

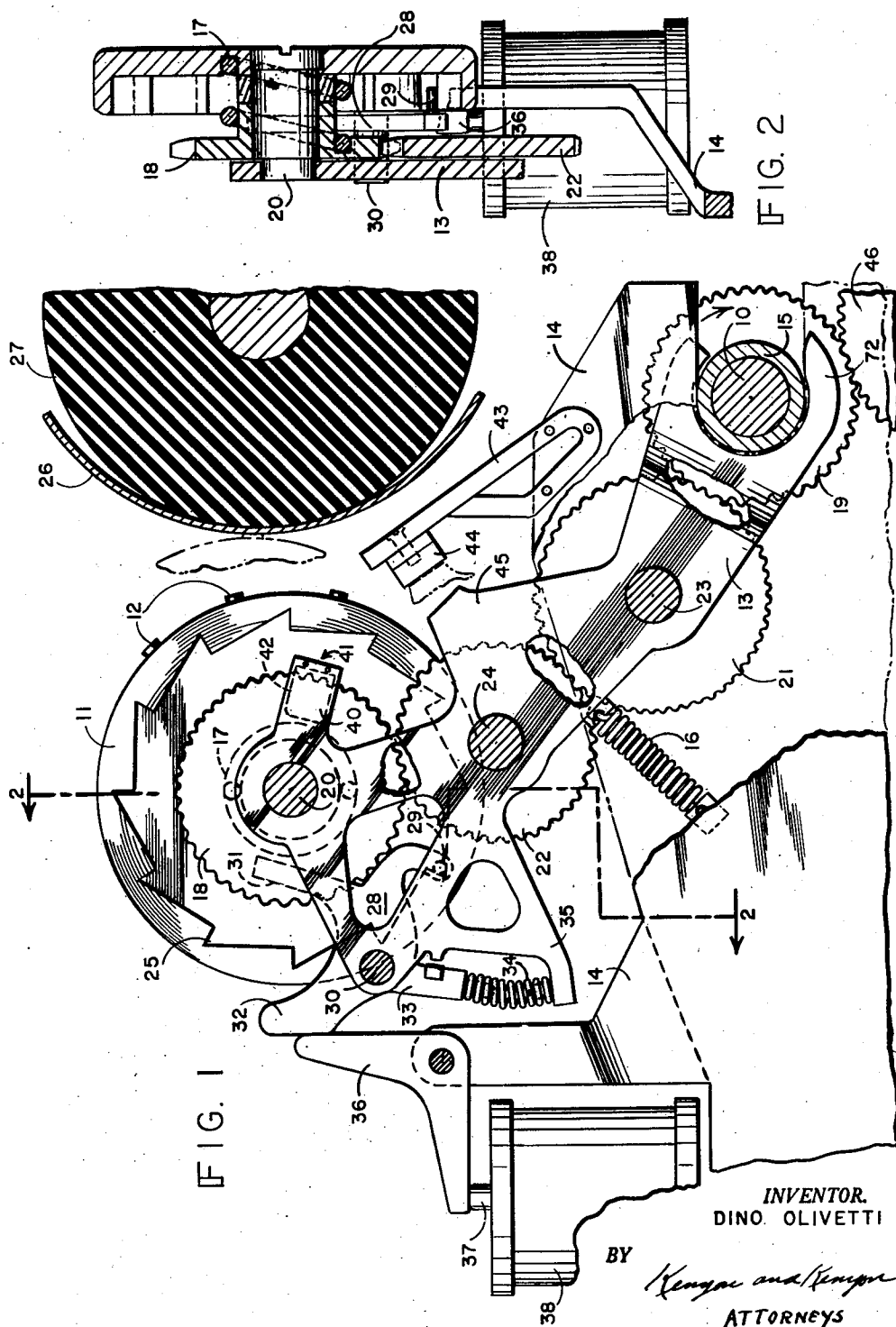
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D. OLIVETTI

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PRINTING MECHANISM

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INVENTOR.
DINO. OLIVETTI

BY

Kengor and Kengor
ATTORNEYS

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PRINTING MECHANISM

Dino Olivetti, New Canaan, Conn., assignor to Olivetti Corporation of America, New York, N. Y., a corporation of Massachusetts

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The present invention relates to printing mechanisms, and more particularly, it relates to a rapid data printer responsive to rotational analogues of binary input signal information.

In the copending application of Michele Canepa, assigned to the same assignee as the present invention, there is disclosed a novel digital-to-analogue converter of binary information wherein a continuously rotating scan arm is employed to detect an angular coincidence of conductive sectors on a number of digitally controlled commutator rings, and to signal the detection of such coincidence by electrical means. In this way, each information set supplied to the converter is translated into a particular angular displacement of the scan arm, and, as will be apparent to those skilled in the art, the operation is carried out extremely rapidly whereby a large group of binary numbers may be effectively translated into analogue form in a relatively short space of time. The difficulty with this is, however, that conventional printing mechanisms are generally incapable of sufficiently rapid operation to record the information as fast as it is translated, thus subverting one of the main objects of the invention disclosed in the aforementioned copending application.

It is an object of the present invention, therefore, to provide a sufficiently rapid printer to keep pace with the converter, and it is a further object to minimize the complexity of the printer so that it will not be unreasonably costly.

In brief, the printing mechanism of the present invention comprises a printing wheel carrying a plurality of angularly spaced printing characters on its periphery, said printing wheel being normally in driven relation to the aforementioned scan arm. Thus the angular position of the printing wheel and so also the particular printing characters placed in printing position are caused to represent angular displacement of the scan arm. When it has been determined in the converter that an angular displacement of the scan arm in turn corresponds to the binary input information, an electrical impulse supplied by the latter is utilized to energize a solenoid which causes the printing wheel to print. If, however, the actual printing operation were carried out while the printing wheel continued to rotate, a considerable problem would arise due to relative movement between the printing character and the recording medium, such as a paper tape, giving rise to blurred impressions or even tearing the tape. This problem is surmounted according to the present invention by locking the printing wheel against rotation while actual printing is taking place and yet permitting the printing wheel to regain its proper relation angularly with respect to the scan arm after the printed impression has been made. To these ends, there is provided a yieldable linkage between the scan arm and the printed wheel including an input gear mounted for rotation about the pivot axis of a pivotal member whereon the printing wheel is mounted. By locking the printing wheel against rotation

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with the aforementioned solenoid, rotation of the input gear is impeded causing the support member to pivot about its axis and the printing wheel to print. Thereafter, the linkage imparts an increased amount of torque to the printing wheel to cause it to rotate faster than usual until it regains its normal angular position relative to the scan arm.

The novel features of the invention together with further objects and advantages thereof will become more readily apparent when considered in connection with the accompanying drawing wherein:

Fig. 1 is a front view of the printing mechanism according to the invention; and

Fig. 2 is a sectional view taken on line 2—2 of Fig. 1.

Referring to the drawing, it will be observed that the printing mechanism according to the present invention includes a printing wheel 11 having printing characters in predetermined angularly spaced relation on its periphery, two of which, by way of example, have been designated by the numeral 12. Printing wheel 11 is rotatably mounted on a shaft 20 carried by a support member 13 which in turn is pivotally mounted on a frame member 14. For the latter purpose, there is provided a bushing 15 projecting outwardly from member 14 to engage an end portion of member 13 which is concave, or in other words has a semicircular indentation adapted to bear on the bushing. Also connected to support member 13 is one end of a tension spring 16 having its other end attached to frame member 14.

Coaxial with printing wheel 11 and coupled thereto by means of a helical spring 17 is an output gear 18 which in turn is in driven relation to an input gear 19 mounted for rotation about the pivot axis of support member 13 by means of a stub shaft 10. Coupling between the input and output gears is afforded by a pair of idler gears 21 and 22, the former having its teeth in engagement with those of input gear 19, and the latter having its teeth in engagement with those of output gear 18. Stub shafts 23 and 24 serve as rotatable mountings for idler gears 21 and 22 respectively, and are each rigidly attached to support member 13.

Printing wheel 11 is provided with internal ratchet or indexing teeth 25, one for each of the printing characters 12. Cooperating with the indexing teeth 25 so as to properly position one of the characters 12 with respect to a recording medium, as, for example, a paper tape 26 and a tape backing roll 27, is a latching device designated generally by numeral 28. Latching device 28 is pivotally mounted on support member 13 by a pin 30, and includes a pawl 29 for engagement with the teeth 25; and three lever arms 31, 32 and 33. Lever arm 33 is provided with a retaining end for a helical compression spring 34 disposed between the end of lever arm 33 and a projection 35 from support member 13. As will appear in more detail from the description of the operation of the printing mechanism according to the present invention, spring 34 serves as a toggle to maintain pawl 29 in one of two positions wherein it is either engaged with an indexing tooth 25 or out of engagement therewith.

As shown in Fig. 1, lever arm 32 of latching device 28 registers with a lever in the form of a bell crank 36 actuated by the vertically disposed plunger 37 of a solenoid 38. Solenoid 38 and bell crank 36, are attached to a portion of frame 14. Lever arm 31, on the other hand, is adapted to be engaged by spring 17 when the latter is in an expanded condition whereby latching device 28 is pivoted oppositely from the way it is pivoted by bell crank 36 and solenoid plunger 37. To this end, lever arm 31 extends adjacent the periphery of the helical spring 17 and a spring containing member 41 which is formed in part with support member 13 is provided to

limit expansion of the spring except in the direction of arm 31. Containing member 41 comprises in essence a portion 49 of member 13 projecting radially from the common axis of printing wheel 11 and output gear 18, and an L-shaped bracket 42 rigidly attached to the end of the projection 40. Bracket 42 extends parallel to the axis of output gear 18 for a short distance and thereafter extends inwardly adjacent the periphery of spring 17. Finally, there is provided an arm 43 attached to frame member 14 mounting a stop 44 to register with a projection 45 on support member 13 when the latter is pivoted from its equilibrium position, as will appear.

In operation, input gear 19 is coupled to the indexing shaft of the aforementioned digital-to-analogue converter in any convenient manner known to the art as, for example, with a spur gear 46 shown in part in Fig. 1, so that the angular position of the former will be representative of the angular position of the latter. Input gear 19 in turn drives output gear 18 through idler gears 21 and 22 and also drives printing wheel 11 by virtue of the yieldable linkage provided by helical spring 17 between the output gear and the printing wheel. Hence, the angular position of printing wheel 11 will likewise be representative of the angular position of the indexing shaft and, more particularly, so will the specific ones of the characters 12 on the periphery of printing wheel 11 placed in printing position. When, in the converter, it has been determined that the angular position of the indexing shaft in turn corresponds to the binary input information, a signal in the form of an electrical impulse is supplied to solenoid 38 to cause plunger 37 to move upwardly whereby bell crank 36 is pivoted in a clockwise direction. As a result, lever arm 32 and so also latching device 28 is urged in a clockwise direction, breaking the toggle provided by the action of spring 34 and causing the latch to assume a new equilibrium position with pawl 29 in engagement with one of the indexing teeth 25. Printing wheel 11 will then be locked against rotation and rotation of gears 18, 22, 21 and 19 will be impeded by virtue of the restraining action of helical spring 17.

Because input gear 19 is mounted independently of pivotal support member 13, it follows that as gear 46 continues to rotate, support member 13 is itself then caused to move about its pivot axis, bringing printing wheel 11 forward into registry with the tape. At this point, projection 45 on support member 13 strikes against stop 44, producing, in combination with spring 16, a highly elastic collision with the result that support member 13 is returned very nearly to the position it had prior to the initiation of the foregoing operations. During these operations, however, spring 17 will have been expanded to a considerable extent owing to the fact that output gear 18 remains in driven relation to gear 46 whereas the printing wheel is locked. Accordingly, lever arm 31 will be urged in a counterclockwise direction by spring 17 causing pawl 29 to be shifted out of engagement with the internal teeth 25 of the printing wheel. At this point, the energy having been stored in the spring 17 by angular displacement of gear 18 relative to the printing wheel will be released, thereby rapidly restoring the printing wheel to its normal angular position with respect to output gear 18, and the indexing shaft of the converter. This effectively places the printing mechanism in condition to receive the next electrical impulse from the converter when the angular position of the indexing shaft corresponds to a new set of binary input information.

Although a paper tape and a backing roll have been illustrated as the recording medium of the printing mechanism according to the invention, it will be apparent to those skilled in the art that these are merely illustrative and that various forms of recording mediums will be equally suitable. Various other modifications within the

spirit and scope of the invention will occur to those skilled in the art so that I do not wish to limit my invention to the precise embodiment illustrated. Rather the invention should be deemed to be limited only by the scope of the appended claims.

What is claimed is:

1. A printing mechanism to print on signal one of a group of characters selectable in accordance with the angular position of an indexing shaft, said mechanism comprising a printing wheel carrying printing characters in predetermined angularly spaced relation on its periphery, an output gear aligned axially with said printing wheel, a pivotal support member mounting said output gear and said printing wheel, whereby said wheel is movable to effect engagement with a printing surface, a torsion member coupled between said output gear and said printing wheel so as to provide a yieldable linkage therebetween, an input gear coupled to said output gear, said input gear being mounted for rotation about the pivot axis of said support member, means to couple said input gear to said indexing shaft, and a signal responsive locking mechanism associated with said printing wheel operable to lock the latter against rotation so as to impede rotation of said input gear relative to said support member and causing the latter to pivot the same about its axis thereby moving said printing wheel to said printing surface, said torsion member when said printing wheel is unlocked imparting a torque thereto momentarily increasing its rate of rotation.

2. A printing mechanism according to claim 1 wherein said torsion member comprises a helical spring.

3. A printing mechanism according to claim 2 wherein said signal responsive locking mechanism includes a solenoid actuated latching device mounted on said support member, said latching device having a pawl for engagement with portions of said printing wheel to lock same, and a lever arm for disengaging said pawl from said printing wheel to release same, said lever arm being actuated by said spring when in an expanded condition due to angular displacement of said output gear relative to said printing wheel while the latter is locked.

4. A printing mechanism according to claim 3 including a toggle action device tending to maintain said latching member in one of two positions wherein said pawl is respectively engaged and disengaged from said printing wheel.

5. A printing mechanism to print on signal one of a group of characters selectable in accordance with the angular position of an indexing shaft, said mechanism comprising a printing wheel carrying printing characters in predetermined angularly spaced relation on its periphery and provided with internal teeth corresponding to said characters respectively, an output gear aligned axially with said printing wheel, a pivotal support member mounting said output gear and said printing wheel, a helical spring coupled between said output gear and said printing wheel, an input gear mounted for rotation about the pivot axis of said support member, at least one idler gear mounted on said support member for intercoupling said input and output gears, means to couple said input gear to said indexing shaft, a pawl pivotally mounted on said support member for engaging said internal teeth to lock said printing wheel, whereby said support member is caused to pivot away from its equilibrium position momentarily, elastic stop means to rebound said support member and thereby return it to its equilibrium position, and a lever arm rigidly attached to said pawl in spaced relation to said spring, to disengage said pawl from said internal teeth, said lever arm being actuated by said spring when in an expanded condition due to locking of said printing wheel.

6. A printing mechanism to print on signal one of a group of characters selectable in accordance with the angular position of an indexing shaft, said mechanism

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comprising a printing wheel carrying printing characters in predetermined angularly spaced relation on its periphery, and having internal indexing teeth corresponding to said characters respectively, an output gear aligned axially with said printing wheel but rotatable independently thereof, a pivotal support member mounting said output gear and said printing wheel for pivoting between an equilibrium position and a forward position, a helical spring coupled between said output gear and said printing wheel, an input gear mounted for rotation about the pivot axis of said support member, at least one idler gear mounted on said support member for intercoupling said input and output gears, means to drive said input gear in synchronism with said indexing shaft, a pawl pivotally mounted on said support member, a first lever arm rigidly attached to said pawl, a solenoid adapted to move said first lever arm to cause said pawl to engage an indexing tooth and to lock said printing wheel, whereby said support member is moved pivotally from its equilibrium position

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to its forward position, elastic stop means to rebound said support member and thereby return it to its equilibrium position, a second lever arm rigidly attached to said pawl to disengage it from said index tooth, said second lever arm being actuated by said helical spring when sufficiently expanded due to locking of said printing wheel, and toggle means tending to maintain said pawl in one of two positions wherein the same is respectively engaged and disengaged from said indexing teeth.

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