Aug. 19, 1952 G. W. HOPKINS 2,607,289

PRINTING MACHINE

Filed Jan. 21, 1949 4 Sheets-Sheet 1

FIG. 5

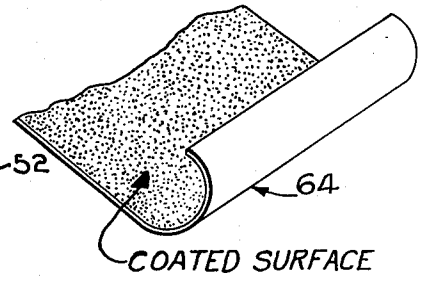
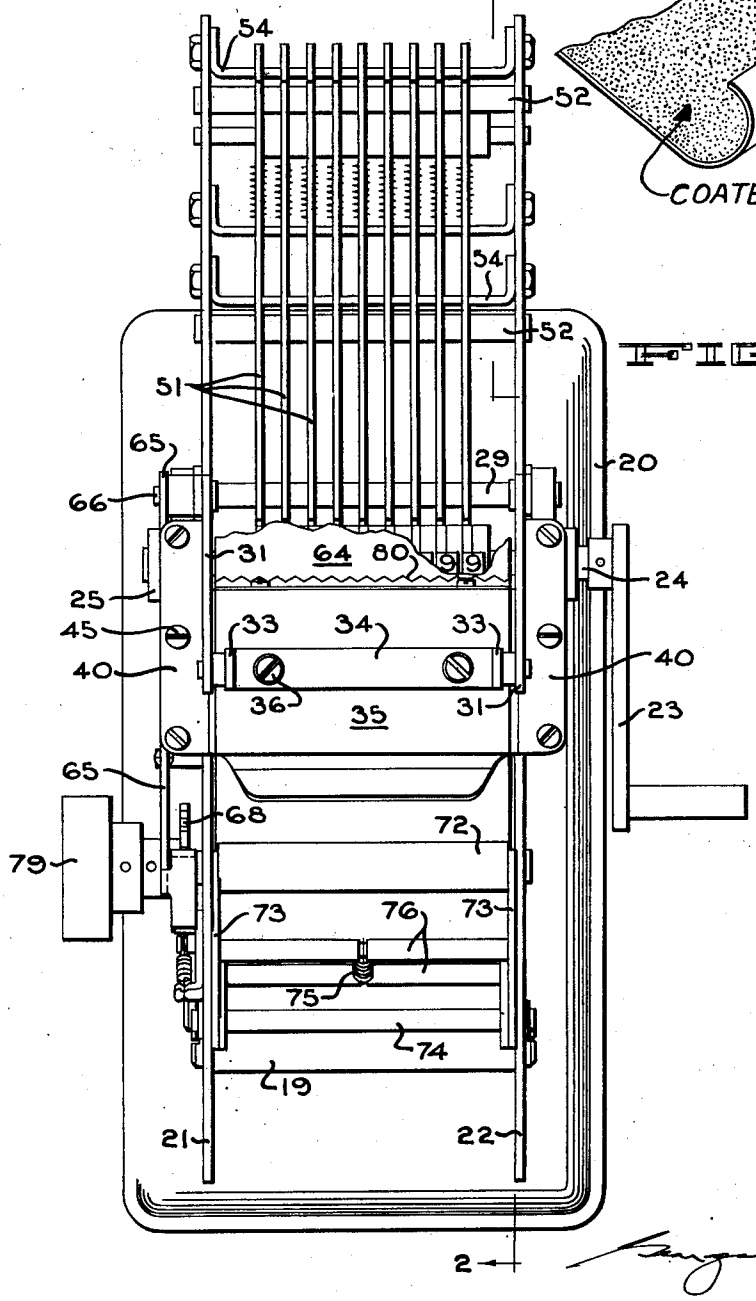


FIG. 3



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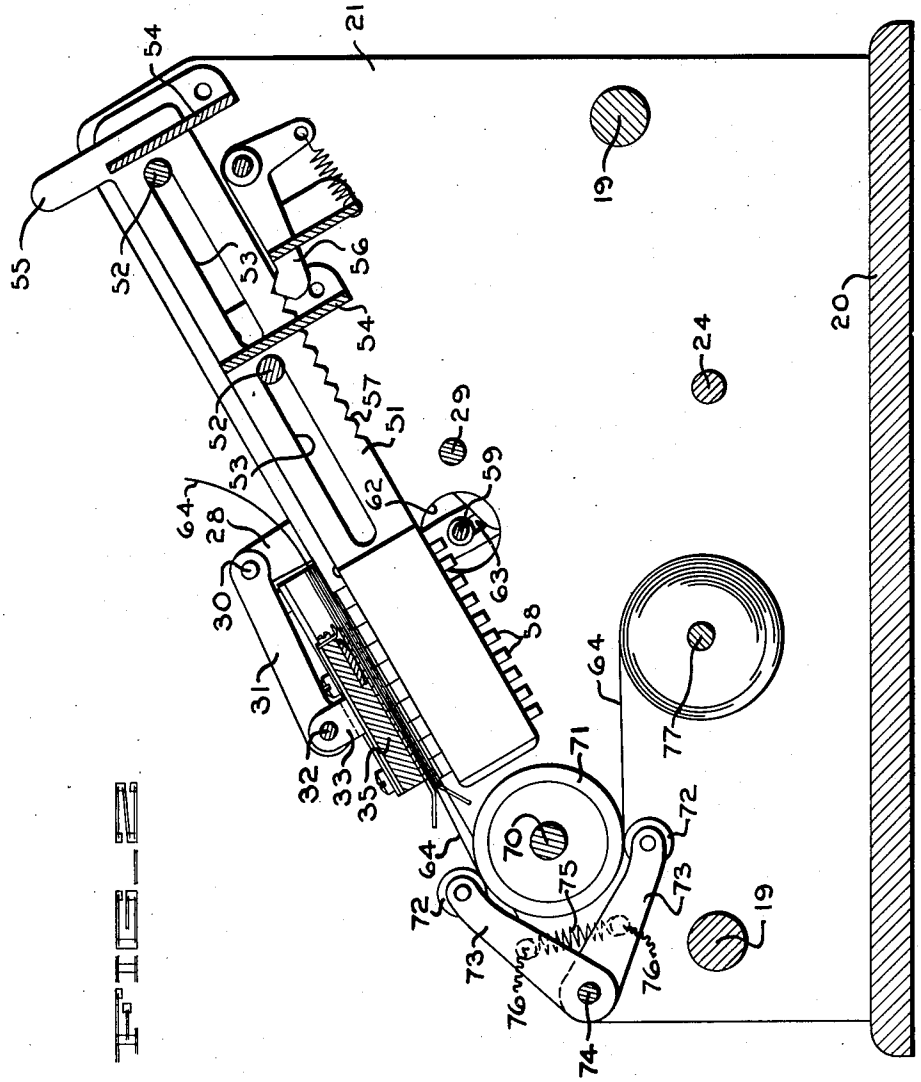


FIG. 2

INVENTOR.

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PRINTING MACHINE

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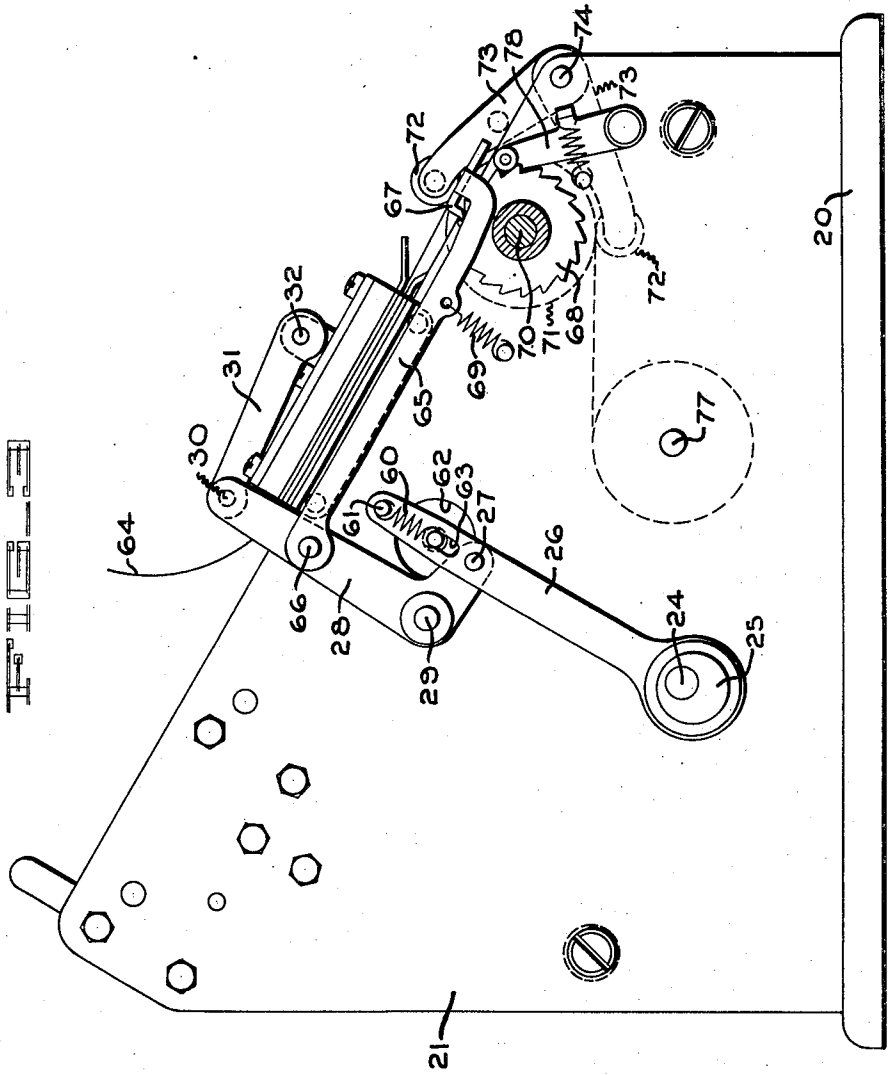


FIG. 3

INVENTOR.

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PRINTING MACHINE

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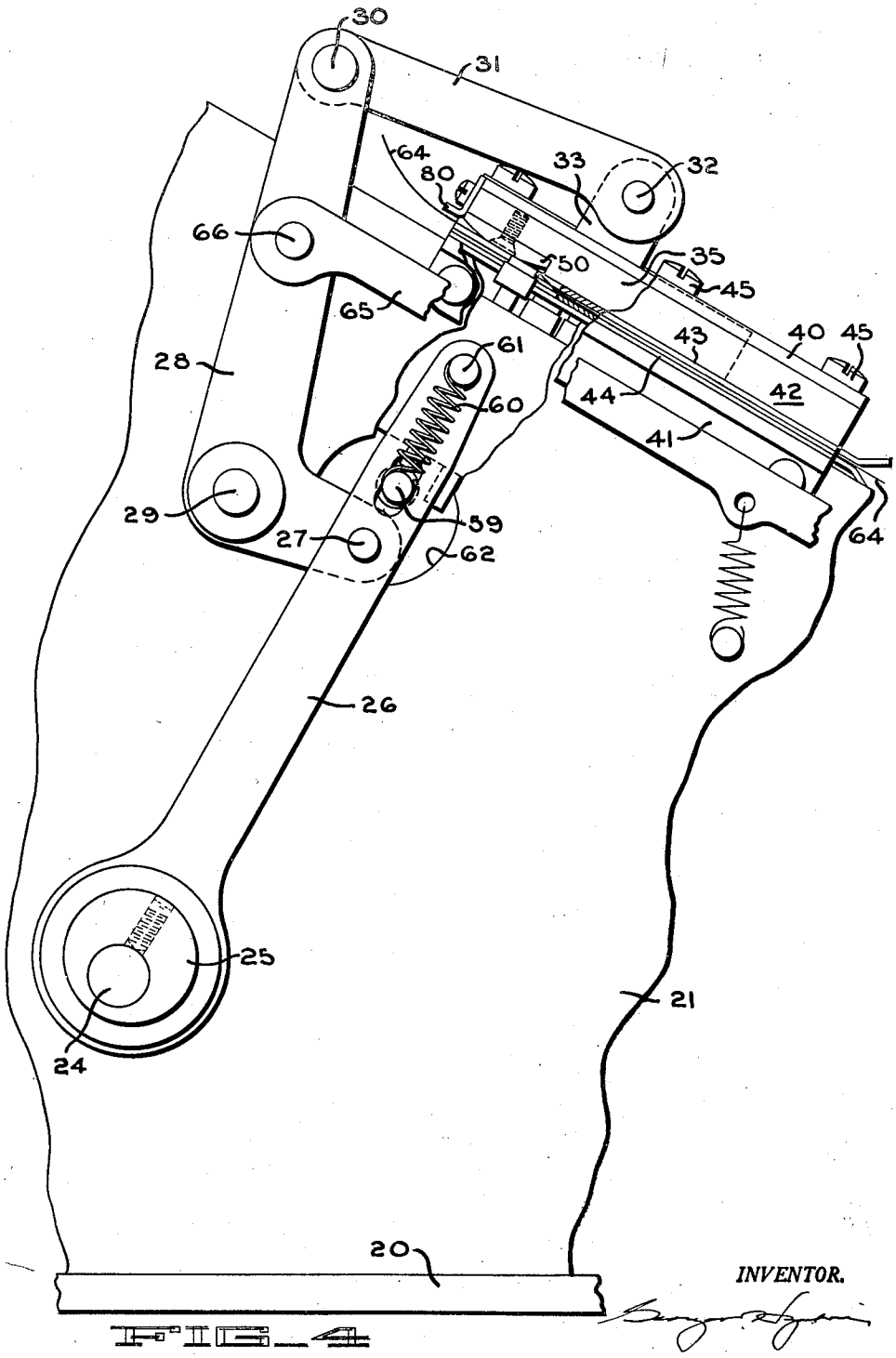


FIG. 4

INVENTOR.

Patented Aug. 19, 1952 2,607,289

UNITED STATES PATENT OFFICE

2,607,289

PRINTING MACHINE

George W. Hopkins, San Leandro, Calif., assignor to Friden Calculating Machine Co. Inc., a corporation of California

Application January 21, 1949, Serial No. 71,943

8 Claims. (Cl. 101—93)

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This invention relates to the method and apparatus for printing from type on a piece or strip of coated record material in such a manner as to eliminate the use of the conventional ink ribbon.

It is well known that a marking stylus of brass, bronze, platinum or other suitable material may be caused to produce a mark on suitably coated paper when the stylus is rubbed against the surface of the paper. The paper commonly utilized for this purpose is provided with a coating containing a metalliferous substance of such a nature that when the marking stylus is rubbed across the coated surface of the paper, a mark or line will be produced on the surface of the paper so as to indicate the path followed by the stylus.

In the printing mechanisms commonly used at the present time in typewriters, cash registers, adding machines, etc., an ink ribbon is interposed between the type and the paper so as to cause an ink impression of the type to be made on the paper when the type is forced thereagainst. Such ink ribbons are a constant source of annoyance and trouble and, as a result, considerable effort has been spent in attempting to eliminate the ink ribbon altogether. Thus far, however, no satisfactory solution to this problem has been discovered.

It was with this problem in mind that I devised a method of printing from type without the use of an ink ribbon by utilizing the brass stylus and coated paper method of recording mentioned above. I have found that by placing a piece of the coated paper over the type and then rubbing the coated surface of the paper with the plain, uncoated surface of a piece of brass or other suitable material, a very satisfactory impression may be obtained. I have also devised a machine for printing in accordance with this method, which machine will be described in considerable detail hereinafter.

Accordingly, it is an object of the present invention to provide a method of printing from type on a piece of coated record material without the use of an ink ribbon.

Another object of the invention is to provide an apparatus for printing in accordance with this method.

Another object of the invention is to provide a printing machine in which a strip of coated record material is fed between a marking platen and suitable printing type and means is provided for causing the printing type to be pressed against the paper and the platen, after which the platen is rubbed across the surface of the coated record material so as to provide an imprint of the type on the record material.

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Another object of the invention is to provide a printing machine in which a strip of coated record material is fed between a reciprocating platen and one or more printing type which are adapted to be pressed into contact with the record material and platen together with means for feeding the record material in the same direction as the reciprocating platen, whereby the imprint made on the record material by the type will be uncovered by the platen at the end of the printing operation.

Other objects of the invention will become apparent from the following description of one type of mechanism for carrying out my novel method of printing, which mechanism is shown in the accompanying drawings, wherein:

Figure 1 is a plan view of the printing machine.

Figure 2 is a cross-sectional elevation taken through the machine along the line 2—2 in Figure 1.

Figure 3 is a left side elevation of the machine.

Figure 4 is a view showing certain of the mechanism illustrated in Figure 3 in greater detail.

Figure 5 is a fragmentary perspective view of a coated record strip.

In the accompanying drawings, there is shown a machine for enabling printing to be accomplished in accordance with the method mentioned earlier herein. That is, a strip of coated record material is fed through the machine by means of suitable guides provided therefor. These guides hold the paper in such a position that the coated surface thereof lies adjacent to a marking platen which may be in the form of a bar, plate, etc., and which is constructed of a material having the property of producing a mark on the surface of the strip of coated paper when rubbed thereagainst. Located on the opposite side of the paper from the marking platen is a group of printing type which are arranged for sliding movement in a direction perpendicular to the surface of the marking platen so as to enable the type to be resiliently urged into engagement with the paper and the platen at the appropriate time during the printing cycle. The platen is arranged for reciprocatory movement and the machine is so designed and constructed that the platen will be reciprocated during the time that the type is urged into engagement therewith. As a result of the rubbing action of the marking platen on the coated surface of the paper, a printing impression will be made on the paper from

the type which has been pressed into contact with the paper and the platen. It will be found that the characters printed on the surface of the coated paper by a machine of this type are quite clear and legible and are not readily subject to smearing during handling of the printed tape after it is removed from the machine.

As shown in Figures 1 and 2, the machine is provided with a base 20 to which is secured a left-side frame 21 and a right-side frame 22 which are tied together by cross-bars 19 and between which are mounted the main operating mechanisms of the machine. The machine is adapted to be given cycles of operation, during which a printing impression is made on the record material, by means of a hand crank 23 which may be rotated through 360° so as to cause one complete cycle of operation of the printing mechanism and thereby cause one printing impression to be made on the record material. It is to be realized, of course, that if desired the machine could be arranged for cyclical operation by oscillating movements of the hand crank rather than by the rotary movements thereof as contemplated in the present machine.

The hand crank 23 is secured to the right-hand end of a main drive shaft 24 which is journalled between the side frames 21 and 22 and which has fastened thereto at either end an eccentric 25 (Figures 3 and 4) by means of which the various operating mechanisms of the machine are driven. Each eccentric 25 is arranged to reciprocate an operating arm 26, which arms are guided at their upper ends by studs 27 mounted in the forwardly-extending arms of bell crank levers 28. The bell crank levers are pivotally mounted on studs 29 secured to the side frames 21 and 22 and each bell crank lever carries a stud 30. Pivoted on the studs 30 are a pair of links 31 which serve to operate the marking platen. At their opposite ends the links 31 are pivoted on studs 32 which are fastened to the upturned ears 33 of a bracket 34 (Figure 1) which is secured to the upper surface of a platen carrier 35 by means of screws 36.

As shown in Figures 1 and 4, the carrier 35 is supported for substantially horizontal sliding movement by a pair of upper bearing plates 40, each of which is held in spaced relationship with respect to a supporting bracket 41 suitably secured to the side frames 21 and 22. The bearing plates 40 are maintained in said spaced relationship by means of platen guide blocks 42 and upper and lower paper guides 43 and 44, respectively, which are spaced apart by means of intervening shim strips so as to form a paper chute. The bearing plates 40, guide blocks 42, and paper guides 43 and 44 are secured to the brackets 41 by means of screws 45 which pass through apertures provided in the various elements and screw into tapped holes provided in brackets 41. By means of this construction, the platen carrier 35 is guided for substantially horizontal sliding movement, the up and down movement of the carrier being limited by the upper bearing plates 40 and the upper paper guides 43 while endwise movement thereof is prevented by the guide blocks 42. It will be observed from the foregoing description that the carrier 35 will be moved first rearwardly and then returned in a forward direction to its starting position each time the hand crank 23 is turned through 360°.

Secured to the under side of the carrier 35 is a marking platen 50 (Figure 4) which, as mentioned earlier herein, may be plain, i. e. uncoated, and of any of the various materials having the ability to produce a mark on the surface of the coated record material which is used in the machine. The marking platen 50 is secured in place on the carrier by means of screws or other suitable fastening means, and the lower face of the platen 50 may be formed with a slightly arcuate contour as shown in Figure 4, if desired, so as to effect substantially line contact between the paper and the printing type.

As shown in Figures 1 and 2, the machine is provided with a plurality of individually settable type carriers 51 which are supported for substantially horizontal sliding movement by means of cross-bars 52 which pass through elongated slots 53 formed in the type carriers. The type carriers are held in a spaced apart relationship, as shown in Figure 1, by means of combplates 54 which are supported between the side frames 21 and 22. Each type carrier is provided at its rear end with a finger piece 55 by means of which the operator may effect any desired setting of the individual carriers, the various settings of each carrier being determined by a spring-urged detent lever 56 which is arranged to engage with a series of notches 57 provided in the lower edge of each of the carriers. At its forward end, each carrier has mounted therein a plurality of slidable type elements 58, the upper ends of which are inscribed with suitable type characters for printing on a strip of coated record material 64. Each type element 58 is urged downwardly to its lower or inactive position either by gravity or by means of a suitable restoring spring, not shown herein, so as to normally maintain the printing type out of engagement with the record material and platen. For the purpose of resiliently urging the selected type elements on each type carrier upwardly into contact with the underside of the record material so as to bring the upper, or coated, surface thereof into contact with the marking platen, there is provided a pressure bar 59 (Figures 2 and 4) which extends across the machine and passes through apertures 62 provided therefor in the side frames 21 and 22. Each end of the bar 59 is received within an elongated slot 63 provided in the arms 26, the bar being normally urged into engagement with the upper ends of the slots by means of a relatively strong spring 60 stretched between each end of the bar 59 and a stud 61 fastened to the upper end of each of the arms 26. The portion of the bar 59 underlying the type elements 58 is preferably provided with a sleeve of rubber or other similar resilient material so as to take care of any slight variation in the lengths of the various type elements 58. It will thus be seen that when the crank 23 is rotated and the arms 26 thereby elevated, the bar 59 will be moved up against the lower ends of the type elements 58 thus forcing the type characters inscribed on the upper ends of the elements into contact with the paper 64 so as to force the same against the marking platen. The upper travel of the arms 26 is somewhat more than is necessary to move the type into printing position, and the springs 60 will therefore be stretched so as to resiliently hold the type against the paper and platen during the reciprocatory movement of the latter, whereby constant pressure is exerted on the type during the printing operation.

Means is provided in the present machine for feeding the strip of record material rearwardly by a given amount at the outset of each printing cycle, this means comprising a paper feed

pawl 65 which, at its rear end, is pivoted on a stud 66 secured to the bell crank 28 lying on the left-hand side of the machine. The pawl 65 is provided at its forward end with a tooth 67 (Figure 3) which is urged into contact with a ratchet wheel 68 by means of a spring 69. The ratchet wheel is secured to the left-hand end of a shaft 70 journalled between the side frames of the machine. Secured to the shaft 70, between the side frames, is a rubber feed roll 71 against which the strip of record material is held by a pair of pressure rolls 72. The coils 72 are rotatively mounted on the outer ends of arms 73 which are pivoted on a rod 74 supported between the side frames 21 and 22. The arms 73 are urged toward the feed roll 71 by means of a spring 75 (see Figure 2) which is tensioned between tie-rods 76 extending between the arms 73. The strip of coated record material 64 is wound on a spool which is rotatably supported on a rod 77 supported between the side frames. Referring to Figure 3, it will be noted that at the outset of the upward movement of the arm 26, the bell crank 28 will be rocked counterclockwise and the pawl 65 moved rearwardly so as to advance the strip of record material through a distance equal to one tooth space of the ratchet wheel 68 where the paper will be held by the immobilized feed roll 71, then held stationary by a spring-urged detent arm 78 for the remainder of the cycle while the pawl 65 is being returned to the position shown in Figure 3.

If desired, the paper may be fed by hand by rotating a knob 79 (Figure 1) secured to the left-hand end of the shaft 70. Tearing off of the printed portion of the tape is facilitated by means of a serrated tear-off bar 80 secured to the rear edge of the platen carrier 35.

Operation

The machine hereinabove described operates as follows to cause an imprint of the printing type to be recorded on the strip of coated record material.

As the hand crank 23 is rotated in a clockwise direction, as viewed from the right-hand side of the machine, the arms 26 are moved upwardly so as to rock the bell cranks 28 counterclockwise, as viewed in Figures 3 and 4. The platen carrier and marking platen are thereby caused to move rearwardly and the paper feed pawl 65 is likewise moved in a rearward direction so as to cause feeding movement of the record strip 64. The type elements 58 are then picked up by the pressure bar 59 and moved upwardly so as to press the coated surface of the record material into contact with the rearwardly moving marking platen 50. Upon reaching their top dead center positions, the eccentrics 25 will have caused the arms 26 to move upwardly a sufficient distance to stretch the springs 60 attached to the pressure bar 59, in the manner shown in Figure 4, and the marking platen 50 will have been moved to its rearmost position where the forward edge of the platen lies over the type elements, as shown in Figure 4. Upon further movement of the hand crank, the arms 26 are moved downwardly so as to cause the marking platen to rub against the coated surface of the material in a forward direction and the paper feed pawl will be moved idly toward the front of the machine so as to engage the next tooth of the ratchet wheel 68 preparatory to a paper feeding operation during the next printing cycle. As the arms 26 move downwardly, the springs 60 are permitted to contract until the pressure bar 59 engages with the upper ends of the slots 63 in the arms 26. Upon further downward movement of the pressure bar, the type elements will be retracted by their individual restoring springs so as to move the type away from the platen.

The resulting imprint made on the record strip by the rubbing action of the marking platen on the coated surface of the strip will be uncovered by the platen during its final forward movement in the cycle so that the printed result may be read-off by the operator at the conclusion of the cycle. Referring to Figure 2, which shows the parts in their home positions, it will be noted that the type element 58, located immediately above the pressure bar 59, lies to the rear of the platen when the parts are in their normal positions and, hence, the imprint effected by this type element will likewise lie to the rear of the platen where it may be viewed by the operator after printing has been effected.

Any selected group of symbols may be printed across the record strip by first setting the type carriers 51 to the desired positions and then operating the hand crank 23 so as to cause an imprint of the selected type to be made on the record material.

While the form of mechanism shown and described herein is well adapted to fulfill the objects of the present invention, it is to be understood that it is not intended that the invention shall be confined to the particular form or embodiment herein disclosed since it is capable of embodiment in various forms, all coming within the scope of the claims which follow.

I claim:

1. A method of reproducing a character inscribed on a piece of type on a record strip having on one of its faces a coating of material inherently capable of being changed in appearance on areas of said face rubbed in pressurized contact with a plain uncoated surface comprising interposing the record coated strip between the type and a platen having a plain uncoated surface with the coated side of the strip adjacent said platen surface and the other side of said strip adjacent said type, pressing the platen relatively against the record strip and the type, and then rubbing the platen relatively over the coated surface of the record strip so as to cause a character reproduction corresponding to the type character to be made visible on the coated face of the strip.

2. A method of forming a visible character on a piece of record material having on one of its faces a coating of material inherently capable of being changed in appearance on areas of said face rubbed in pressurized contact with a plain uncoated surface, which comprises disposing the record material with the coated side up, providing type beneath the record material and a platen having a plain uncoated bottom surface above the record material over the type, causing relative movement of the type toward the platen so as to cause the coated surface of the record material to be pressed up against said platen surface by the type, and then rubbing the platen surface relatively over the coated surface of the record material so as to cause a character reproduction corresponding to the type character to be made visible on the coated surface of the record material.

3. In a machine for reproducing type characters on a record strip having on one of its faces a coating of material inherently capable of

being changed in appearance on areas of said face rubbed in pressurized contact with a plain surface, the combination of one or more type; a platen itself having a plain uncoated surface; means for positioning selected type in cooperative spaced relation to said platen surface; means for positioning such a coated strip between said platen surface and the selected type with the coated face of the strip directly adjacent said platen surface so as to be engageable therewith and with the other face of said strip adjacent the selected type; and mechanism for effecting relative movement of said platen and said selected type including a cyclically operable operating member, yieldable means operable by said member during a period beginning after the commencement of a cycle and ending before the completion of a cycle for effecting relative approaching movement of said platen and said selected type to cause the latter to press the coated face of the strip resiliently into contact with said platen surface, and means operable by said member during substantially a complete cycle thereof for effecting relative reciprocatory movement of said platen and said selected type transverse to said approaching movement, whereby an area of the coated face of said strip corresponding to said selected type is rubbed in directly engaging pressurized contact with said platen surface, the last phase of said reciprocatory movement taking place after the ending of said period.

4. In a machine for reproducing type characters on a record strip having on one of its faces a coating of material inherently capable of being changed in appearance on areas of said face rubbed in pressurized contact with a plain surface, the combination of one or more type; a platen itself having a plain uncoated surface; means for positioning selected type in cooperative spaced relation to said platen surface; means for positioning such a coated strip between said platen surface and the selected type with the coated face of the strip directly adjacent said platen surface so as to be engageable therewith and with the other face of said strip adjacent the selected type; mechanism for effecting relative movement of said platen and said selected type including a cyclically operable operating member, means operable by said member during a period beginning after the commencement of a cycle and ending before the completion of a cycle for effecting relative approaching movement of said platen and said selected type to cause the latter to press the coated face of the strip into contact with said platen surface, and means operable by said member during substantially a complete cycle thereof for effecting relative reciprocatory movement of said platen and said selected type transverse to said approaching movement, whereby an area of the coated face of said strip corresponding to said selected type is rubbed in directly engaging pressurized contact with said platen surface, the last phase of said reciprocatory movement taking place after the ending of said period; and means operable by said mechanism for feeding the record strip to present a new portion of the coated face thereof for engagement with said platen surface during each cycle of operation of said mechanism.

5. In a machine for reproducing type characters on a record strip having on one of its faces a coating of material inherently capable of being changed in appearance on areas of said face rubbed in pressurized contact with a plain surface, the combination of one or more type; a platen itself having a plain uncoated surface; means for positioning selected type in cooperative spaced relation to said platen surface; means for positioning such a coated strip between said platen surface and the selected type with the coated face of the strip directly adjacent said platen surface so as to be engageable therewith and with the other face of said strip adjacent the selected type; mechanism for effecting relative movement of said platen and said selected type including a cyclically operable operating member, means operable by said member during a period beginning after the commencement of a cycle and ending before the completion of a cycle for effecting relative approaching movement of said platen and said selected type to cause the latter to press the coated face of the strip resiliently into contact with said platen surface, and means operable by said member during substantially a complete cycle thereof for effecting relative reciprocatory movement of said platen and said selected type in a predetermined path transverse to said approaching movement, whereby an area of the coated face of said strip corresponding to said selected type is rubbed in directly engaging pressurized contact with said platen surface, the last phase of said reciprocatory movement taking place after the ending of said period; and means operable by said mechanism for feeding the record strip along said predetermined path to present a new portion of the coated face of said strip for engagement with said platen surface during each cycle of operation of said mechanism.

6. In a machine for reproducing type characters on a record strip having on one of its faces a coating of material inherently capable of being changed in appearance on areas of said face rubbed in pressurized contact with a plain surface, the combination of one or more type; a platen itself having a plain uncoated surface; means for positioning selected type in cooperative spaced relation to said platen surface; means for positioning such a coated strip between said platen surface and the selected type with the coated face of the strip directly adjacent said platen surface so as to be engageable therewith and with the other face of said strip adjacent the selected type; and mechanism for effecting relative movement of said platen and said selected type including a cyclically operable operating member, means operable by said member during a period beginning after the commencement of a cycle and ending before the completion of a cycle for effecting relative approaching movement of said platen and said selected type to cause the latter to press the coated face of the strip into contact with said platen surface, and means operable by said member during substantially a complete cycle thereof for effecting relative reciprocatory movement of said platen and said selected type transverse to said approaching movement, whereby an area of the coated face of said strip corresponding to said selected type is rubbed in directly engaging pressurized contact with said platen surface, the last phase of said reciprocatory movement taking place after the ending of said period.

7. A construction as set forth in claim 6 including means mounting said type for approaching movement toward said platen, and means mounting said platen for movement transverse to said approaching movement.

8. In a machine for reproducing type characters on a record strip having on one of its faces

a coating of material inherently capable of being changed in appearance on areas of said face rubbed in pressurized contact with a plain surface, the combination of one or more type; a platen itself having a plain uncoated surface; means for positioning selected type in cooperative spaced relation to said platen surface; means for positioning such a coated strip between said platen surface and the selected type with the coated face of the strip directly adjacent said platen surface so as to be engageable therewith and with the other face of said strip adjacent the selected type; and mechanism for effecting relative movement of said platen and said selected type including a cyclically operable operating member, means operable by said member during a period beginning after the commencement of a cycle and ending prior to the completion of a cycle for pressing the selected type against the record strip and thereby pressing the coated face of said strip against said platen, and means operable by said member before the beginning of said period, throughout said period, and after the end thereof for imparting a reciprocatory movement to the platen

to cause it to rub against the part of the coated face of the record strip which is pressed by the type; and means operable by said member for effecting a feeding movement of the record strip in the direction of reciprocation of said platen and during a part of the cycle other than said period, whereby a reproduction of the selected type formed on the coated face of said strip by the rubbing of the platen will be uncovered at the end of a cycle.

GEORGE W. HOPKINS.

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