

Selective adjustment or setting of the matrix elements 10 is effected manually, usually through the medium of a radially projecting pin 30 provided on each element. To assist the operator in accurately locating the elements, a yieldable detent is also provided in association with each element. Detents of this character must necessarily be relatively weak so as not to interfere with the manual shifting of the elements. In the exemplary machine the detent provided for each matrix element comprises a ball 31 disposed within a bore in a bracket 32 mounted on the head 12 and extending along one side of the matrix ring assembly. A spring 33 urges the ball into engagement with the locating notches 14 in the element.

Notwithstanding the provision of detents of the above general character, the machine operators frequently fail to accurately position all of the matrix elements when resetting the same. This is particularly likely to occur when the operators are trying to maintain a high production rate on a job where frequent changes in the machine setting are required.

It has been proposed heretofore, as for example in the copending application of Nicholas S. Miller, Serial No. 709,043, filed November 9, 1946, now Patent No. 2,589,271, granted March 18, 1952, to provide mechanism comprising latches for the several matrix elements normally effective to hold the individual matrix elements in set positions and disengageable to permit resetting of the elements. The arrangement is such that the disengagement of any latch is operative to mechanically or electrically lock the perforating machine against operation.

Such mechanisms are subject to the objection that they introduce delays that have been found objectionable in modern office practice. For one thing, the necessity of disengaging the latches prior to resetting materially slows down this phase of the operation. Moreover, the operator must go through all of the motions of carrying out a perforating operation before discovering through failure of the machine to operate that one of the matrix elements is improperly positioned. Then the elements must be checked visually to find and reset the misalined one. This is often difficult and time consuming when the misalinement is relatively small. Considerable time is thus lost from production.

In accordance with the invention, the damage to the machine from inaccurately positioned matrix elements is effectively prevented and the delays above mentioned are avoided by the provision of power actuated alining mechanism adapted to initially check the position of all matrix elements and to automatically shift any slightly misalined ones into exact alinement preceding each machine cycle. If the misalinement is too great the machine is temporarily disabled until the operator shifts the misalined element or elements to approximately alined positions, whereupon the mechanism completes the alining movement and the machine cycle proceeds in the normal manner.

The improved alining mechanism in its preferred form comprises a matrix positioning member common to all of the matrix elements and normally occupying an inactive position and arranged for power operation into active position relative to the several elements, in which

latter position it is effective to initiate the machine cycle. As herein shown, this positioning member takes the form of bar 35 disposed at one side of the matrix element assembly and supported on the head 12 for pivotal movement on an axis parallel to the axes of the elements. Pivotal support is provided by ears 36 bent inwardly from opposite ends of the bar and apertured to receive a shaft 37 supported on the head 12.

The bar 35 preferably serves as the alining member and to this end it has one marginal edge portion, in this instance the lower edge portion, bent inwardly substantially at right angles to form a lip 38 adapted to enter the locating notches 14 of the matrix elements when the notches of all elements are alined. To enable the bar 35 to shift misalined matrix elements into alined positions, the locating notches are widened at their outer ends to present sloping surfaces 39 engageable by the lip 38 to cam the element in one direction or the other and thus bring the associated notch into alined position. It will be appreciated, of course, that the bar 35 and its lip 38 are located so that the entry of the lip into one of the notches 14 of a matrix element coincides with the accurate positioning of one of the matrix faces with the punch group 15. A spring 39a connected between the bar 35 and the bracket 32 normally maintains the bar in the retracted or inactive position in which it is shown in Fig. 1.

Power for rocking the alining bar to operative position is provided by a solenoid 40 supported on a bracket 41 mounted on the machine frame rearwardly of the matrix head. The solenoid has its armature 42 connected by a link 43 with an arm 44 extending upwardly from the bar 35. The connections between the link 43 and associated parts are designed to permit pivoting to accommodate the reciprocating movements of the head 12.

The solenoid 40 when energized draws its armature to the right as viewed in the drawings and this rocks the bar 35 in a clockwise direction so as to project the lip 38 into the notches 14. If the lip engages the sloping surface of any matrix element, that element is shifted in a direction to line up the notch with the lip. When all elements are alined the bar moves into the fully operated or active position shown in Fig. 2.

To provide maximum operating efficiency the solenoid 40 is incorporated in the control circuit of the machine so that an alining action such as that above described precedes each operating cycle and the cycle is automatically initiated upon completion of the alining action. The alining mechanism is thus enabled to function as a safety lock out to prevent operation of the machine whenever a matrix element is misalined a greater amount than can be corrected automatically.

Referring to the circuit diagram shown in Fig. 5 of the drawings, current for operating the machine is supplied by way of line conductors 45 and 46 adapted to be connected in any preferred manner with a suitable power line. Solenoid 40 is connected in the circuit so as to become energized upon closure of a normally open starting switch 47. This switch may be arranged for actuation by a sheet 48 of paper or other material to be perforated upon insertion of the sheet into the machine. One or more alternatively available switches, such as a manually operable switch 49, may also be provided for starting purposes. As shown, such switch or switches are connected in multiple with the switch 47 and function in the same manner.

Energization of the solenoid 40 rocks the alining bar 35 to the operative position providing the matrix elements are properly positioned or are positionable by the bar as above explained. Movement of the bar into operative position automatically initiates a machine cycle by closure of a cycle starting switch 50. In the exemplary machine the switch 50 is supported on the matrix head 12 as by a bracket 51 and in a position to be actuated by a finger 52 rigid with and projecting rearwardly from the upper edge of the bar 35. Preferably the finger is provided with an adjustable actuating element such as a screw 53 engageable with the movable operating member 54 of the switch as the bar approaches operative position.

Closure of the switch 50 completes a circuit by way of normally closed switch contacts 55 of a relay 56 for energizing a solenoid 57 which is arranged to withdraw the latch bolt 28 and engage the clutch 27 to initiate rotation of the crankshaft 25. In accordance with the usual

practice, the clutch element is formed with a cam surface operative to retain the latch bolt in withdrawn position for a portion of the revolution of the crankshaft and to allow the bolt to return to stop position in time to interrupt the rotation of the shaft.

The clutch bolt 28 is provided with an operating element 57 which upon withdrawal of the bolt closes a switch 58 to start the motor M. The motor through the now engaged clutch 27 drives the crankshaft 25 and the latter through the connecting rods 26 reciprocates the matrix head 12. In the initial movement of the head 12 a switch 59 is closed to complete an energizing circuit for the relay 56. Relay 56 opens switch contacts 55 to deenergize the solenoid 57 and closes switch contact 60 to complete a holding circuit for itself by way of switch 50. Deenergization of the solenoid 57 releases the latch bolt 28 so that it may effectively disengage the clutch 27 and interrupt the rotation of the crankshaft 25 at the end of its single revolution. Relay 56 remains energized as long as switch 50 remains closed, which is determined by the energization of the solenoid 40. Since this solenoid is in circuit with the starting switches 47 and 49, it will remain energized as long as either switch is closed. Thus in order to initiate a new machine cycle it is necessary to open the starting switch 47 at least momentarily as by withdrawal of the sheet 48. Improper reperforation of a sheet is thus effectively prevented.

In the event that one or more of the matrix elements is set so far out of line that the alining mechanism is ineffective to complete the alining movement, the bar 35 is, of course, blocked against movement to fully operative position. Accordingly, switch 50 remains open and the machine remains inoperative.

It will be apparent from the foregoing that the invention provides a power driven mechanism of a novel and advantageous character operative automatically to shift improperly positioned matrix elements to aline them accurately with adjacent elements for proper engagement with the punches of the machine. Through the interlocking arrangement provided initiation of a machine cycle is effectively prevented until all of the matrix elements are properly positioned. Moreover, this guarding action is effective while still leaving the matrix elements free for manual adjustment during idle periods of the machine. Delays are thus avoided and the productive capacity of the machine is materially increased.

I claim as my invention:

1. In a perforating machine having a plurality of groups of punches, a head supported and guided for movement toward and from said punches, power operated means including a motor for driving said head, a plurality of matrix elements supported on said head for independent adjustment, said elements being arranged in side by side relation in position to operatively engage the respective punch groups upon movement of said head, each of said matrix elements having a plurality of notches for locating the same accurately relative to the punch group, an alining bar supported at one side of said matrix element assembly for movement toward and from the elements, said bar having one edge positioned to enter corresponding notches in all of the elements when the elements are accurately positioned for cooperation with the punch groups, means normally urging said bar to a retracted position with said one edge clear of the elements, other means operable to shift said bar toward the elements, and means including a control device actuated by said bar upon entry of its edge into the notches of all of the elements starting said motor to initiate an operating cycle of said power operated means.

2. In a perforating machine having a plurality of groups of punches, a head supported and guided for movement toward and from said punches, power actuated means including a motor for moving said head, a plurality of matrix elements supported on said head for adjustment relative to each other, said elements being assembled in side by side relation in position to operatively engage the respective punch groups upon movement of said head, each of said matrix elements having a plurality of notches for locating the same accurately relative to the punch groups, an alining bar supported at one side of the matrix element assembly for movement toward and from the elements and adapted to enter corresponding notches in all of the elements when the elements are accurately positioned for cooperation with the punch

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groups, a switch for controlling said motor positioned for actuation by said bar upon its entry into the alined notches, a starting device, and power actuated means operable under direct control of said starting device for moving said bar toward the matrix element assembly, the notches in said matrix elements being widened at their outer ends to present sloping surfaces engageable by said bar when the element is misaligned, said bar acting on said surfaces to cam the misaligned element into alined position.

3. In a perforating machine having a plurality of groups of punches, a head supported and guided for movement toward and from said punches, power operated means for imparting such movements to the head, a plurality of matrix elements supported on said head for relative adjustment, said elements being arranged in side by side relation in position to operatively engage the respective punch groups upon movement of said head, each of said matrix elements having a plurality of notches for locating the same accurately relative to the associated punch group, an alining member supported at one side of said matrix element assembly for movement toward and from the elements, said member entering corresponding notches in all of the elements when the elements are accurately positioned for cooperation with the punch groups, each of said matrix elements having cam surfaces adjacent the locating notches engageable by said member when the element is slightly misaligned, a starting device, other power actuated means operated under direct control of said starting device for moving said member into the notches of properly alined elements and to engage the cam surfaces of misaligned elements and cam them into alinement, and means including a control device actuated by said member for initiating an operating cycle of said first power actuated means upon accurate alinement of all of the matrix elements.

4. In a machine for perforating indicia in sheet material, in combination, a plurality of groups of punches, a like plurality of annular matrix elements each being settable selectively in different positions for operating the associated group of punches in a predetermined combination, means supporting said matrix elements in side-by-side relation for rotation about a common axis, said

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elements having locating notches coordinated with their operating positions, the notches of each element alining with those of the companion elements when the elements are accurately positioned with respect to their respective groups of punches, a bar pivoted to rock about an axis parallel to the rotational axis of the matrix elements, said bar having its edge portion positioned to enter all of the alined notches, spring means normally retaining said bar in a retracted position with said edge portion disposed clear of the matrix elements, a solenoid operatively connected to said bar and effective when energized to rock said bar about its pivot in a direction to project the edge portions into the notches, and a starting switch operable to close an energizing circuit for said solenoid.

5. In a machine for impressing indicia in or on sheet material, in combination, a plurality of matrix elements each having a plurality of indicia impressing positions, means supporting said elements in side-by-side relation for adjustment manually with a selected position of each element alined with those of the companion elements, the positions of said matrix elements being coordinated with locating notches formed in the elements, motor driven means for actuating said matrix elements in an impressing operation, a member common to all of said matrix elements, means including a solenoid operable when energized to move said member into the alined notches in the elements when all of the elements are accurately positioned for impressing indicia, manually operable means to close a circuit for energizing said solenoid, and means including a control device operable upon the entry of said member into the alined notches to start the operation of the motor of said motor driven means.

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