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Hoffman

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[54] **WHEEL INDEXING MECHANISM**

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[58] **Field of Search**.....74/822, 2, 125, 125.5, 118, 74/116, 112, 84; 235/1.3, 91.1, 92 F, 92 G

[56] **References Cited**

UNITED STATES PATENTS

3,191,448 6/1965 Murphy .....74/577 X

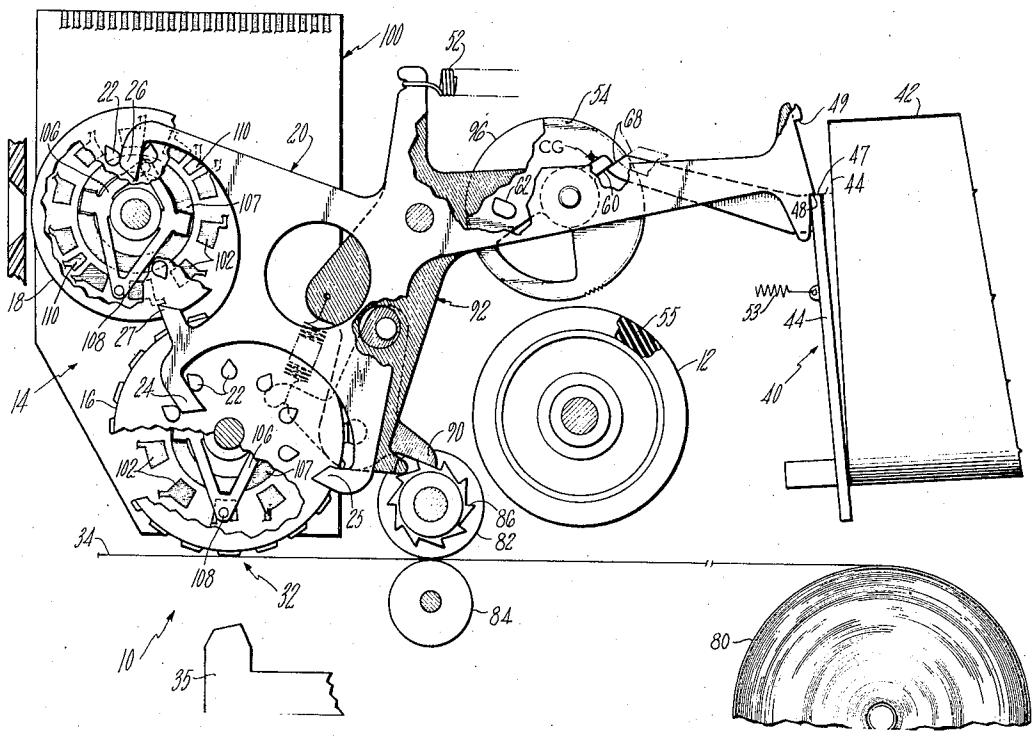
3,448,639 6/1969 Adler.....74/822

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[57] **ABSTRACT**

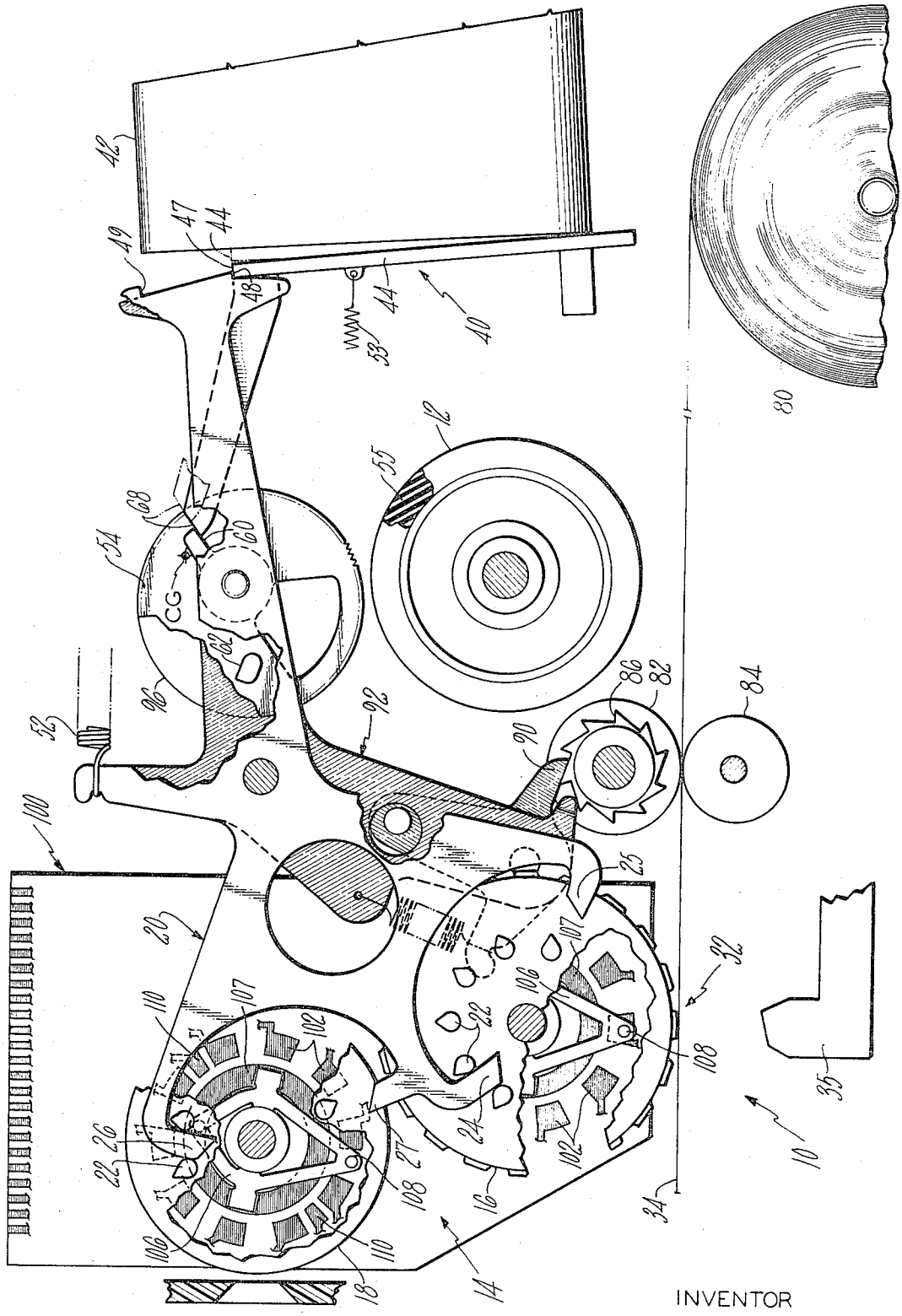
A printer having a plurality of decades each having a pivotal verge and print and readout wheels adapted to be simultaneously indexed by the verge. An eccentric rotatably mounted on the verge engages a power roll for oscillating the verge for indexing the wheels, and an electromagnet having an armature for latching the verge and eccentric is operable for releasing the latch for indexing the wheels.

13 Claims, 1 Drawing Figure



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WHEEL INDEXING MECHANISM

BRIEF SUMMARY OF THE INVENTION

The present invention relates generally to wheel indexing mechanisms and more particularly to a wheel indexing mechanism of the type having a power rotor providing a source of indexing power.

It is a principal aim of the present invention to provide a new and improved wheel indexing mechanism for indexing a character wheel of a printer, counter or the like.

It is another aim of the present invention to provide a new and improved electromagnetically operated wheel indexing mechanism having an electromagnetic operator selectively operable for selectively indexing the wheel.

It is a further aim of the present invention to provide a printer having a new and improved electromagnetically operated print wheel indexing mechanism.

It is another aim of the present invention to provide a new and improved register having a plurality of wheels of increasing order and having individual wheel indexing mechanisms providing for either parallel entry for independently indexing the wheels or for serial entry for indexing the wheels for counting.

Other objects will be in part obvious and in part pointed out more in detail hereinafter.

A better understanding of the invention will be obtained from the following detailed description and the accompanying drawing of an illustrative application of the invention.

BRIEF DESCRIPTION OF THE DRAWING

In the drawing:

The FIGURE is a side elevation view, partly broken away and partly in section, of a printer incorporating an embodiment of a wheel indexing mechanism of the present invention.

BRIEF DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings in detail wherein like parts are designated by like numerals, a printer **10** incorporating an embodiment of a wheel indexing mechanism of the present invention comprises a power rotor or roll **12** which is driven at a substantially constant speed (e.g., 700 RPM) by a suitable electric motor (not shown). The printer **10** comprises a stack of substantially identical sections or decades **14** (only one of which is shown in the Figure) and each decade **14** comprises print and readout wheels **16, 18** mounted in laterally spaced relationship in the same plane and a single pivotally reciprocable verge or drive arm **20** for indexing the wheels **16, 18** together. More particularly, each of the wheels **16, 18** has ten equiangularly spaced (i.e., angularly spaced 36°) generally teardrop shaped pins or ratchet teeth **22** and the verge **20** has two pairs of opposed detent pawls **24, 25** and **26, 27** for indexing the wheels **16, 18** in unison. Thus, when the verge **20** is pivoted in the clockwise direction as viewed in the Figure, the pawls **24, 26** are withdrawn from between adjacent pins **22**, and the opposed pawls **25, 27** are pivoted into engagement with the pins **22** to index the wheels one step or 18°, in the counterclockwise direction as viewed in the Figure. When the verge is

pivoted in the opposite pivotal direction, the pawls **25, 27** are withdrawn and the pawls **24, 26** are pivoted into engagement with the pins **22** to also index the wheels **16, 18** one step or 18°, in the counterclockwise direction as viewed in the Figure. Pivotal "overtravel" of the verge in both pivotal directions is provided by the receipt of the active pawls between adjacent wheel pins **22** and such that the verge provides for locking the wheels **16, 18** against rotation between steps. Accordingly, by pivotally reciprocating the verge **20** back and forth the wheels **16, 18** are adapted to be indexed in unison in 18° steps and be locked against rotation between steps.

The print and readout wheels **16, 18** have 20 corresponding type and readout characters respectively such that the readout wheel **18** provides a visual readout of the type character at a printing station **32** where the type is operable to provide a printout on suitable paper **34** by operation of a print hammer **35**. The twenty character print wheels **16, 18** bear for example two sequences of characters of 0–9 or bear one sequence of characters of 0–9 and any 10 additional characters including for example any desired letters and mathematical symbols.

The pivotal operation of the verge **20** is controlled by an electromagnetically operated control mechanism **40** having an electromagnet **42** and a pivotal armature **44**. The armature **44** functions as a latch and normally remains in an outer pivotal position with its shoulder **47** in engagement with one of the angularly spaced verge shoulders **48, 49** (which are preferably at the same radial distance from the verge axis) to latch the verge from being pivoted, in the clockwise direction as viewed in the Figure, by a drive tension spring **52**. The electromagnet **42** when energized attracts the armature **44** (against the bias of an armature return spring **53**) to an inner pivotal position shown in part in broken lines in the Figure to disengage the verge **20** for pivotal operation by the drive spring **52**.

A circular cam or eccentric rotor **54** is rotatably mounted on the verge **20** for engagement with the power roll **12**. The cam **54** is preferably made of plastic and is suitably knurled and the power roll **12** has an outer hard rubber layer **55** to provide an appropriate friction drive between the power roll **12** and cam **54**. The cam **54** is thereby adapted to be rotated by the power roll **12** for pivoting the verge **20**, and the eccentricity of the cam **54** is established so as to pivot the verge **20** though the desired angle.

The cam **54** has a pair of integral abutments **60, 62** and the armature **44** has a second shoulder **68** engageable with the stops **60, 62** for latching the cam **54** against rotation by the power roll **12**. The inner verge shoulder **48** is preferably located to engage the latch shoulder **47** after a few degrees of pivotal movement of the verge **20** (in the clockwise direction as viewed in the Figure) from its outer or counterclockwise pivotal end position, and the outer verge shoulder **49** is preferably located to engage the latch shoulder **47** a few degrees of pivotal movement of the verge before it reaches its inner or clockwise pivotal end position and such that in both instances the verge **20** is near its respective pivotal end position and is moving relatively slowly toward the power roll **12** when the verge is latched. Also the abutments **60, 62** are preferably located to permit a few

degrees of rotation of the cam **54** after the verge **20** is latched by the latch shoulder **47** and so that the cam **54** is free to be rotated by the drive roll **12** and (until the active abutment **60, 62** engages the latch shoulder **68**) by the force of its rotational inertia and weight (due to the location of the center of gravity of the cam **54** as shown in the Figure) to "lift" the cam **54** out of engagement with the drive roll **12**. The cam **54** is preferably "lifted" just enough to adequately disengage the cam **54** from the power roll **12**. Also the latch shoulder **68** is located so that any shock resulting from the engagement of the rotating cam **54** with the latch shoulder **68** is absorbed by the verge return spring **52**, and the center of gravity of the cam **54** is located for gravitationally holding the active abutment **60, 62** in engagement with the latch shoulder **68** and for therefore maintaining the cam **54** out of contact with the drive roll **12**.

When the electromagnet **42** is momentarily energized, the armature **44** is attracted against the bias of the tension spring **53** to momentarily withdraw the latch shoulders **47, 68** to release the verge **20** for being pivoted by the cooperative action of the cam **54**, power roll **12** and spring **52** to index the wheels **16, 18** one step. Also, since the verge **20** is operated back and forth at a continually changing angular velocity in accordance with a sine wave velocity curve and since the verge is latched near its pivotal end or zero velocity positions, the verge is gradually angularly accelerated from its rest position when the verge **20** is released.

Each momentary operation of the electromagnet **42** will therefore provide for momentarily unlatching the verge **20** for indexing the wheels **16, 18** an 18° increment and continuous operation of the electromagnet will provide for continuously indexing the wheels **16, 18** until the electromagnet is deenergized to release the armature **44**.

A paper indexing mechanism similar to the described character wheel indexing mechanism is provided for indexing the paper **34** from a roll **80**. The paper **34** is received between a pair of pressure rolls **82, 84** and a ratchet wheel **86** provided on the pressure roll **82** is engageable by a ratchet pawl **90** for indexing the paper. The ratchet pawl **90** is pivotally mounted on a spring biased bell crank **92** (which corresponds to the verge **20**) and an eccentric or cam **96** is mounted on the bell crank **92** for engagement with the power roll **12** in the manner of the eccentric **54**. An electromagnet (not shown) like the electromagnet **42** is provided for latching the bell crank **92** and cam **96** in the manner of the armature latch **44**, excepting that the cam **96** has a single abutment **60** for latching the cam **96** and the bell crank **92** has a single cooperating shoulder **48** engageable by the armature latch. Thus, when the paper indexing electromagnet (not shown) is energized, its armature is attracted to release the bell crank **92** to provide for oscillating the pawl **90** through one full oscillation for indexing the pressure roll **82**.

A printed circuit board **100** having 10 equiangularly spaced (i.e., angularly spaced 36°) readout pads **102** associated with each character wheel **16, 18** is provided for producing electrical signals corresponding to the 20 character positions of the wheels. A two contact contact arm **106** is mounted on each of the wheels **16, 18** for selectively engaging the respective readout pads **102** and a "common" pad **107**, and the contact arms **106** are angularly positioned on the wheels **16, 18** such that with the wheels in each full character position the outer contact **108** of one of the arms **106** engages a readout pad **102** and the outer contact **108** of the other contact arm **106** lies between readout pads **102**. Preferably the contact arms **106** are located and the readout pads **102** are dimensioned to provide a "make-before-break" circuit.

The printed circuit board **100** also includes a pair of diametrically opposed transfer pads **110** intermediate readout pads **102** associated with the readout wheel **18**, and in a conventional manner the transfer pads **110** may be used where the printer is employed for counting and connected for energizing the electromagnet **42** of the adjacent higher order decade **14** (when the lower order decade is at "**9**") to index the wheels **16, 18** of the adjacent higher order decade one step for each 10 steps of the adjacent lower order decade (and as the lower order decade is indexed from "**9**" to "**0**"). Where the 20-character wheels **16, 18** are composed of only one sequence of characters of 0–9, the transfer pad **110** associated with the remaining characters would be left out of the transfer circuit, and the readout pads **102** associated with the remaining characters would be suitably connected so that each counter wheel would be automatically indexed ten steps through such remaining characters from "9" to "0".

As will be apparent to persons skilled in the art, various modifications, adaptations and variations of the foregoing specific disclosure can be made without departing from the teachings of the present invention.

I claim:

1. In a multiple wheel register having a plurality of coaxial register wheels and a wheel indexing mechanism for each of the register wheels comprising a pivotal stepping member pivotal for indexing the wheel in stepwise fashion, operating means operable for pivoting the stepping member for indexing the wheel and control means for selectively operating the operating means for selectively indexing the wheel, the improvement wherein the register comprises an elongated power roll rotatable about an axis generally parallel to the axis of the coaxial register wheels, wherein the wheel indexing mechanism comprises a cam rotatably mounted on the respective stepping member for engagement with the power roll for being rotated thereby for pivoting the stepping member, spring means biasing the stepping member in one pivotal direction for biasing the cam into engagement with the power roll, and wherein the control means comprises an electromagnetic operator having an armature operative to latch the respective stepping member in at least one pivotal position thereof.

2. In a multiple wheel register according to claim **1** wherein the armature is operative for latching the cam against rotation by the power roll in cooperation with latching the stepping member.

3. In a multiple wheel register according to claim **1** wherein the armature is operative to latch the pivotal stepping member against the bias of the spring means as the stepping member is moving toward the power roll.

4. In a multiple wheel register according to claim **3** wherein the armature is operative to latch the pivotal stepping member against the bias of the spring means at

each of two pivotal positions of the stepping member as it is moving toward the power roll.

5. In a multiple wheel register having a plurality of coaxial wheels, a wheel indexing mechanism for each of the wheels comprising a stepping member connected to be reciprocated back and forth for indexing the wheel in stepwise fashion, operating means operable for reciprocating the stepping member back and forth for indexing the wheel and control means for selectively operating the operating means for selectively indexing the wheel, the improvement wherein the register comprises an elongated power roll rotatable about an axis generally parallel to the axis of the coaxial wheels and wherein each wheel indexing mechanism comprises a cam rotatably mounted on the respective stepping member for engagement with the power roll for being rotated thereby for reciprocating the stepping member back and forth for indexing the wheel.

6. In a multiple wheel register according to claim 5 wherein the cam is circular and is eccentrically mounted on the stepping member.

7. In a multiple wheel register according to claim 5 wherein the control means comprises releasable latching means for latching the cam against rotation by the power roll.

8. In a multiple wheel register according to claim 7 wherein the releasable latching means is operable for latching the cam against rotation by the power roll at each of two angularly spaced positions of the cam.

9. In a multiple wheel register according to claim 7 wherein the releasable latching means provides for latching the stepping member against movement in at least one direction in cooperation with latching the cam against rotation by the power roll.

10. In a multiple wheel register according to claim 5 wherein the operating means comprises spring means biasing the stepping member in one direction for biasing the cam into engagement with the power roll.

11. In a multiple wheel register according to claim 5 wherein the control means comprises releasable latching means operable for latching the stepping member against movement in at least one direction.

12. In a multiple wheel register according to claim 11 wherein the releasable latching means comprises a pivotal latch having a first pivotal position for latching the stepping member and an electromagnetic operator for pivoting the latch from its said first pivotal position for releasing the stepping member.

13. In a multiple wheel register according to claim 5 wherein each wheel has an annular arrangement of spaced detent pins and wherein the corresponding stepping member is pivotally mounted for pivotal reciprocable movement and comprises a pair of generally opposed pawls engageable with the wheel pins for indexing the wheel in stepwise fashion and insertable between the pins to provide for pivotal overtravel of the stepping member.

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