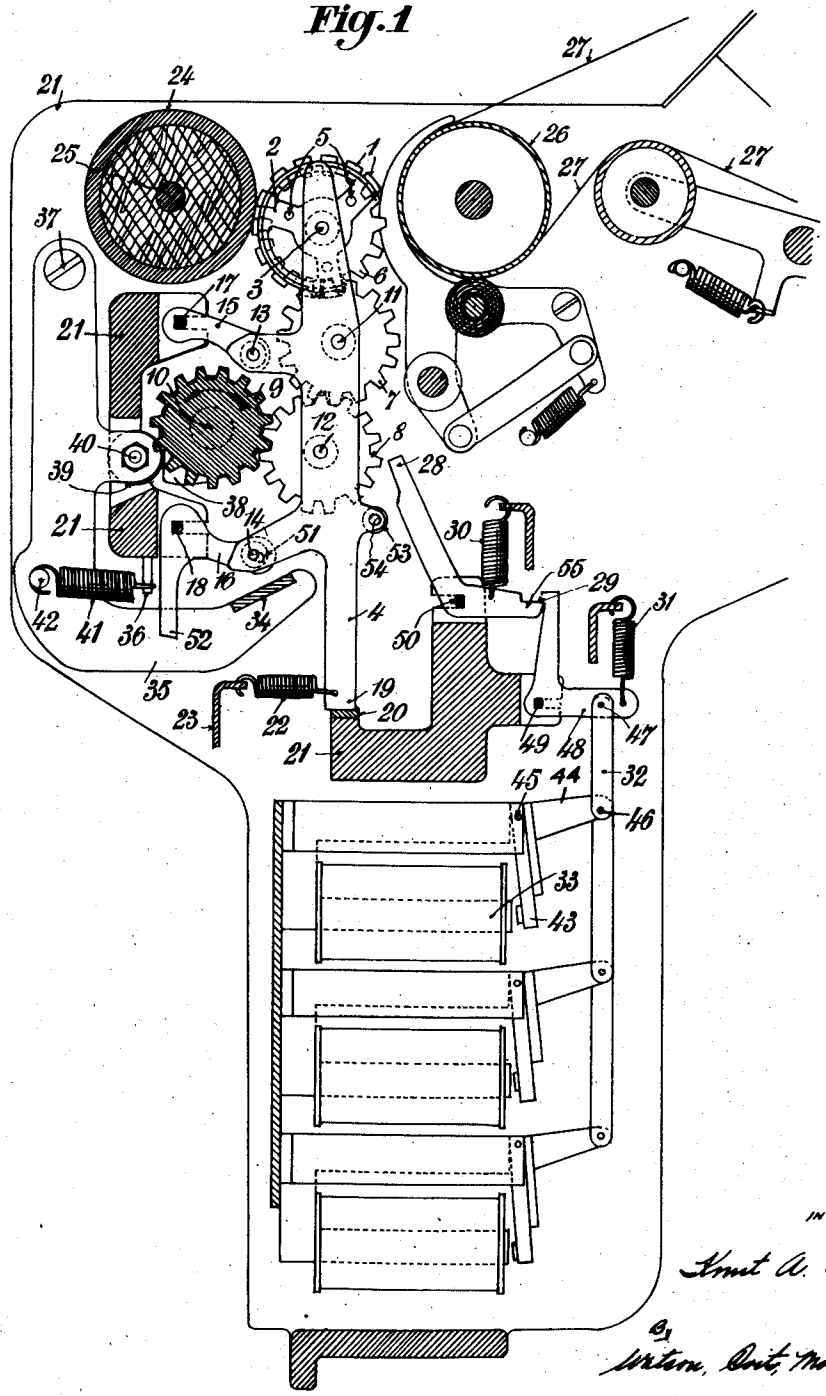
Aug. 28, 1934. K. A. KNUTSEN 1,971,859

PRINTING DEVICE FOR TABULATING MACHINES FOR PERFORATED CARDS

Original Filed June 17, 1931 3 Sheets-Sheet 1

Fig. 1



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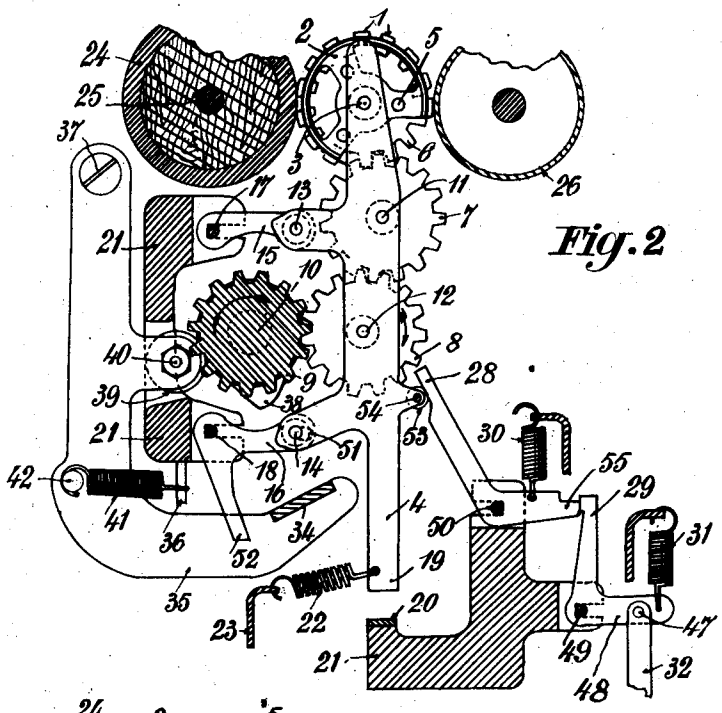


Fig. 2

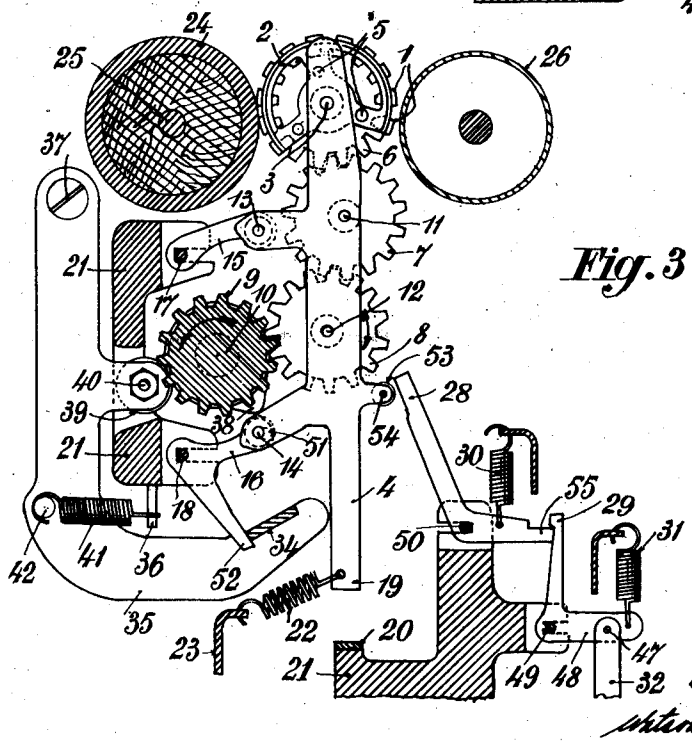


Fig. 3

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PRINTING DEVICE FOR TABULATING MACHINES FOR PERFORATED CARDS

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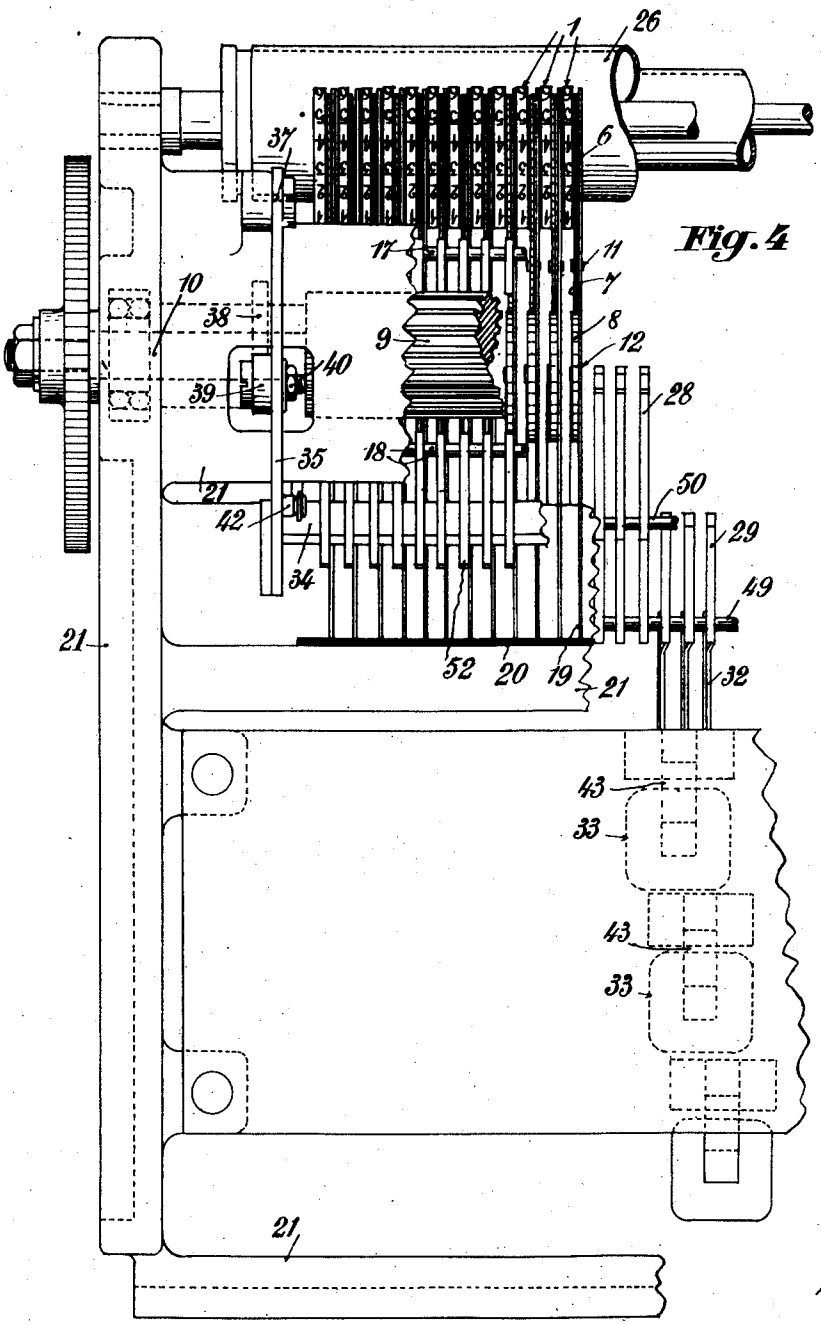


Fig. 4

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Patented Aug. 28, 1934 1,971,859

UNITED STATES PATENT OFFICE

1,971,859

PRINTING DEVICE FOR TABULATING MACHINES FOR PERFORATED CARDS

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Application June 17, 1931, Serial No. 545,121. Renewed April 13, 1934. In Norway May 15, 1931

17 Claims. (Cl. 101—93)

This invention relates to printing apparatus and more particularly to printing apparatus of the type which is adapted to be associated with tabulating machines for perforated register cards, the printing being effected in accordance with the arrangement of the perforations in the cards.

In my prior copending U. S. application Ser. No. 540,166, filed May 26, 1931, I have disclosed a printing apparatus of this character involving the provision of a series of type elements, each type element being allocated to a certain point on the register card, the construction being such that the type element will be operated if and when a perforation occurring on the card at the point in question is detected by mechanism associated with the type operating apparatus, for instance mechanism such as that shown in the patent to Bull No. 1,675,969, granted July 3, 1928. In the embodiment shown in my prior application each type element is mounted on a separate type carrier, these type carriers being movably supported on a rotatable drum, and when selected by the detecting mechanism for operation, the selected carriers are shifted with respect to the drum in such manner as to cause the type elements to roll upon the paper to effect the printing.

The present invention is an improvement of this arrangement involving the mounting of a plurality of type elements on a single rotatable type wheel, the construction being such that upon selection of a type element for printing, the type wheel is moved bodily in such manner as to cause the selected type element to roll upon the paper.

It is a feature of the invention that the printing apparatus is simple in construction, entirely automatic in operation, and applicable to various conventional forms of detecting mechanism for ascertaining the position of perforations on register cards.

Further objects and features of the invention will be apparent from the following description, taken in connection with the accompanying drawings, in which

Figure 1 is a sectional view of one form of printing apparatus constructed in accordance with the principles of the invention and indicating the position which the parts occupy normally, that is to say, in readiness for a printing operation;

Figure 2 is a sectional view corresponding to Figure 1 and illustrating the position of the parts during the actual printing of a type element as the latter rolls on the paper;

Figure 3 is a similar view in section, showing a further position of the parts immediately upon completion of the printing operation; and

Figure 4 is an elevational view of the machine with certain parts removed or broken away to clarify the illustration.

Referring specifically to the embodiment of the invention shown in the drawings, it will be observed by reference to Figures 1 and 4 that the various type elements 1 are mounted on and secured in any conventional manner to a plurality of type wheels 2, the latter being supported for rotation about axes 3 on a corresponding number of type wheel carriers 4.

It will of course be understood that the arrangement is such that each of the type elements 1 on a given type wheel 2 prints a character which corresponds to a given position of a perforation in a certain column on a register card, a type wheel 2 being allocated to each column on the card. Thus the type wheel selected for operation by the occurrence of a perforation on a card will be that corresponding to the column in which the perforation occurs, and the particular type elements which effects the printing in accordance with that perforation will depend upon the position of the perforation in the column as will be readily understood.

A toothed gear 6 is rigidly secured, for instance, by means of rivets 5, to each of the type wheels 2 for effecting rotation of the same about its rotational axis 3. Thus each type wheel 2 may be rotated by means of an intermeshing train of gears 6, 7, and 8 supported for rotation about the axes 3, 11, and 12 respectively on the type wheel carrier 4 to which they are allocated. All of the gears 8 mesh with a common driving gear 9 which is secured to a driving shaft 10 adapted to be rotated in any suitable manner.

It will be observed that in the preferred form of the invention illustrated in the drawings, the gears 6, 7, 8, and 9 are all of the same diameter and thus if the gear 9 is turned in a counterclockwise direction as indicated in Figure 1, each of the gears 6 and the associated type wheels 2 will be rotated in a clockwise direction and at the same rate of speed, it being understood that this rotation of the several type wheels is maintained continuously during operation of the machine.

Each of the type wheel carriers 4 is supported for bodily movement independently of the other type wheel carriers and for this purpose is pivotally connected to a pair of links 15 and 16 which are in turn pivoted on the member 21 forming part of the fixed frame of the machine.

In the position normally occupied by each of the type wheel carriers 4 in readiness for a printing operation, the lower end 19 of the carrier abuts a stop 20 carried by the fixed frame member 21 of the machine, and in this position the type elements 1 engage a rotatable color drum 24 with a light pressure, this color drum being supported on a shaft 25 mounted in the machine frame. Coiled springs 22 acting between a fixed portion 23 of the frame and each of the type wheel carriers 4 serve to draw the latter toward the left as shown in Figure 1 and thus maintain the carriers in the position shown in that figure. It will be here observed that if any one of the type wheel carriers is elevated, the links 15 and 16 will be swung about their points of pivotal connection with the frame member 21 and if the movement is continued sufficiently far, for instance to the extent to which the parts have been moved in Figure 3 of the drawings, the spring 22 will then act to retain the type wheel carrier 4 in its upper position.

It will be observed that a platen 26 is located in proximity to the type wheels, a web 27 of paper, suitably tensioned, being fed around this platen. The platen 26 is so positioned, as shown in Figure 1 of the drawings, that before selection and printing of a type element are effected, the type wheels may be rotated on their axes without contacting their type elements with the paper web. If, however, any type wheel carrier 4 be selected and moved upwardly, it will pass through the position shown in Figure 2 in which a type element 1 is shown in contact with the paper and on continued movement will assume the position shown in Figure 3 in which the type elements have been moved above the platen 26 and again out of contact with the paper. It will be observed that during such upward movement of a type wheel carrier, the type wheel supported thereon is rotated through the gears 6, 7, 8, and 9 in a clockwise direction and it is obvious that the type wheel is moving upwardly will roll the selected type element across the paper to effect the printing. By means of this rolling action the speed of operation of the machine may be very materially increased and a clearer printed record produced.

The mechanism for selecting and effecting bodily movement of a type wheel carrier 4 will now be described. As shown in Figures 1 and 4 of the drawings, a plurality of electro-magnets 33 are suitably mounted in the frame of the machine, each one of these magnets being allocated to and serving to effect operation of a single type wheel carrier only. Since the spacing of the type wheel carriers is preferably close, the magnets 33 may be arranged one above the other with only a slight lateral displacement, as indicated for instance in Figure 4 of the drawings. An armature 43 pivotally supported in the frame as at 45 is associated with each magnet 33, each armature carrying an arm 44 which is connected by means of a link 32 to a bell crank lever 48, the link being pivoted to these members at the points 46 and 47 respectively. Each bell crank lever 48 is pivoted at 49 to the fixed frame member 21 and is urged in a counterclockwise direction by means of a coil spring 31 acting between the lever and a portion of the frame. The remaining arm of each bell crank lever is provided with a hooked portion 29 and is positioned for engagement with the projecting nose 55 of a blocking lever 28 which is pivoted in the frame at 50. Each blocking lever 28 is normally urged in a counterclockwise direction of rotation by means of a coil spring 30 but is retained against such rotation by the cooperation of the hooked portion 29 of the bell crank lever 48 and the projecting portion 55 of the blocking lever.

It is now apparent that if a given magnet 33 be energized in response to an impulse from suitable detecting mechanism as the result of an occurrence of a perforation in a register card, the armature 43 will be attracted and the associated arm 44 and link 32 will be moved downwardly, thus rocking the bell crank lever 48 in a clockwise direction against the action of the spring 31 and releasing the lever 28. The spring 30 attached to the lever 28 will now rotate the latter in a counterclockwise direction so that the nose of the lever 28 engages with the teeth of the corresponding gear 8. Thus continued rotation of this gear by the driving gear 9 in a clockwise direction will cause the gear to climb against the blocking lever 28 and about the gear 9 and the type wheel carrier 4 on which the gear 8 is mounted will be elevated, it being observed that the gears 6, 7, an 8 will continue to rotate about their axes. Thus the selected type wheel corresponding to the column in which the perforation in the card occurs will be shifted successively through the positions shown in Figures 1, 2, and 3 of the drawings and the position of the perforation in the column will determine the instant at which the type wheel carrier is shifted so that the appropriate type element 1 will be selected and will be rolled against the paper 27 on the platen 26 to effect printing of the corresponding character.

A roller 53 is pivoted at 54 on each type wheel carrier 4 and as a carrier is elevated in the manner hereinbefore explained, the roller 53 will engage the lever 28 as shown in Figure 2. Continued upward movement of the carrier 4 will thus result in the shifting of the lever 28 to the right by the roller 53 against the action of the spring 31 and thus the lever 28 is moved out of operative engagement with the gear 8 and is reset, the nose 55 of the lever again engaging the hooked portion 29 of the lever 48. At the conclusion of this movement the type wheel carrier 4 occupies its uppermost position with the type elements 1 out of engagement with the platen, and is retained in that position by the spring 22 as hereinbefore explained.

It is of course necessary to ensure that the selected type wheel carrier 4 will be returned to the position shown in Figure 1 after the printing operation has been completed. For this purpose a cam 38 is provided on the driving shaft 10, this cam coacting with a roller 39 pivoted at 40 on a lever 35, the latter being in turn pivoted to a fixed portion of the frame as indicated at 37. A return bar 34 extending transversely across the entire width of the printing apparatus is positioned in cooperative relationship with a plurality of arms 52, each one of these arms being formed integrally with one of the links 16 associated with each of the type wheel carriers 4. The lever 35 is normally maintained in the position shown in the drawings with the roller 39 in engagement with the cam 38 by means of a spring 41 secured at one end to the lever 35 as shown at 42 and at the other end to a pin 36 carried by the fixed frame member 21. It will be observed that when the rise on the cam 38 moves into engagement with the roller 39, the lever 35 will thereby be shifted to the left from the position which it occupies in the drawings, and by

reference to Figure 3 it will be seen that any link 16 corresponding to a type wheel carrier 4 which has been shifted upwardly will be displaced about its pivotal axis 18 and the corresponding carrier will be returned to the position shown in Figure 1 of the drawings. This displacement of the return bar 34 and the restoration of any type wheel carriers 4 which may have been shifted is effected once in each rotation of the driving shaft 10 and thus once for each rotation of the type wheels 2. It will therefore be observed that the rise in the cam 38 can be so positioned as to effect return of any displaced type wheels 2 when the latter have been rotated to a position in which that portion of the periphery of each type wheel which is not provided with type elements faces the platen 26, and thus no printing will be effected during the return of the displaced type wheel carriers.

In order that the type elements may be pressed yieldingly against the paper web 27, the connection between each type wheel carrier 4 and the corresponding link 16 is of the pin and slot type as indicated at 51 so that a slight displacement of the lower end of the type wheel carrier 4 to the right is permitted as the type elements engage the platen. Thus the tension of the spring 22 determines the pressure exerted by the type elements on the paper.

It will be observed that various modifications may be made in the preferred embodiment of the invention illustrated in the drawings without departing from the principles of the invention. Thus the blocking levers 28 may be selected and shifted by mechanical means actuated in response to the passing of a perforated card through the detecing mechanism. Such various other alterations are contemplated as fall within the spirit and scope of the appended claims.

What I claim is:

1. A printing device adapted to be used in connection with tabulating machines for perforated cards, which comprises in combination, a plurality of type elements, a series of toothed wheels on which the type elements are directly carried, a supporting plate for each toothed wheel, intermediate pinions journalled on said plate, a driving shaft provided with a toothed member for meshing with all the series of intermediate pinions, and means for carrying and holding the said plates.

2. A printing device adapted to be used in connection with tabulating machines for perforated cards, which comprises in combination, a frame, a movable support linked to said frame, a type carrier journalled on said support, a driving shaft, transmission means carried by said support for constantly transmitting the rotation of said shaft to the type carrier journalled on said support, and a stopping means, carried by said frame, adapted to operatively engage said transmission means for causing said support to move with respect to said frame.

3. A printing device adapted to be used in connection with tabulating machines for perforated cards, which comprises in combination, a frame, a plurality of movable supports linked to said frame, a type carrier journalled on each support respectively, a driving shaft, a set of pinions journalled on each support for constantly transmitting the rotation of said shaft to the type carrier journalled on said support, and a plurality of stopping means, carried by said frame, adapted to engage one pinion of each set respectively for causing said support to move with respect to said frame.

4. A printing machine adapted to be used in connection with tabulating machines for perforated cards which comprises in combination, a frame, a plurality of movable supports adapted to move with respect to said frame with a translatory movement, a type carrier journalled on each support respectively, a driving shaft, a set of pinions journalled on each support for constantly transmitting the rotation of said shaft to the type carrier journalled on said support, and a plurality of stopping means, carried by said frame, adapted to engage one pinion of each set respectively, for causing said support to move with respect to said frame.

5. A printing machine adapted to be used in combination with tabulating machines for perforated cards which comprises in combination, a frame, a plurality of parallel supporting plates, two links for connecting each of said plates with said support so as to allow a translatory movement of each plate with respect to said frame, a type wheel journalled on each supporting plate respectively, a toothed wheel integral with said type wheel, a driving shaft, a gear integral with said shaft, a set of intermeshing pinions journalled on each supporting plate, said set of pinions meshing at one end with said gear and at the other end with said toothed wheel, for constantly transmitting the rotation of said shaft to said type wheel, and a plurality of stopping means, carried by said frame, adapted to engage one of the pinions of each set respectively for causing said support to move with respect to said frame.

6. A printing device according to claim 5 in which the stopping means comprise, a stopping lever pivoted to said frame and adapted to engage the teeth of one of said pinions, a spring for bringing said stopping lever into its operative position with respect to said pinion, a lever for locking said stopping lever in its inoperative position, and means for operating the second mentioned lever.

7. A printing device according to claim 5 in which one of said two links is connected to said supporting plate through a pin and slot connection so as to ensure a certain play in the connection.

8. A printing device adapted to be used in connection with tabulating machines for perforated cards, which comprises in combination, a frame, a plurality of parallel supporting plates, two links of substantially equal length for connecting said frame to each of said plates respectively so as to allow a translatory movement of said plate with respect to said frame, a type wheel journalled on each supporting plate, a toothed wheel integral with said type wheel, a driving shaft, a gear integral with said driving shaft, two meshing pinions journalled on each supporting plate, one of said pinions meshing with said gear and the other one with the toothed wheel carried by said supporting plate, a spring for elastically maintaining said supporting plate in its initial position, a stopping lever pivoted to said frame and adapted to engage the teeth of the first mentioned pinion, a spring for bringing said stopping lever into its operative position with respect to said pinion, a lever for locking said stopping lever in its inoperative position, an electro-magnet for operating the second mentioned lever, a bar for bringing back said supporting plates into their initial position, and a cam for operating said bar operatively connected with said driving shaft.

9. A printing device according to claim 8 in

which the two pinions pivoted on each supporting plate have the same number of teeth.

10. In printing apparatus, the combination with a platen, of a type wheel having a plurality of type elements on the periphery thereof, a support on which said wheel is rotatably mounted adjacent the platen, means for rotating said type wheel to present different type elements to the platen, and means for moving said support across said platen during rotation of said type wheel to roll a selected one of said type elements on the platen to effect printing with the selected type element.

11. In printing apparatus, the combination with a platen, of a type wheel having a plurality of type elements on the periphery thereof, a support on which said wheel is rotatably mounted adjacent the platen, means for rotating said type wheel to present different type elements to the platen, said support normally occupying a position in which said type elements are spaced from said platen, and means operable during rotation of said type wheel for moving said support through a predetermined path to carry said type wheel across said platen to first engage and thereafter disengage a selected one of said type elements with said platen, the direction of rotation of said type wheel being such that the selected type element may roll against the platen during movement of the support.

12. In printing apparatus, the combination with a platen, of a type wheel having a plurality of type elements on the periphery thereof, a support on which said wheel is rotatably mounted adjacent the platen, means for rotating said type wheel to present different type elements to the platen, said support normally occupying a position in which said type elements are spaced from said platen, means operable during rotation of said type wheel for moving said support through a predetermined path to carry said type wheel across said platen to first engage and thereafter disengage a selected one of said type elements with said platen, the direction of rotation of said type wheel being such that the selected type element may roll against the platen during movement of the support, and means for restoring the support to the said normal position.

13. In printing apparatus, the combination with a platen, of a type wheel having a plurality of type elements on and extending about a portion only of the periphery thereof, a support on which said wheel is rotatably mounted adjacent the platen, means for rotating said type wheel to present different type elements to the platen, said support normally occupying a position in which said type elements are spaced from said platen, means operable during rotation of said type wheel for moving said support through a predetermined path to carry said type wheel across said platen to first engage and thereafter disengage a selected one of said type elements with said platen, the direction of rotation of said type wheel being such that the selected type element may roll against the platen during movement of the support, and means for restoring the support to the said normal position, said last named means operating in timed relation with the rotation of said type wheel to restore the support when that portion of the periphery of the type wheel on which said type elements are located has been rotated past the platen.

14. In printing apparatus, the combination with a platen, of a type wheel having a plurality of type elements on the periphery thereof, a support on which said wheel is rotatably mounted adjacent the platen, means for rotating said type wheel to present different type elements to the platen, and means for moving said support through a linear path such that a selected type element will roll on the platen during an intermediate part only of said movement to effect printing by the selected type element.

15. In printing apparatus, the combination with a platen, of a type wheel having a plurality of type elements on the periphery thereof, a support on which said wheel is rotatably mounted adjacent the platen, means for rotating said type wheel to present different type elements to the platen, said means including a gear train of which at least one gear is carried by said support, and means movable to engage the teeth of the gear carried by the support and to serve as a fulcrum therefor, whereby continued rotation of said gear train effects bodily displacement of said carrier and type wheel across said platen.

16. In printing apparatus, the combination with a platen, of a type wheel having a plurality of type elements on the periphery thereof, a support on which said wheel is rotatably mounted adjacent the platen, means for rotating said type wheel to present different type elements to the platen, means for moving said support across said platen during rotation of said type wheel to roll a selected one of said type elements on the platen to effect printing with the selected type element, and an inking roller positioned for engagement with said type elements.

17. In printing apparatus, the combination with a platen, of a type wheel having a plurality of type elements on the periphery thereof, a support on which said wheel is rotatably mounted adjacent the platen, means for rotating said type wheel to present different type elements to the platen, means for moving said support across said platen during rotation of said type wheel to roll a selected one of said type elements on the platen to effect printing with the selected type element, and resilient means engaging said support for urging the type elements into yielding engagement with the platen.

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