Nov. 13, 1956 T. R. ARDEN 2,770,190

WIRE PRINTING MECHANISM

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FIG. 1

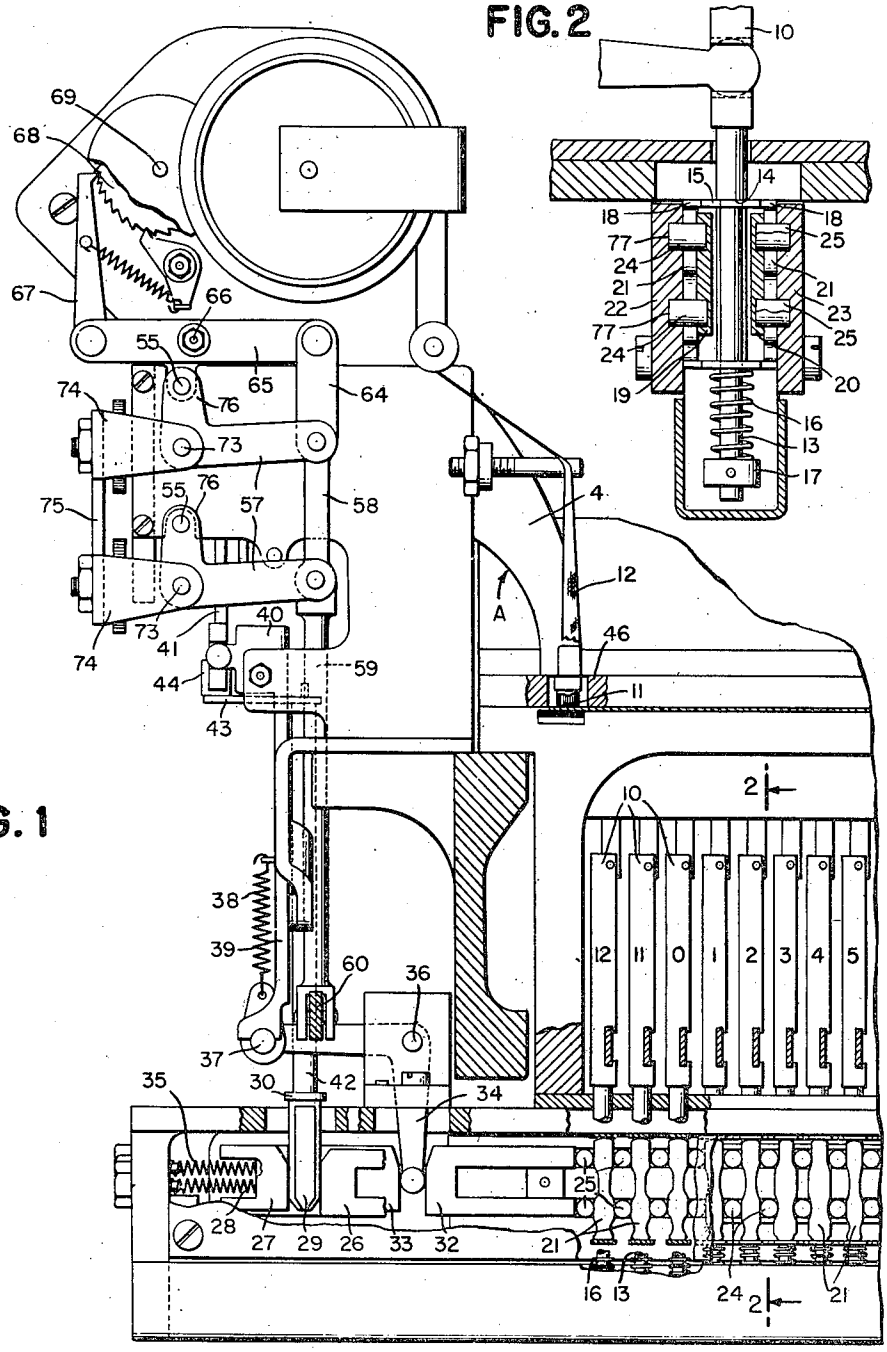

FIG. 2

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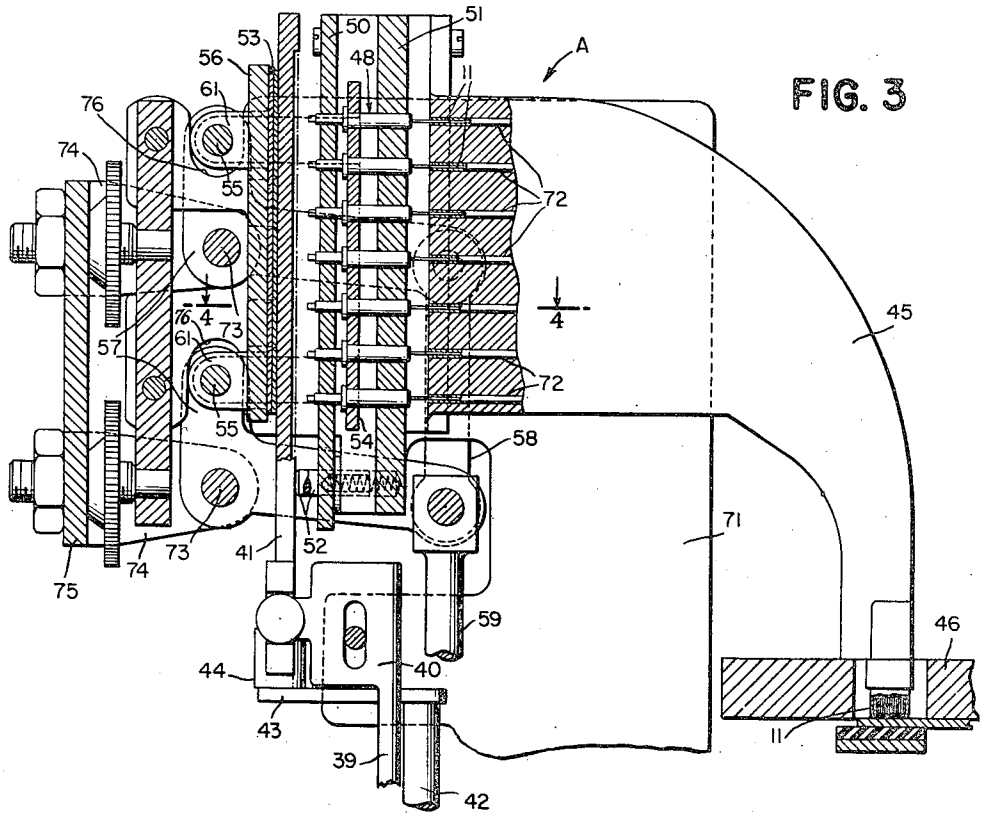


FIG. 3

FIG. 4

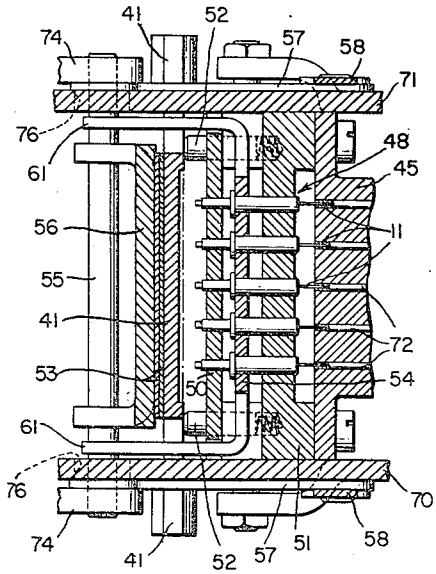
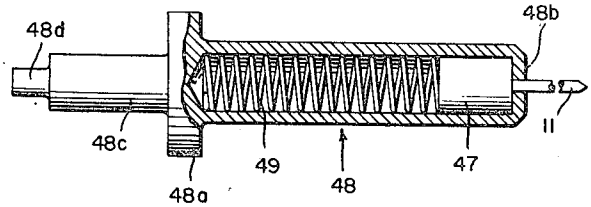


FIG. 5



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2,770,190

WIRE PRINTING MECHANISM

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5 Claims. (Cl. 101—93)

This invention relates to printing machines and more particularly to improved wire printing mechanism for such machines, whereby characters are formed by selectively actuating character forming wires whose ends directly form the characters.

In the wire printing mechanisms of the prior art, it was found that the markings were not always uniform because of the changing lengths of the printing wires which resulted from wearing of the lower or printing ends. The present wire printing mechanism is provided with means for compensating for the changing wire lengths, resulting in uniform markings which were heretofore unobtainable.

The principal object of the invention is to provide an improved wire printing mechanism for a printing machine, whereby compensation is made for the changing lengths of the printing wires because of wearing of the lower or printing ends.

A specific object of the invention is to provide a novel connection device to be interposed between the printing plate and printing wires in the wire printing mechanism of a printing machine.

A further object of the invention resides in the provision of a wire printing mechanism for a printing machine, wherein the moving parts are operable to print alphabetic, numeric or special characters at high speed.

Briefly, the present invention comprises a printing mechanism having a transmission device for each of a multiplicity of printing wires. The transmission device includes a cylindrical member which has a projection extending outwardly therefrom and is slidably supported in a pair of guides. A plunger is mounted for movement within each member and is secured at one end to a related wire extending through an opening in one end of this member. An initially stressed spring is positioned between the plunger and the other end of the member. Actuating means is provided for selectively engaging the members which are supported for movement relative to their related wires so that engagement by the actuating means causes a member to move in the direction of the related wire and the spring to push the related wire to a marking position through pressure upon the plunger. A plate is positioned between the guides to cooperate with the projection of each engaged member to restore each member after it has been actuated.

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

In the drawings:

Fig. 1 is a partial side elevation of a printing machine showing the operating mechanisms for the wire printing unit.

Fig. 2 is a detailed sectional view along lines 2—2 of Fig. 1.

Fig. 3 is a side elevation partly in section showing the wire printing mechanism and the operating connections therefor.

Fig. 4 is a sectional view taken along lines 4—4 of Fig. 3.

Fig. 5 is an enlarged detail view partly in section of the connection device.

The wire printing mechanism of the present invention is provided with a housing having a plurality of tubes extending therethrough and a plurality of printing wires respectively extending through each tube. A slidably supported connection device extends respectively from each printing wire, and actuating means is provided to selectively engage the connection devices which in turn move their related printing wires to a marking position. This improved mechanism permits compensation for the changing lengths of the printing wires because of wearing of the printing ends. The present invention is intended for use in the printing mechanism of a machine such as that disclosed in the copending U. S. patent application Serial No. 103,224 of E. W. Gardinor et al., filed July 6, 1949, and now matured into Patent 2,647,581 which is the IBM model 026 punch with printing machine.

For purposes of this invention, record cards are fed singly to the punching station, past which each card is traversed column by column and perforations are made in the columns in accordance with alphabetic or numeric data. Printing mechanism is provided at the punching station and arranged so that, as punching is effected in each column, a printed designation corresponding to the punching is made in the card.

Referring to Fig. 1, the printing mechanism generally designated A is shown in the upper right hand side of the drawing. Located on the punching line, that is, in line with the row of punches **10**, is a group of wires **11** with the ends thereof disposed in a rectangle (see Figs. 3 and 4), five wire diameters in width and seven wire diameters in length. The ends of these wires constitute a so-called wire printing device which is similar to that described and claimed in the above-mentioned patent. Between the ends of the wires **11** and the record card is an ink ribbon **12** through which impressions are made along the upper margin of the card. When the card is positioned at the row of punches **10**, they will be operated singly or in combination to effect code perforations in the card and, as each hole or combination is punched in any card column, wires **11** will be actuated to print a pattern of the character corresponding to the hole or combination of holes punched. These wire patterns are printed as tangential dots on the cards.

Slide positioning devices

Referring to Figs. 1 and 2, the lower end of each punch **10** is of a reduced diameter constituting a stem **13** which provides a shoulder **14** upon which a block **15**, slidable on the stem, abuts. A spring **16** bears against a collar **17** attached to the lower end of stem **13** and serves to press the block **15** against shoulder **14**. With such construction, the block **15** reciprocates with the punch **10**, with the block being drawn upwardly through spring **16** and returned downwardly by shoulder **14**. Each block **15** has laterally extending flanges **18** (Fig. 2) at its opposite extremities between which a stationary bar **19** extends on one side and a stationary bar **20** extends on the opposite side. These bars are suitably secured to the framework of the machine and are dimensioned vertically so as not to interfer with the reciprocation of the blocks **15**.

Each block **15** has an interposer **21** positioned between flanges **18** on one side or the other (Fig. 2) and disposed in the space between bar **19** and a stationary plate **22** or bar **20** and an opposite plate **23**, so that as the block is reciprocated, its related interposer **21** also moves

up and down in the space between the bar and the plate. The interposer **21** is freely disposed between the flanges **18** so that it may slide laterally. Bar **19** and its related plate **22** are each provided with oppositely facing channels **77** into which rollers **24** extend. Bar **20** and its related plate **23** are similarly channeled to receive rollers **25**. These rollers are free to shift laterally in the channels.

The rollers **24** (Fig. 1) farthest to the right abut against a fixed stop (not shown), and the ones farthest to the left abut the slide **26**. In line with this slide is a short slide **27** urged by spring **28** against a pin **29** in a lever **30**, so that pressure exerted by spring **28** urges all the rollers **24** and interposers **21** therebetween toward the right, as viewed in Fig. 1. On the opposite side of blocks **15** there is a similar arrangement including a fixed stop (not shown) on plate **23**, slides **32** and **33**, a roller in lever **34** and a spring **35**.

In Fig. 1 these parts are shown and numbered to indicate the particular related punches. Thus, the 12, 11 and 0 punches, when operated, each move up a single interposer **21** of the rear or upper set. The 1, 2, 3, 4, and 5 punches, when operated, each move up a single interposer **21** of the lower or forward set. The 6 and 9 punches (not shown) when operated, each move up a pair of interposers, one in each set.

The several interposers **21** have variously configurated vertical camming edges, some of which, when the interposer is moved up, will increase the space between adjacent rollers and shift slides **26** and **32** to the left. Others will decrease this distance so that slides **26** and **32** move to the right under influence of their respective springs **28** and **35**.

Slide **26** may move one, two or three steps to the right and one, two or three steps to the left as indicated by the scale, while slide **32** may move one, two, three or four steps to the left and one, two or three steps to the right.

Printing plate positioning mechanism

In the foregoing manner, the punching of each character hole or combination of holes will be accompanied by a different positioning of slides **26** and **32** in either a leftward or rightward direction, as viewed in Fig. 1. The slide **32** will position lever **34** on rod **36** to move a pin **37** vertically and through spring connection **38** with a plate **39**, the latter is positioned vertically. At its upper end, plate **39** has arms **40** which at their outer ends carry rollers fitted into suitable notches in a printing plate **41**. Accordingly, through these connections the plate **41** is moved up one, two, three or four steps as slide **32** is moved toward the left, as viewed in Fig. 1, and will descend one, two or three steps accordingly as slide **32** is moved toward the right.

The slide **26** through pin **29** and lever arm **30** will rock a rod **42** whose upper end has an arm **43** carrying a pin **44** extending into a vertical slot in the printing plate **41**, so that the plate is positioned toward the left, as viewed in Fig. 1, in accordance with the leftward positioning of slide **26** and is positioned toward the right in accordance with the rightward positioning of the slide. Thus, for each of the possible characters, the plate **41** will be adjusted into different positions from its normal home position.

The printing mechanism

The present invention is embodied in the improved structure of the printing mechanism which will now be described.

Referring now to Fig. 3, it is seen that wires **11** extend through a funnel guide housing **45** suitably supported between the machine side frame plates **70** and **71**. Housing **45** is provided with a series of five openings, one series for each of the seven parallel rows of wires in each of which rows the wires are fanned laterally and the openings themselves are formed to spread vertically toward the left, as viewed in Fig. 1, so that the upper ends of the wires **11** terminate in a rectangle and permit the insertion of thirty-five wires **11** in the funnel guide. For the purposes of this invention, the housing **45** is preferably made from a casting of any suitable material in which the openings are formed integrally to extend through the housing. A tube **72** is inserted in each opening to provide a smooth surface for the moving of wires **11**. The portion of the wires **11** adjacent thet card extend through their respective openings in the housing **45**, the lower portion of which serves to hold the lower ends of wires **11** in compact juxtaposition. These wires converge in a rectangular form which is the overall size of a character to be printed. The lower portion of the housing in turn extends through an opening in the punch die plate **46**. Various combinations of the thirty-five wires **11** are sufficient to form all the required characters to be printed.

A connection device is provided to connect the wires **11** with printing plate **41** when it is actuated. This connection device functions as a transmission device and serves to compensate for changing wire length because of wearing of the lower or printing end of the wires **11**.

The upper ends of each wire **11** are connected to a plunger **47** (Fig. 5) reciprocably mounted within a hollow cylinder **48**, there being a separate plunger and cylinder for each wire **11** (Figs. 3 and 4). Each cylinder **48** is provided with a compression spring **49** which is interposed between the cylinder head **48***a* of the cylinder **48** and the plunger **47** to hold the plunger normally against the front cylinder wall **48***b*. The cylinders **48** are slidably supported within openings in a pair of guide plates **50** and **51** supported between the machine side frame plates **70** and **71**.

The cylinder head **48***a* of each cylinder **48** projects outwardly from the body of the cylinder and is provided with a stem **48***c* (Fig. 5) having an end contact portion **48***d* of reduced diameter which is adapted to be engaged by printing plate **41**. A pair of spring actuated plungers **52** (Fig. 3) act against printing plate **41** to hold it normally away from the cylinder contact portions **48***d*. A restoring plate **54** is positioned between guide plates **50** and **51**. The barrel of each cylinder **48** passes through an opening in plate **54** in such a manner that the cylinder head **48***a* (Figs. 3, 4) lies between guide plate **50** and restoring plate **54**. Plate **54** is engageable with the cylinder heads **48***a* of cylinders **48** for moving the latter to home positions after they have been actuated. The restoring plate **54** is connected by pins **55** to a movable plate **56** which is operable to actuate the printing plate **41** as described hereinafter.

The right hand surface of printing plate **41**, as viewed in Fig. 3, is etched or otherwise configured with a pattern of high or low portions. As already explained, the plate **41** may be positioned up or down and to the right or left with respect to the cylinder contact portions **48***d*, and these movements are so proportioned that each contact portion cooperates with a plurality of high portions on plate **41**. After the plate **41** is positioned, it is pressed toward the contact portions **48***d* of cylinders **48**, and whenever a high portion of plate **41** is in line with a contact portion **48***d*, the wire **11** secured in that cylinder **48** will be actuated to print a mark on the record card.

Printing plate actuating mechanism

Referring now to Fig. 3, the plate **41** has adjacent thereto the actuating plate **56** against which plate **41** is urged by the spring pressed plungers **52** located in the fixed guide plate **51**. Fastened to plate **56** are shim plates **53** whose number can be varied to permit the cylinders to be moved through a predetermined distance to effect a clear marking on the card. The plate **56** has a pin connection with a pair of parallel bell crank levers **57** joined together by

a link 58 from which a rod 59 depends to connect with a lever 60 (Fig. 1). Bell crank levers 57 are pivoted at 73 on a pair of parallel arms 74 which project from a fixed support member 75. The lever 60 is operated through a follower lever from the machine cam shaft which controls the punching operations. The punch shaft is in turn driven directly from the main drive shaft of the machine. This driving mechanism is shown in detail in the forementioned patent of E. W. Gardinor et al, and it is not thought necessary to again disclose it herein. The restoring plate 54 is connected to the bell cranks 57 through links 61 so that it is reciprocated along with printing plate 41. It should be noted that pins 55 project into slots 76 in the machine side frame plates 70 and 71 which allow free reciprocation of bell cranks 57.

Ribbon feeding mechanism

Printing ribbon 12 (Fig. 1) is guided from a spool 62 on shaft 63 to pass beneath printing wires 11 to a second spool (not shown) located directly behind spool 62 on shaft 63. The ribbon 12 follows a path to the second spool which is similar to the path shown in Fig. 1 but being in a different vertical plane. The upper bell crank 57 has a link connection 64 with a lever 65 pivoted at 66, which has a pawl 67 at its left end in engagement with a ratchet 68 secured to a rod 69. This rod also is provided with a clutch element (not shown) mounted thereon for rotation therewith but slidable axially. It is thus seen that when lever 60 actuates rod 59 the clutch element is made effective to drive one of the spools through the above linkage, which is described in detail in the forecited patent of E. W. Gardinor et al.

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

What is claimed is:

1. Printing mechanism comprising in combination, a multiplicity of printing elements, a cylindrical member for each element, each member having a projection extending outwardly therefrom, a pair of guides in which each member is slidably supported, means for connecting each member to its related element, actuating means for engaging the members, means for moving said actuating means from an inactive to an active position, whereby selected ones of said members are engaged to move the related printing elements to a marking position, and a plate positioned between said guides for cooperating with the projection of each engaged member to restore each member when the actuating means is again moved to an inactive position.

2. Printing mechanism comprising in combination, a multiplicity of printing wires, a transmission device for each wire, each device having a projection extending outwardly therefrom, a plunger mounted for movement within each device and secured at one end to a related wire extending through an opening in one end of said device, yieldable means positioned between said plunger and the other end of said device, actuating means for engaging the devices, means for moving said actuating means from an inactive to an active position to engage selected ones of said devices, a pair of guides for supporting said devices for movement relative to said wires, so that engagement by said actuating means causes a device to move in the direction of the related wire and said yieldable means to push the related wire to a marking position through pressure upon said plunger, and a common member positioned between said guides for cooperating with the projection of each engaged device to restore each device when the actuating means is again moved to an inactive position.

3. The mechanism set forth in claim 2, wherein each transmission device is provided with a stem having a contact portion which is engageable by the actuating means to move said device.

4. The mechanism as set forth in claim 2, in which the yieldable means is an initially stressed spring.

5. Printing mechanism comprising in combination, a multiplicity of printing wires, a transmission device for each wire, each device having a projection extending outwardly therefrom, a plunger mounted for movement within each device and secured at one end to a related wire extending through an opening in one end of said device, yieldable means positioned between said plunger and the other end of said device, actuating means for engaging the devices, means for moving said actuating means from an inactive to an active position to engage selected ones of said devices, a pair of guides in which each device is slidably supported for movement relative to said wires, so that engagement by said actuating means causes a device to move in the direction of the related wire and said yieldable means to push the related wire to a marking position through pressure upon said plunger, and a plate positioned between said guides for cooperating with the projection of each engaged device to restore each device when the actuating means is again moved to an inactive position.

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