United States Patent

Davis et al.

[15] **3,670,386**

[45] **June 20, 1972**

[54] **ENCODING AND VERIFYING INFORMATION**

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[22] Filed: **Aug. 18, 1969**

[21] Appl. No.: **850,978**

[52] **U.S. Cl.** ....**29/211 R,** 29/208 C, 235/61.7 B

[51] **Int. Cl.** **B23q 7/10,** B23p 19/04, G06k 1/00

[58] **Field of Search** ....235/61.6, 61.65, 61.7, 61.71, 235/61.8, 61.9, 61.11, 61.115; 340/165, 347 DD; 346/56, 146; 29/211 R, 208 C

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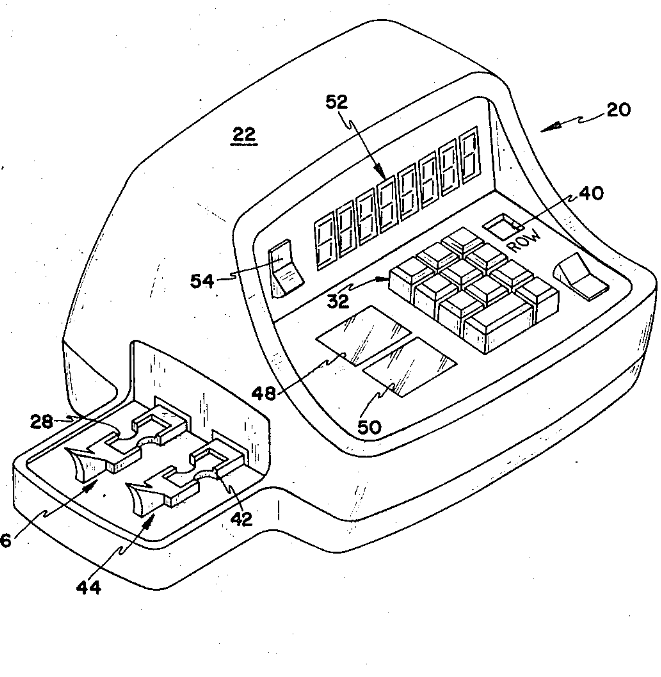
[57] **ABSTRACT**

Method and apparatus for encoding a device presenting rows of encodable sites and for verifying the correctness of the encoding of such a device, the apparatus including a ram assembly for press-fitting balls or the like, received from a ball-feeder assembly, into selected ones of the encodable sites, which sites take the form of blind cavities. The encodable device is light-transmitting and, after being encoded, the rows of sites are successively sensed by an optical reader to verify the accuracy of the encoding procedure. Electrical signals, derived from optical signals generated by the reader and representing the code of each row, are converted to Binary Coded Decimal (BCD) data format and stored in a circulating shift register in a row-by-row fashion so that the stored information can be subsequently converted into human readable form.

13 Claims, 30 Drawing Figures



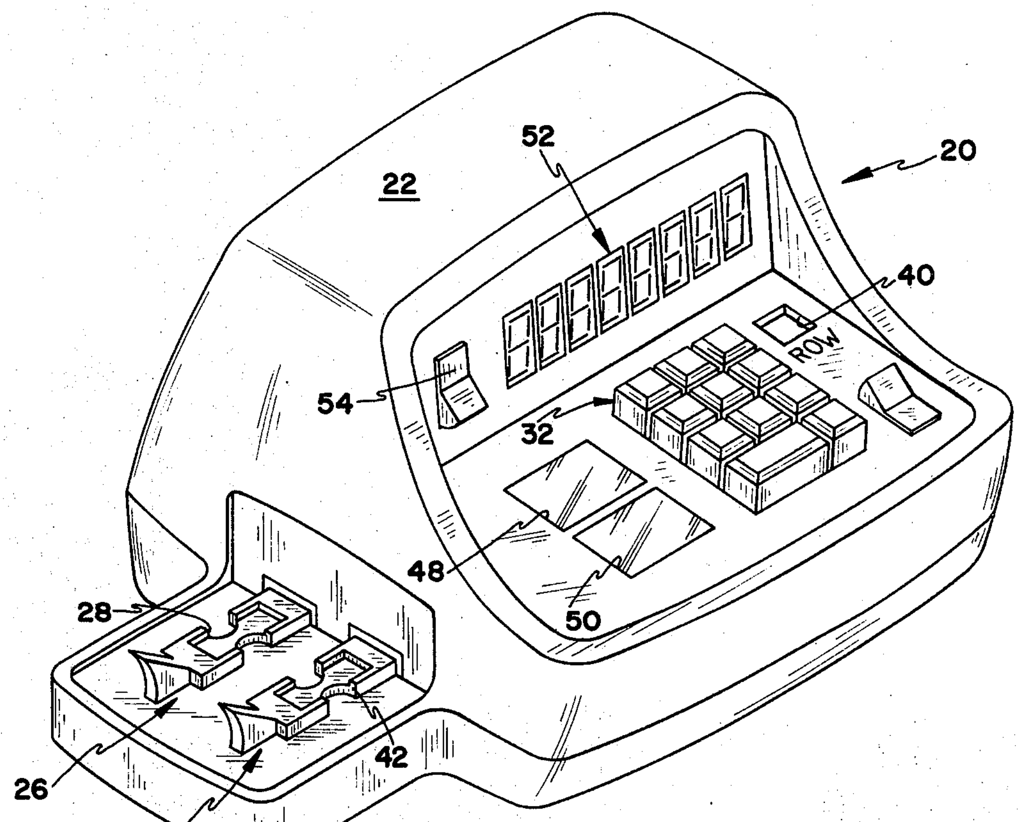


FIG. 1

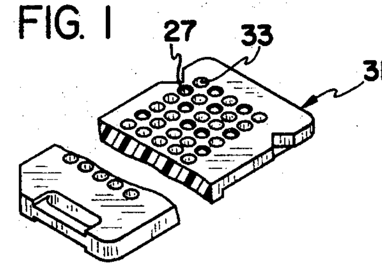


FIG. 2

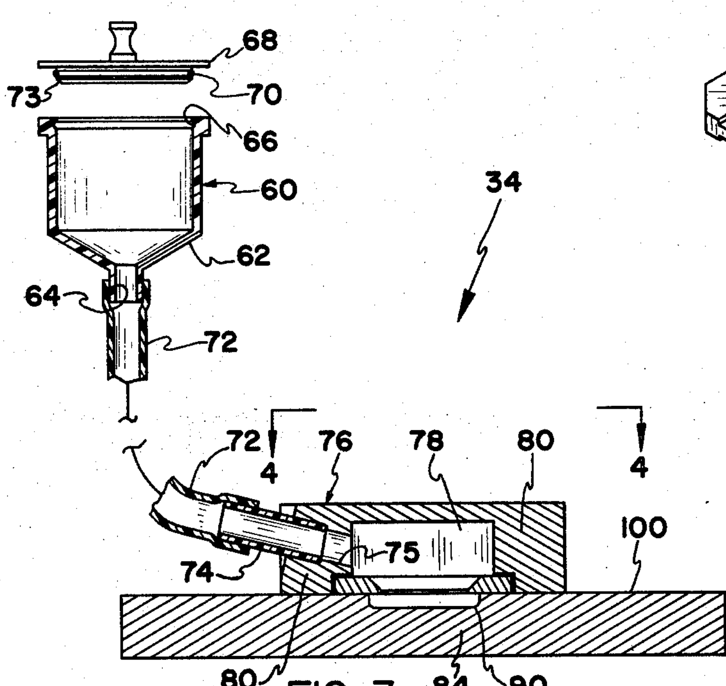


FIG. 3

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STEPHEN L. STUMPH

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ATTORNEY

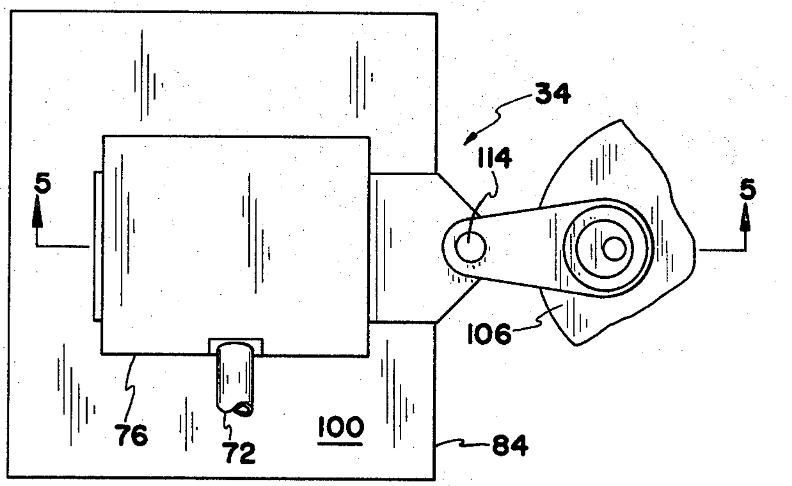

FIG. 4

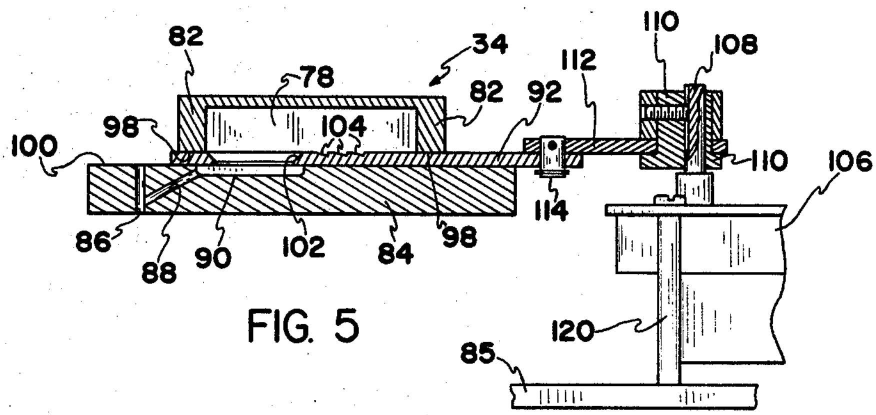

FIG. 5

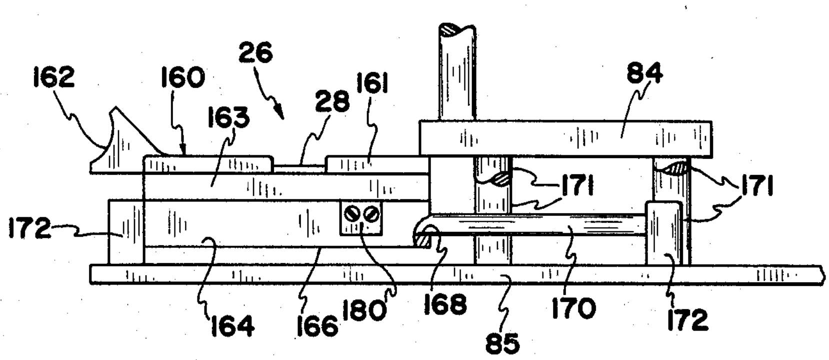

FIG. 6a

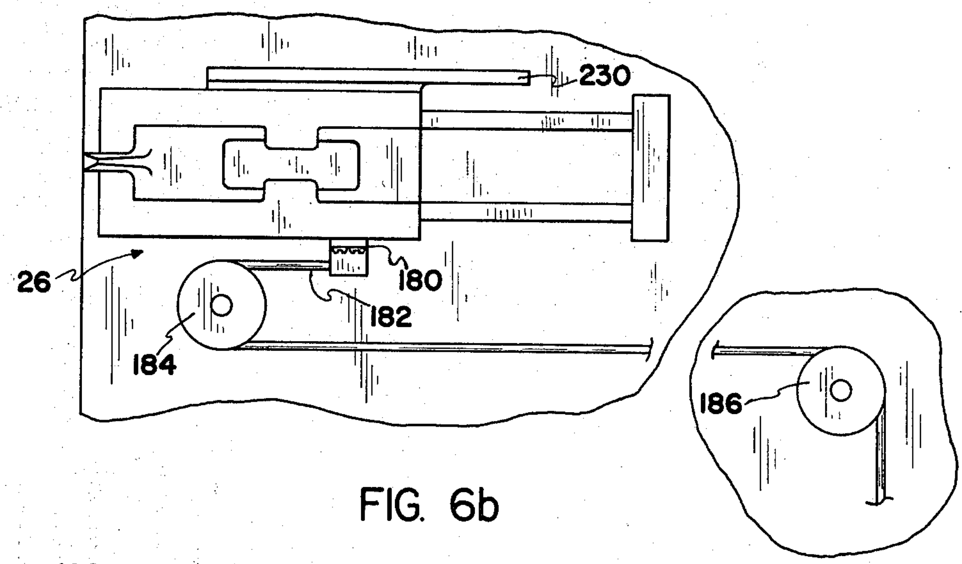

FIG. 6b

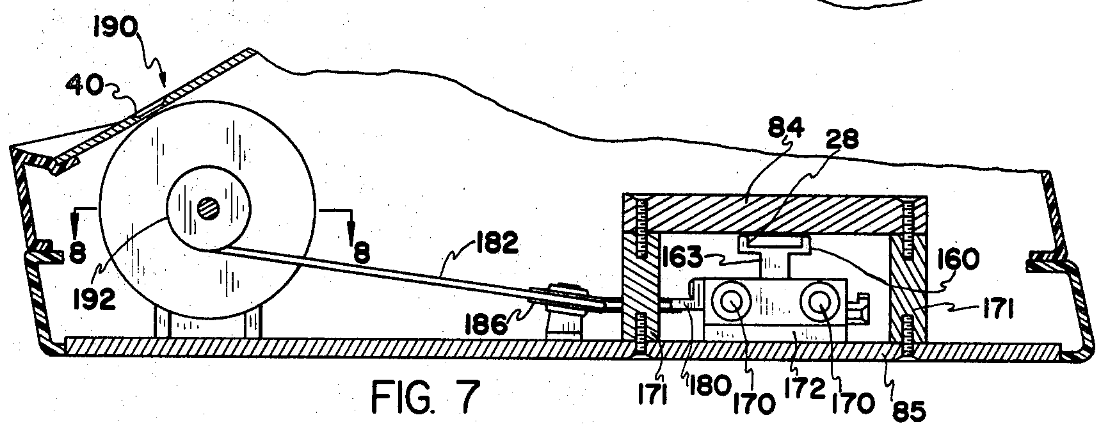

FIG. 7

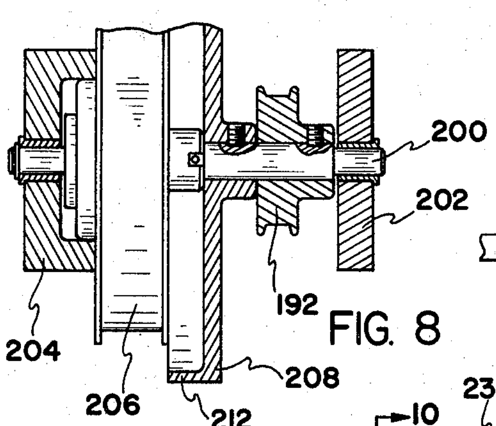

FIG. 8

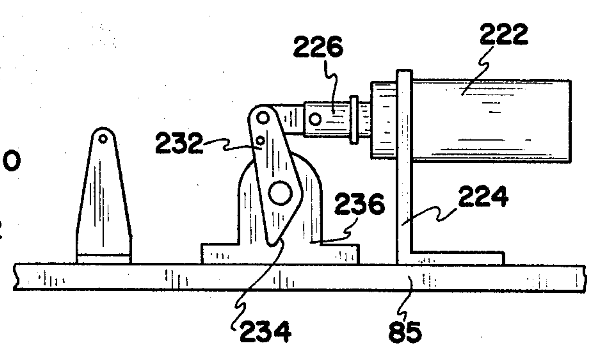

FIG. 9a

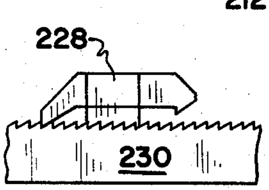

FIG. 10

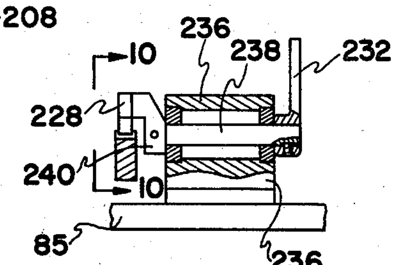

FIG. 9b

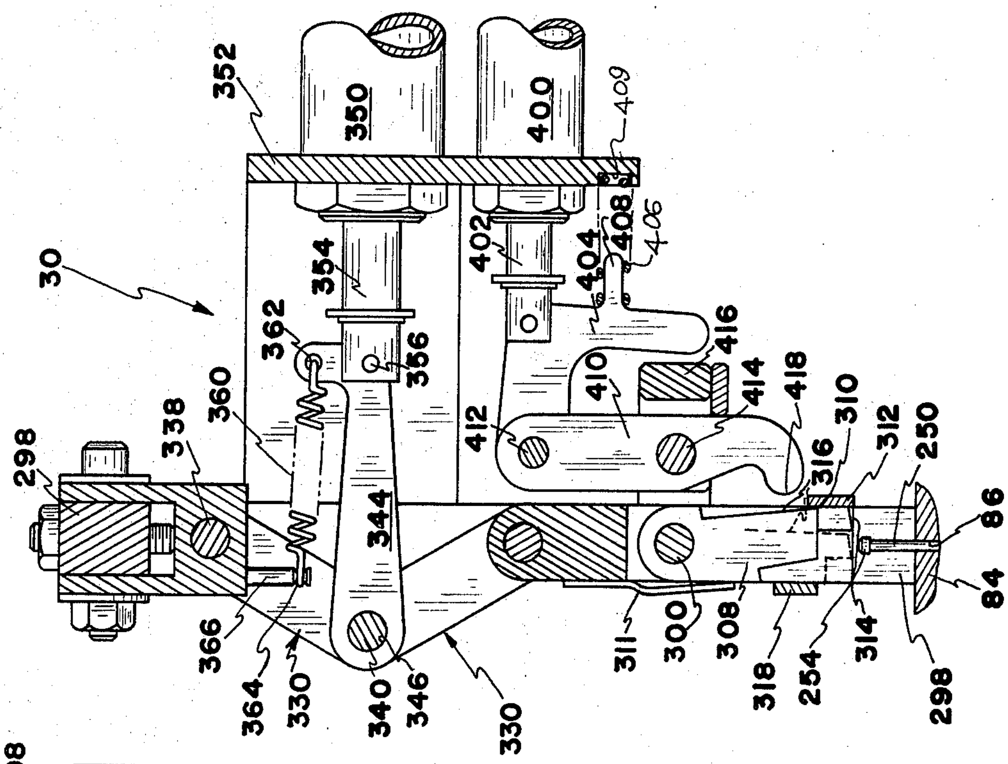

FIG. 12

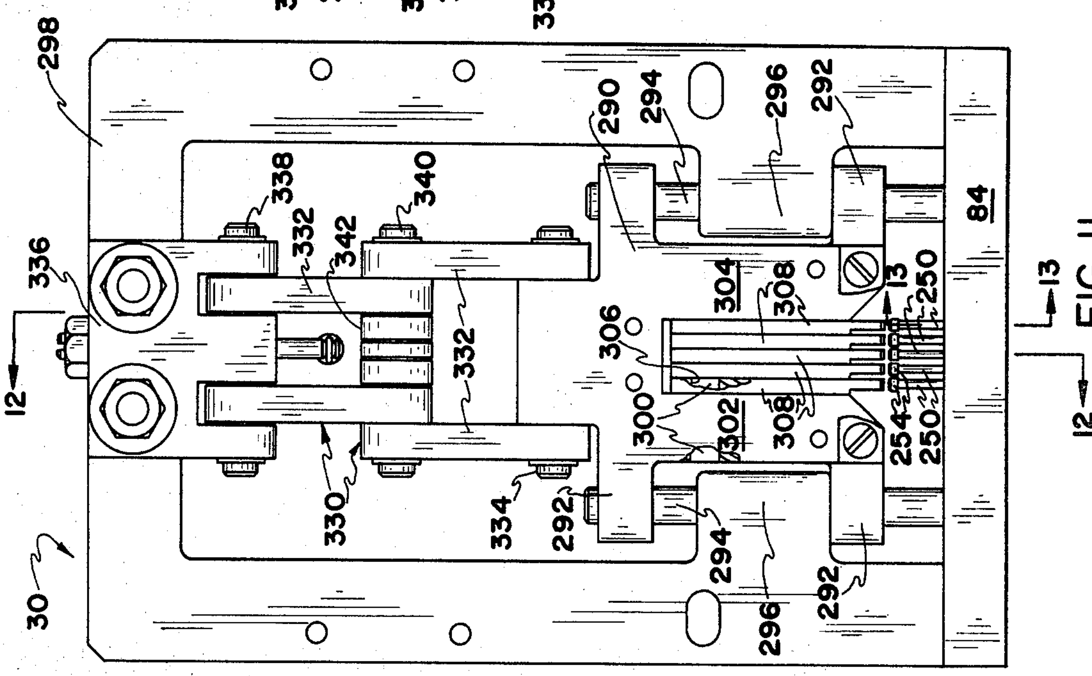

FIG. 11

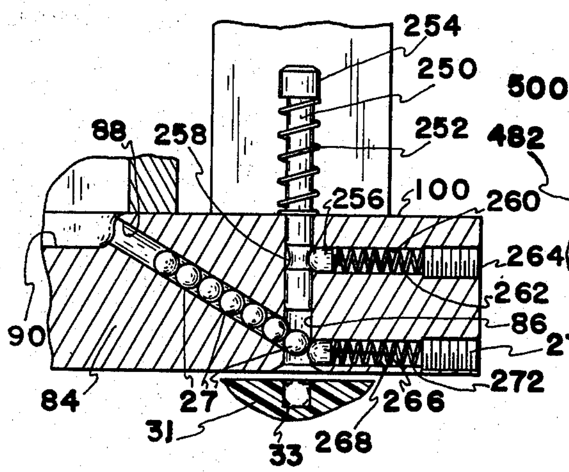

FIG. 13

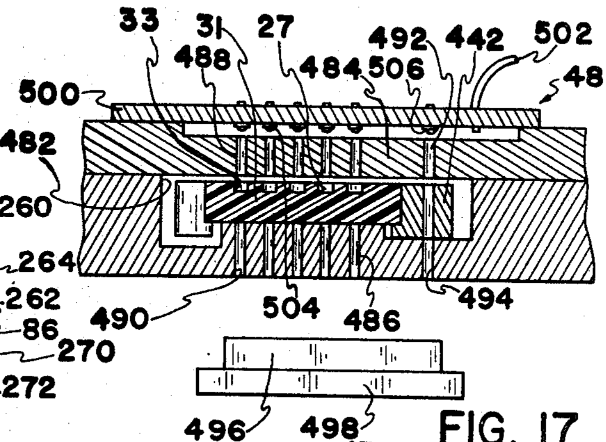

FIG. 17

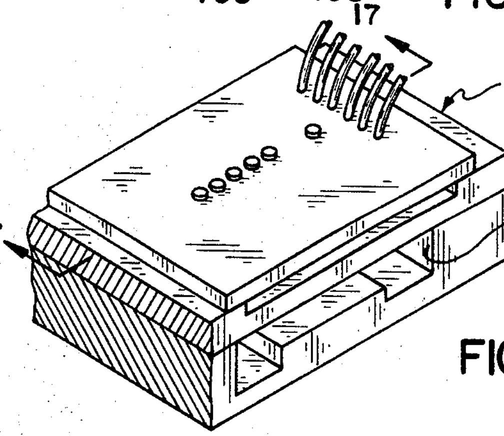

FIG. 16

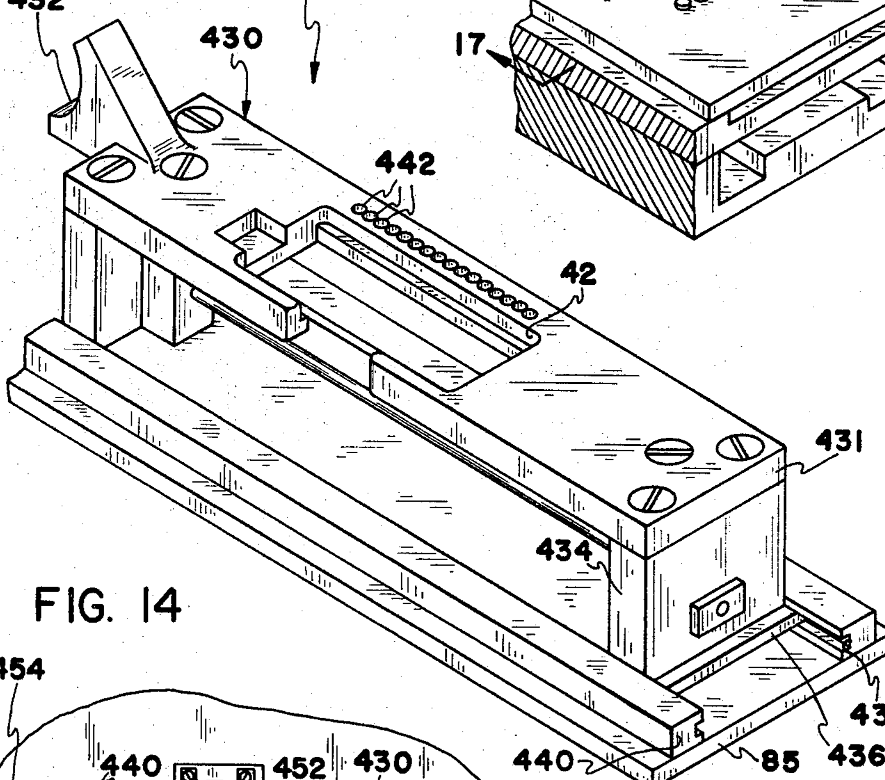

FIG. 14

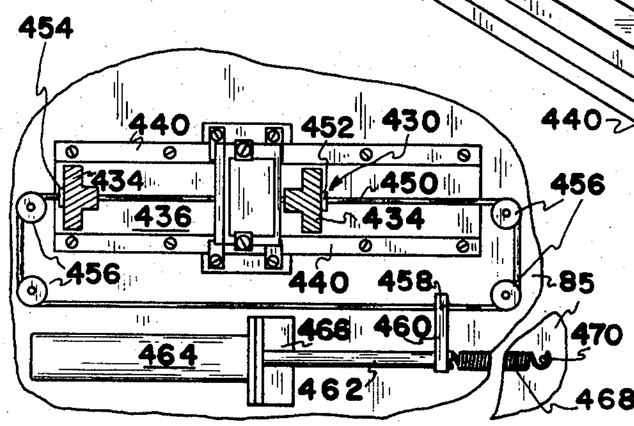

FIG. 15

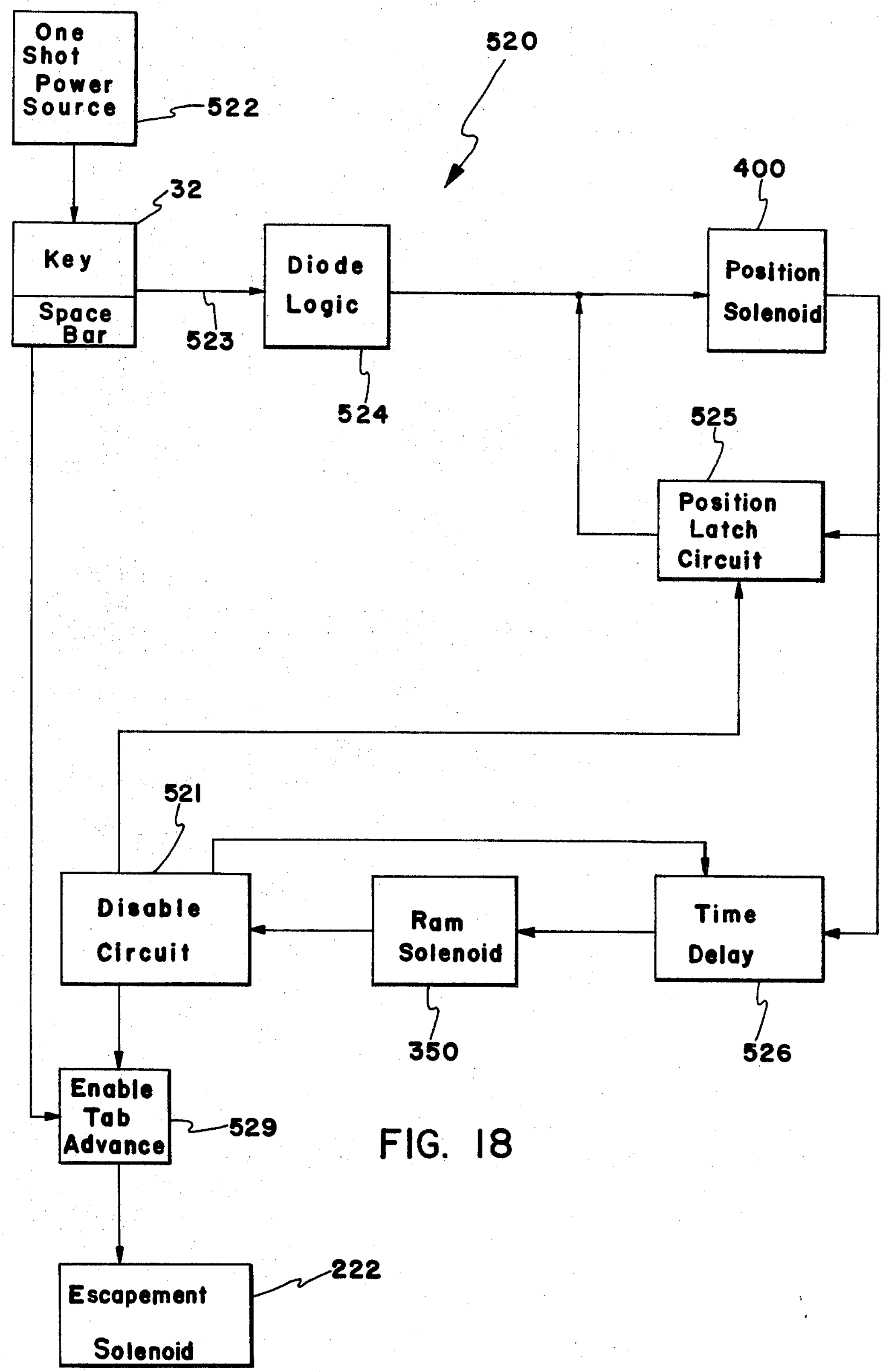
520
One Shot Power Source
522
32
Key
Space Bar
523
Diode Logic
524
400
Position Solenoid
525
Position Latch Circuit
521
Disable Circuit
Ram Solenoid
350
Time Delay
526
Enable Tab Advance
529
Escapement Solenoid
222

FIG. 18

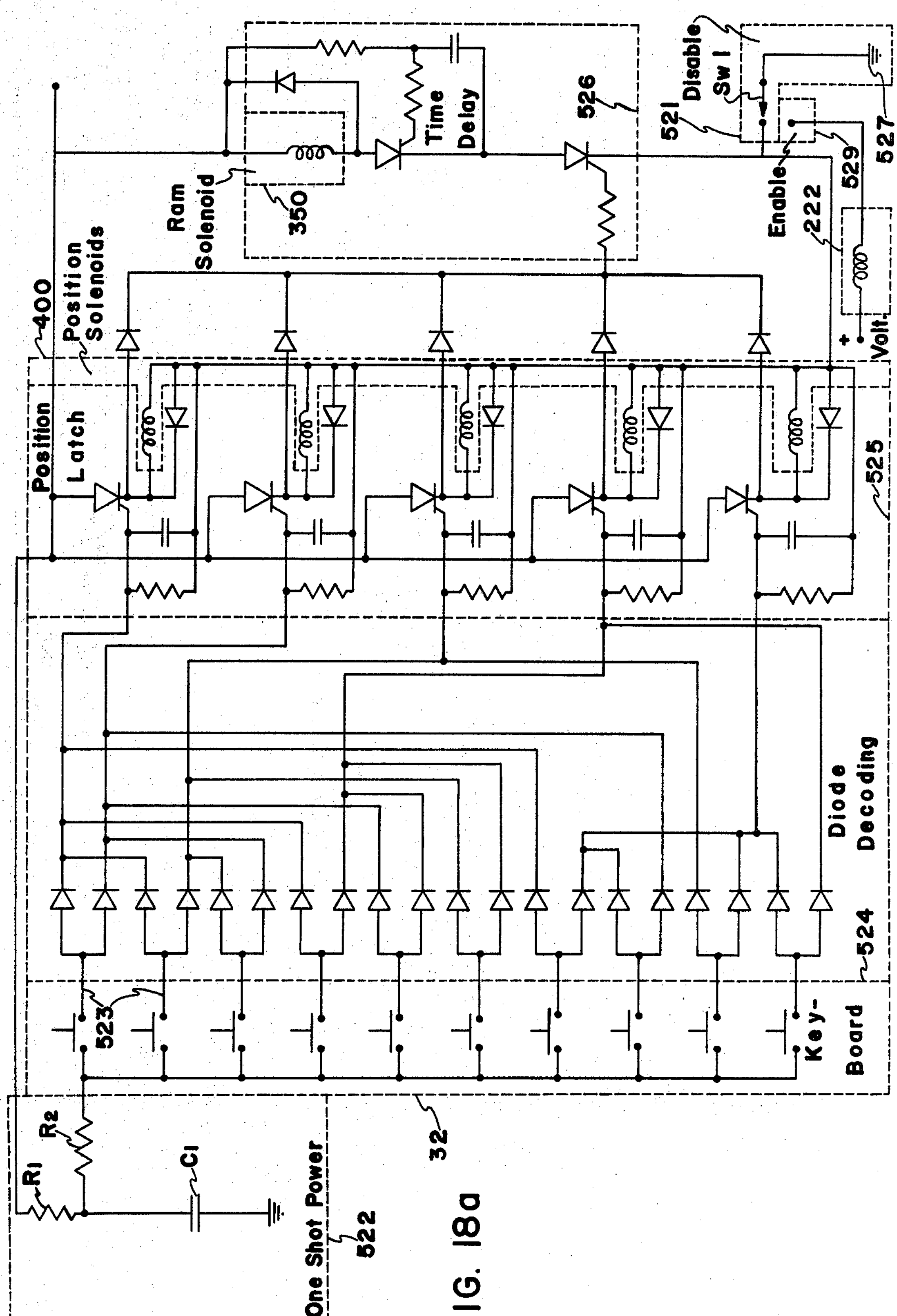
Time Delay
526
Ram Solenoid
350
Disable Sw I
521
527
529
Enable
222
+ Volt.
400
Position Solenoids
Position Latch
525
Diode Decoding
524
523
Key-Board
32
R1
R2
C1
One Shot Power
522

FIG. 18a

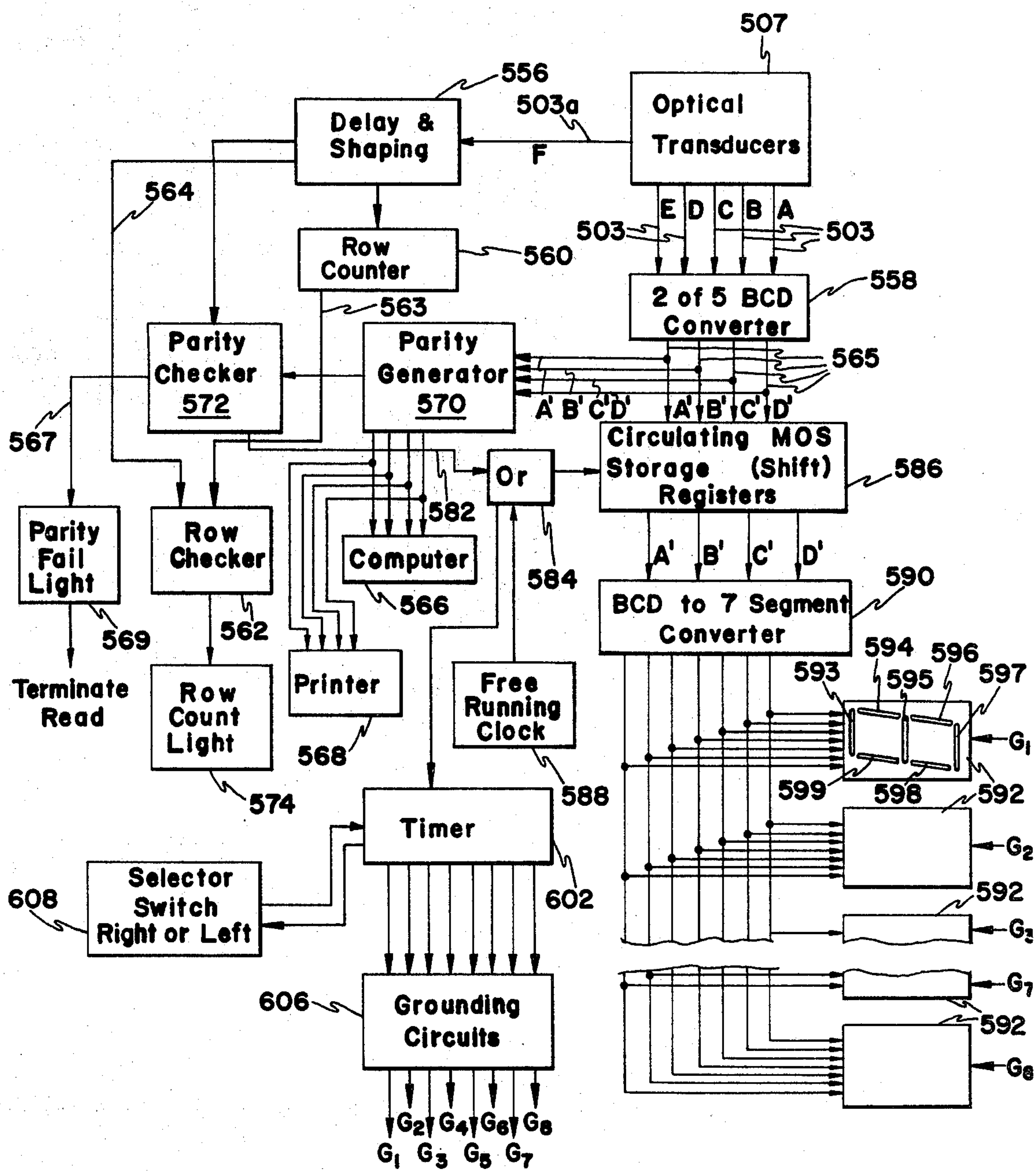
507
Optical Transducers
556
503a
Delay & Shaping
F
E D C B A
503
503
564
Row Counter
560
558
2 of 5 BCD Converter
563
Parity Checker 572
Parity Generator 570
565
A' B' C' D'
A' B' C' D'
567
Circulating MOS Storage (Shift) Registers
586
Or
582
Parity Fail Light
Row Checker
Computer
584
A' B' C' D'
590
BCD to 7 Segment Converter
569
562
566
Terminate Read
Row Count Light
Printer
Free Running Clock
593
594
595
596
597
G_1
568
574
588
599
598
592
Timer
G_2
Selector Switch Right or Left
608
602
592
G_3
G_7
606
Grounding Circuits
592
G_8
G_2 G_4 G_6 G_8
G_1 G_3 G_5 G_7

FIG. 19

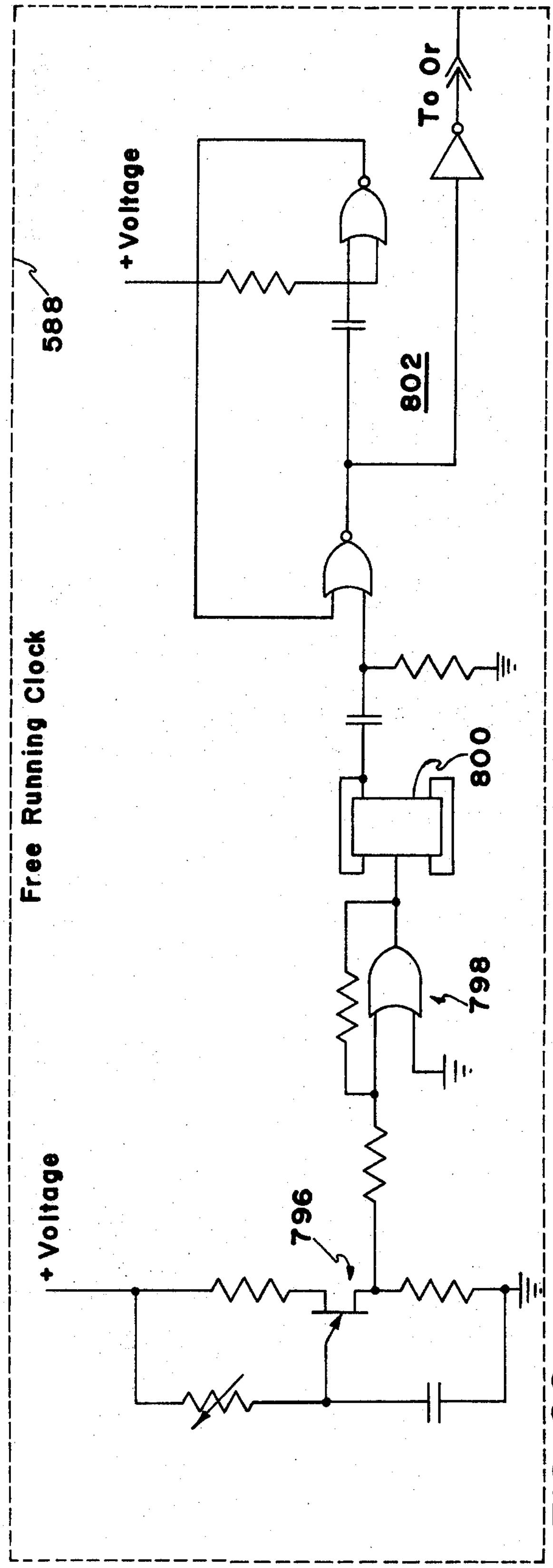
Free Running Clock
588
+ Voltage
+ Voltage
796
798
800
802
To Or

FIG. 26

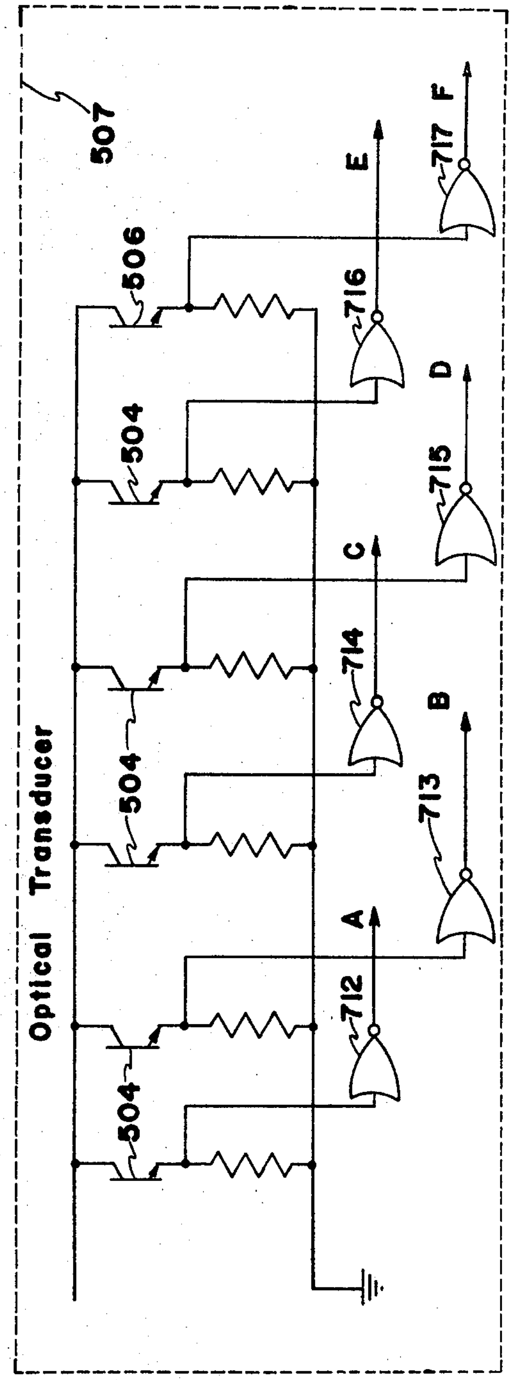
Optical Transducer
507
504
504
504
504
506
712
713
714
715
716
717
A
B
C
D
E
F

FIG. 20

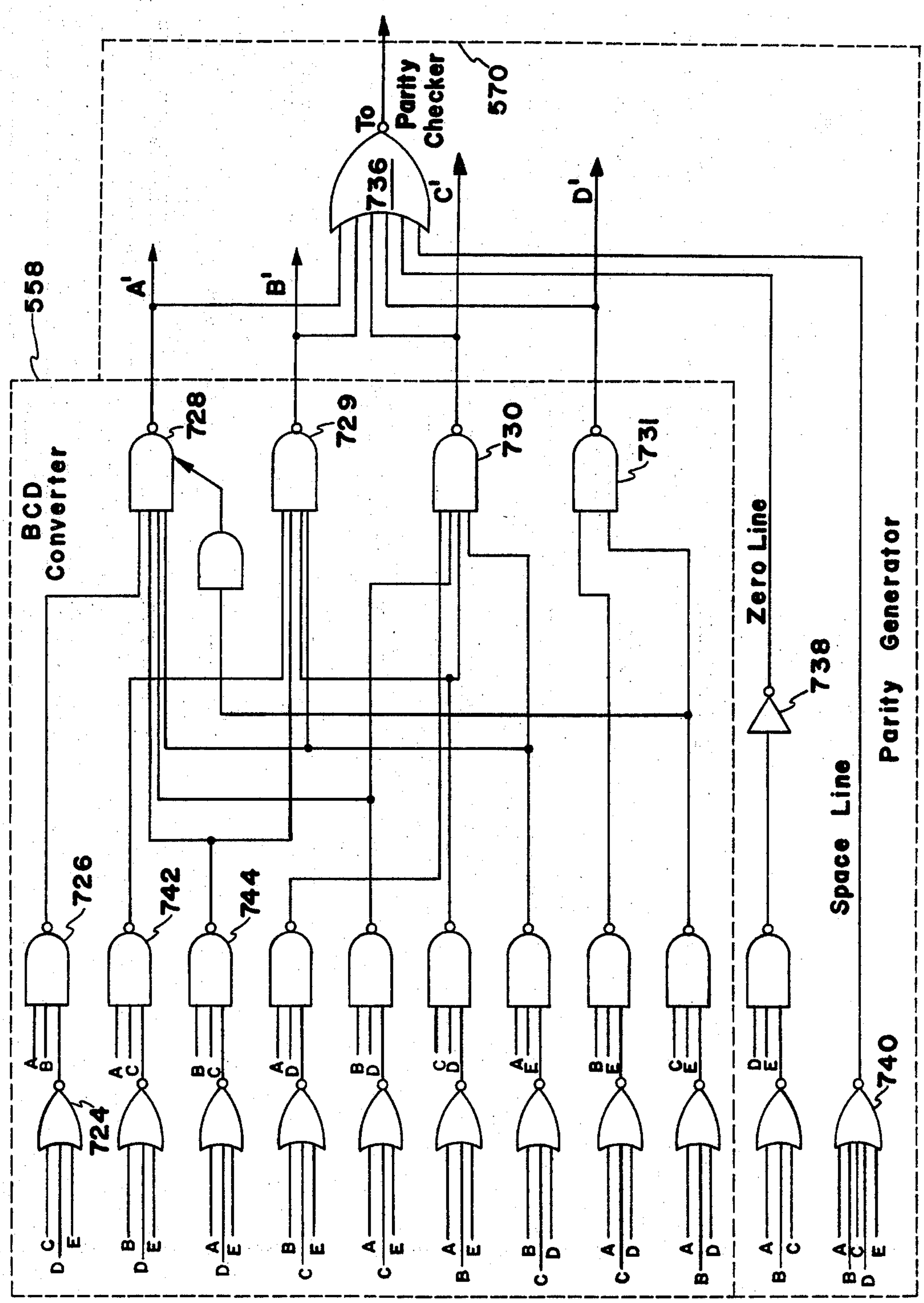
To Parity Checker
570
736
A'
B'
C'
D'
558
BCD Converter
728
729
730
731
Zero Line
738
Space Line
Parity Generator
726
742
744
724
740

FIG. 21

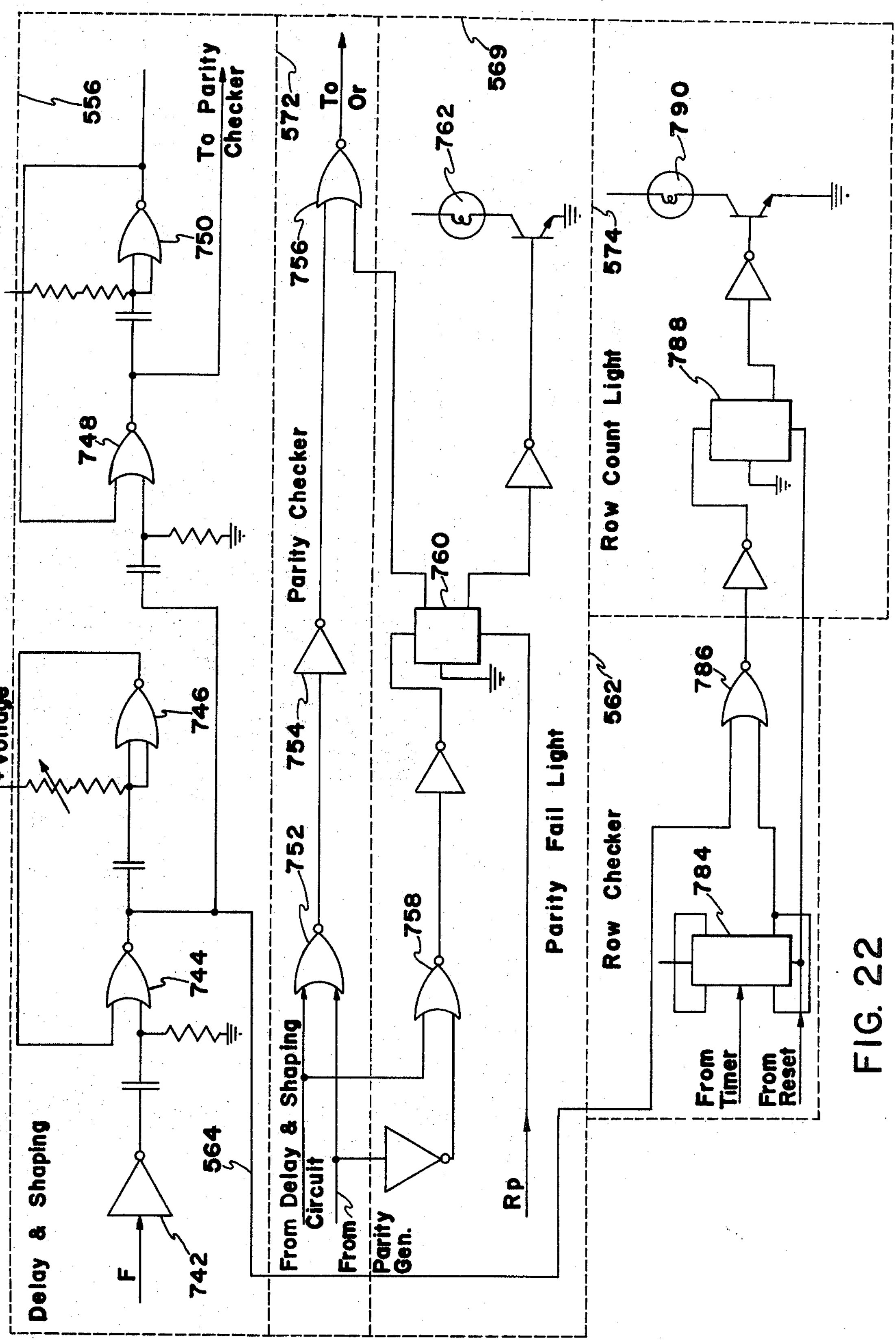
Delay & Shaping
F
742
744
746
748
750
+Voltage
556
To Parity Checker
564
From Delay & Shaping Circuit
From Parity Gen.
752
754
756
758
760
572
To Or
Parity Checker
Parity Fail Light
Rp
762
569
Row Checker
562
784
786
788
790
574
Row Count Light
From Timer
From Reset

FIG. 22

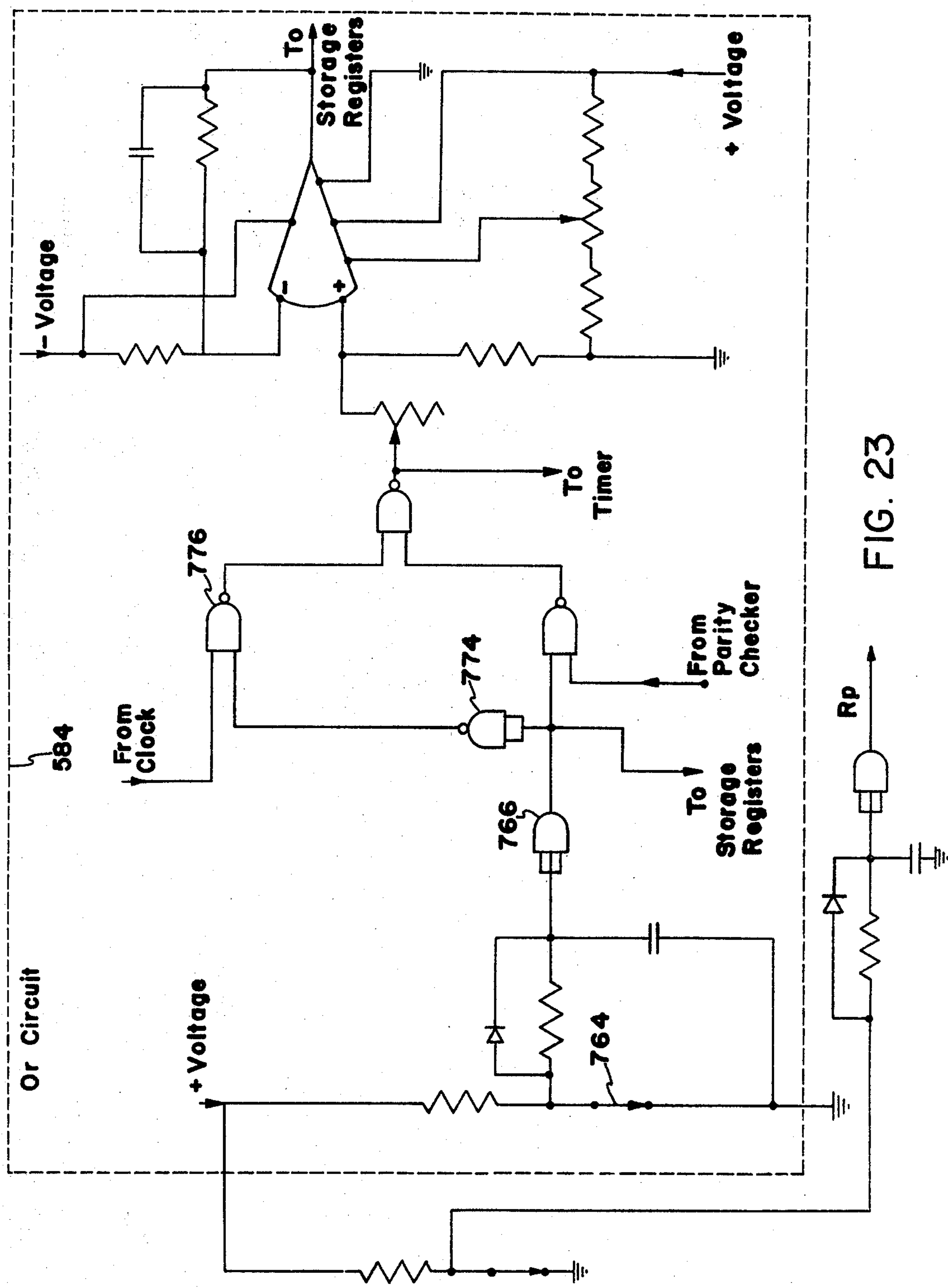
To Storage Registers
+ Voltage
- Voltage
776
774
766
764
584
To Timer
From Clock
From Parity Checker
To Storage Registers
Or Circuit
+ Voltage
Rp

FIG. 23

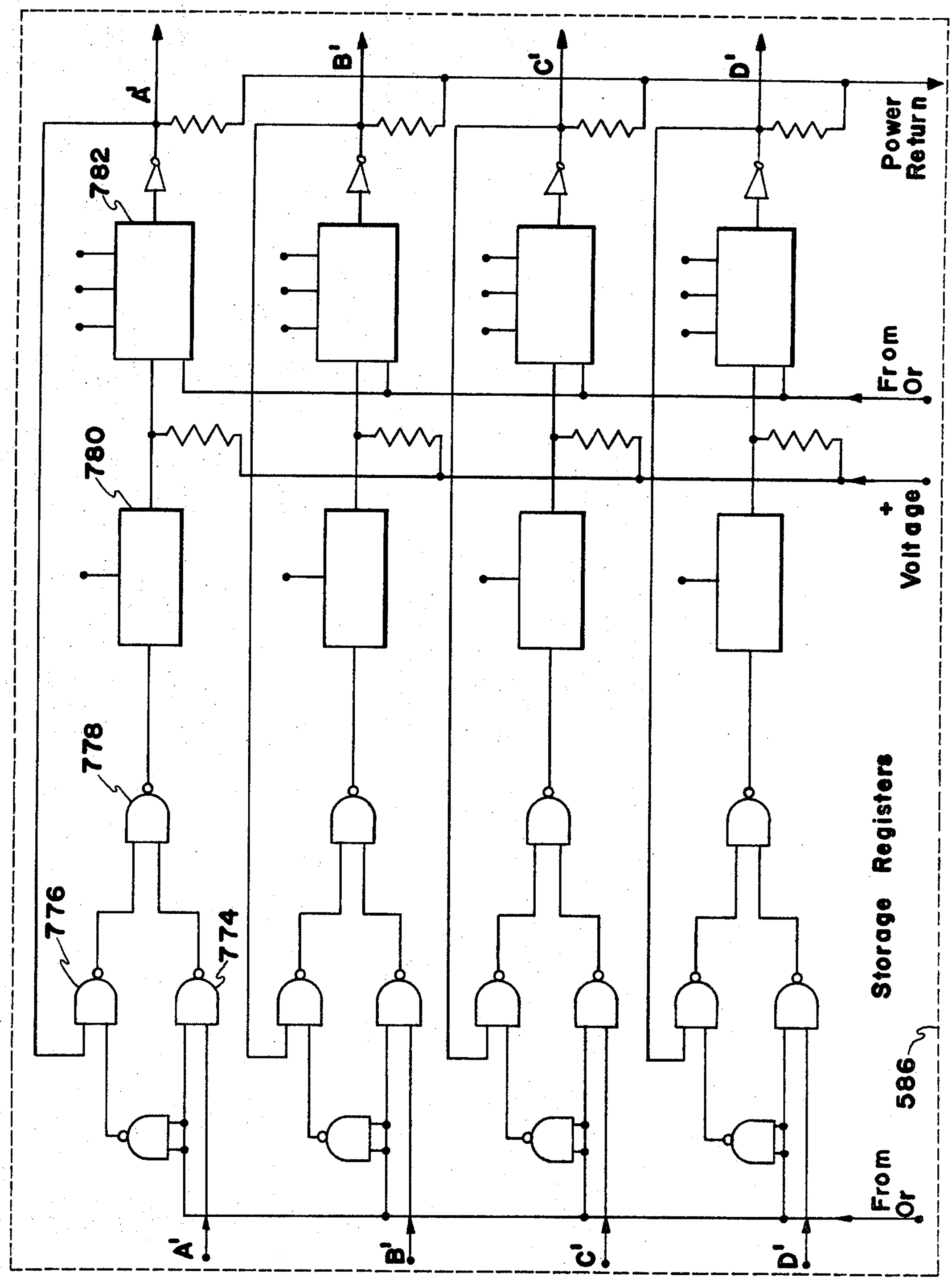
A'
B'
C'
D'
782
780
778
776
774
Power Return
From Or
+ Voltage
Storage Registers
586
From Or
A'
B'
C'
D'

FIG. 24

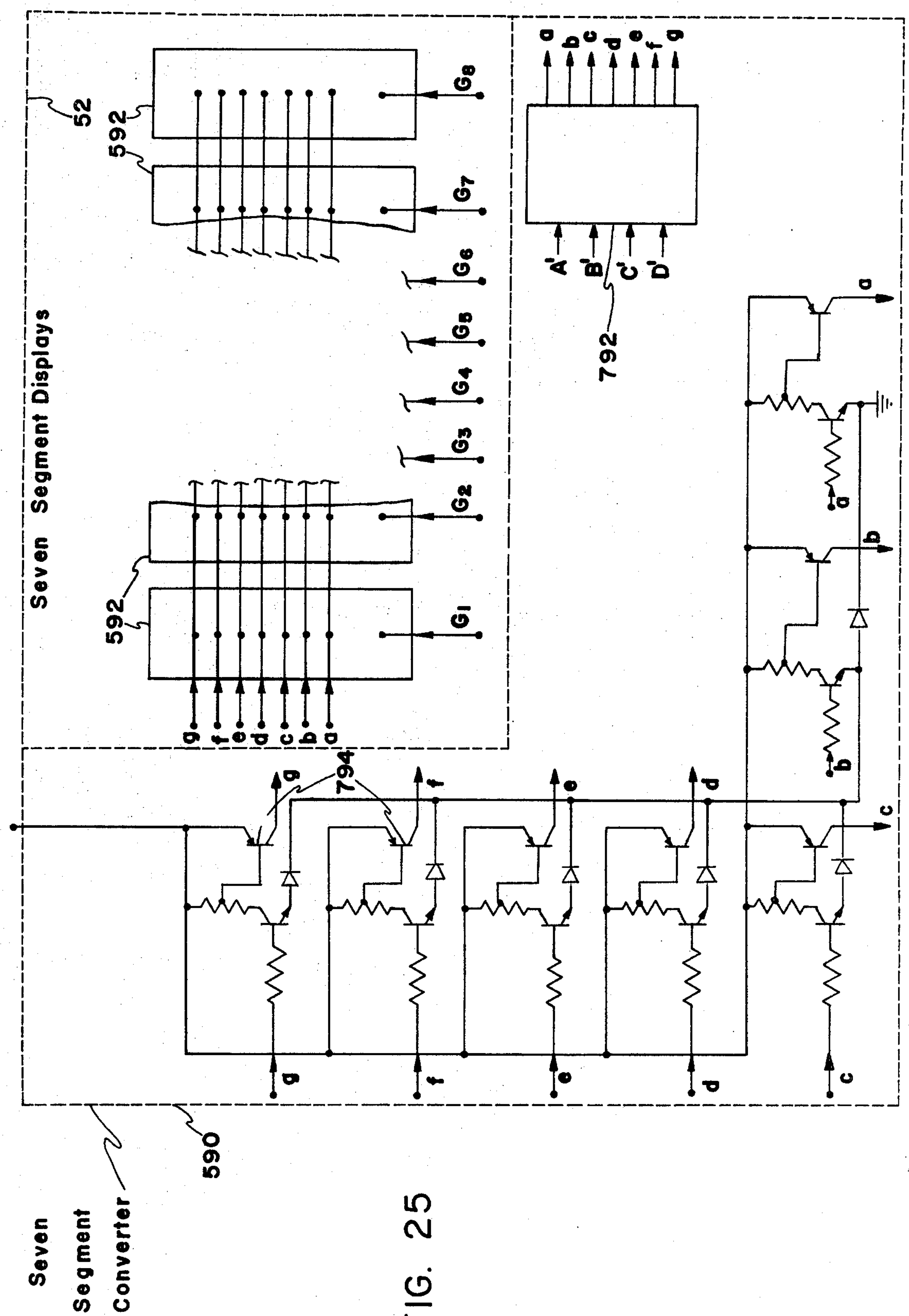
Seven Segment Displays
52
592
592
G1
G2
G3
G4
G5
G6
G7
G8
792
A'
B'
C'
D'
794
590
Seven Segment Converter

FIG. 25

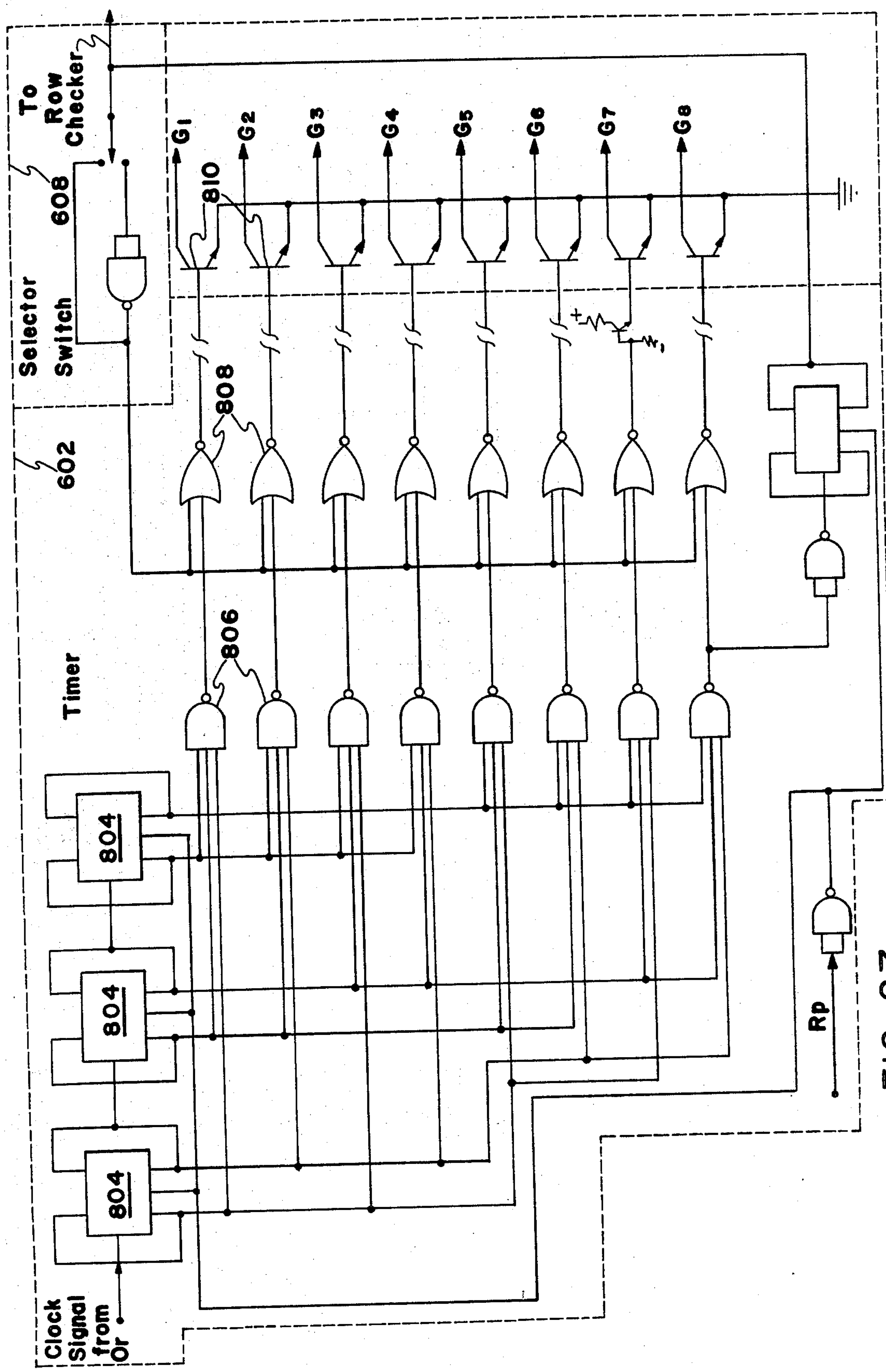
To Row Checker
608
Selector Switch
G1
G2
G3
G4
G5
G6
G7
G8
810
808
602
806
Timer
804
804
804
Clock Signal from Or
Rp

FIG. 27

ENCODING AND VERIFYING INFORMATION

FIELD OF THE INVENTION

The present invention relates generally to identification systems and particularly to methods and apparatus for encoding and verifying the encoding of a device.

BRIEF SUMMARY AND OBJECTS OF THE INVENTION

An encodable device is encoded by selective impression of information representations. The placement of the information representations is checked for accuracy by a reader, the signals of which are output to a computer, printer or display for visual consideration by the operator.

It is a primary object of the present invention to provide novel apparatus and methods for encoding devices.

Another paramount object is the provision of novel apparatus and methods for processing information after it has been read from an encoded device.

Another significant object of the present invention is the provision of novel method and apparatus for verifying the accuracy of code representations placed on encodable devices.

Another principal object of the present invention is the provision of novel apparatus and methods for impressing code information upon devices and for verifying the accuracy of the representations prior to use.

These and other objects and features of the present invention will become more fully apparent from the following description and appended claims taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a schematic perspective representation viewed largely from the top of an encoding and verifying apparatus according to the present invention;

FIG. **2** is a perspective of one suitable identification device; since circulating levels.

FIG. **3** is an elevation of the ball feeding structure of the apparatus of FIG. **1** with parts broken away for clarification purposes;

FIG. **4** is a plan view taken along line **4—4** of FIG. **3**;

FIG. **5** is a cross-section taken along line **5—5** of FIG. **4**;

FIG. **6a** is a side elevation of the encoder carrier with parts broken away;

FIG. **6b** is a plan view of the encoder carrier of FIG. **6a**;

FIG. **7** is an end elevation of the encoder carrier of FIG. **6a** also illustrating the cable takeup drum;

FIG. **8** is a cross section of the takeup drum along line **8—8** of FIG. **7**;

FIG. **9a** is a side elevation of the encoder escapement mechanism;

FIG. **9b** is an end elevation partly in cross section of the encoder escapement mechanism;

FIG. **10** is a fragmentary view taken along line **10—10** of FIG. **9b**;

FIG. **11** is a front elevation of the ram assembly;

FIG. **12** is an elevational view, partly in cross section taken along line **12—12** of FIG. **11**;

FIG. **13** is a sectional view taken along line **13—13** of FIG. **11**;

FIG. **14** is a perspective representation of the reader carrier;

FIG. **15** is a plan view of the return mechanism for the reader carrier;

FIG. **16** is a perspective representation of the optical reader;

FIG. **17** is a cross section taken along line **17—17** of FIG. **16**;

FIG. **18** is a block diagram of the encoder circuit logic;

FIG. **18a** illustrates circuit diagrams of the blocks of FIG. **18**;

FIG. **19** is a block diagram of the reader circuit logic;

FIG. **20** is a circuit diagram of the optical transducer;

FIG. **21** illustrates the circuit diagram for the BCD converter and the parity generator;

FIG. **22** illustrates circuit diagrams for the delay and shaping circuit, the parity checker, the parity fail light and terminate read circuit, the row checker, and the circuit to turn on the row count light;

FIG. **23** illustrates a circuit diagram for the OR circuit and for an associated reset circuit;

FIG. **24** illustrates a circuit for the circulating MOS storage shift registers;

FIG. **25** illustrates circuits for the BCD to 7-segment converter and for the 7-segment displays;

FIG. **26** illustrates a circuit of the free-running clock;

FIG. **27** illustrates a circuit for the timer, for the select switch and for the grounding circuits.

DETAILED DESCRIPTION OF THE ILLUSTRATED EMBODIMENT

While the present invention has many applications, it will hereinafter be described in connection with the numeric encoding of an encodable light-transmitting identification device by electromechanically pressing opaque balls into selected ones of spaced and aligned blind recesses in the device. To verify the correct placement of the balls, the encoded device is passed through an optical reader which causes the display of the numeric equivalent of the code representations (balls) impressed on the device. Like numerals are used in this specification to designate like parts.

GENERAL

Reference is made to FIG. **1** which pictorially represents an encoding-reading console, generally designated **20**. The apparatus **20** is provided with a contoured housing **22** which contains an encoder, adapted to receive an encodable identification device **31** (FIG. **2**) by rectilinear translation of an encoder carrier of an assembly **26** of the encoder. The identification device comprises rows of spaced and aligned blind recesses **33** for selectively receiving shot or balls **27** in press-fit relation at the encoder, the identification device being light-transmitting and the balls being opaque to accommodate subsequent optical reading.

Once the encoder carrier, with the identitification device **31** properly inserted in the device-receiving groove **28**, has been correctly translated into the encoder, a ram assembly will selectively press the balls into appropriate blind recesses **33** in the device **31** on a row-by-row basis corresponding to the numeral button or key of the keyboard **32** depressed by the operator for each row. The ram assembly receives a continuous supply of balls from a ball-feeder assembly and an indicator drum is rotated in correspondence to the to and fro rectilinear displacement of the encoder carrier by utilization of a takeup drum mechanism to at all times indicate at window **40** the row of blind recesses of the identification device **31** currently ready to be encoded. As each row of blind recesses **33** is encoded, the encoder carrier will be stepped one increment toward its original at-rest position illustrated in FIG. **1**.

Once the encoder carrier has been returned to its original, at-rest position with the encoded identification device **31** in the groove **28**, the device is removed and placed in the corresponding groove **42** of the reader carriage of an assembly **44** for insertion into the reader of the apparatus **20**. The reader optically senses the location of the opaque balls in the selected blind recesses **33** of the identification device **31** as the reader carriage is spring-returned at a constant rate to its original, at-rest position illustrated in FIG. **1**. In the event of a parity error, determined by circuit logic, a light will be illuminated at window **48**. In the event too many rows are counted, the error will be made evident to the operator by the illumination of light at a window **50**.

The logic circuit of the reader causes illumination of numerals on the display panel **52** on a row-by-row basis identical to the numerals represented by the encoding balls in the corresponding rows of the identification device. Where the number of encoded rows exceed the number of lamps in the display 52, a selector switch 54 is used to first illuminate the numeric equivalents of one set of coded rows followed by illumination of a second set.

THE BALL-FEEDER ASSEMBLY

The ball-feeder assembly, generally designated 34, is best illustrated in FIGS. 3–5, inclusive. A supply of spherical balls (not shown) is contained within a reservoir 60 and replenished from time to time by the operator. The reservoir which is generally cylindrical in configuration although tapered at 62 to define a restricted outlet port 64 through which balls may pass. In use, the top opening 66, through which the reservoir 60 is replenished, is sealed by a cap 68 which contains an O-ring 70 in a groove of a downwardly extending lip 73. Thus, when the cap 68 is forced into the opening 66 a press-fit relationship is established.

Balls issuing from the egress port 64 of the ball reservoir 60 pass through the hollow interior of a ball feed tube 72 and a tubular fitting 74 over which the tube 72, which is preferably of flexible plastic, is press-fit at its lower end.

The lower end of the fitting 74 is anchored to a ball feed housing 76 which defines a concealed ball-storage compartment 78 communicated with the interior of the fitting 74 through port 75. The compartment 78 is disposed between the longitudinally extending flanges 80 and the transversely extending flanges 82. The housing 76 is appropriately screw-secured to the base 84 of the ram assembly.

The hollow compartment 78 communicates with five vertical bores 86 through ramp passageways 88 each terminating at their upper end in a horizontally disposed groove 90 in the base 84. The exact nature, purpose and construction of each bore 86 will hereinafter be more fully explained.

A shift plate 92 is interposed between the cavity 90 and the compartment 78 and is adapted to be reciprocated in a left-right fashion, as viewed in FIG. 5, through slots 98 in the flanges 82 of the housing 76 across the top surface 100 of the ram base 84.

The shift plate 92 serves to agitate the spherical balls contained within the compartment 78 causing the balls to move through the tapered port 102 in the plate 92 and ultimately into respective vertical bores 86. Serrations 104 disposed transversely across the top of the plate 90 assist in the mentioned agitation.

The to and fro rectilinear translation of the plate 92 is caused by a motor 106 which rotates a drive shaft 108 thereby turning an eccentric 110, disposed about the shaft 108 in non-rotatable relation. The rotation of the eccentric 110 causes translation, right-left as viewed in FIG. 5, of a crank 112 which is rotatably joined to the eccentric 110 immediately above its lower flange and is pin-connected at 114 to the shift's plate. Hence, translation of the crank 112 causes corresponding rectilinear translation of the plate 92. It is preferred that the pin 114 be non-rotatably coupled to the crank 112, as by use of a setscrew. Likewise, a setscrew can be used to non-rotatably join the eccentric 110 to the drive shaft 108. The motor 106 is illustrated as being screw-secured to the frame 85 of the apparatus 20 by means of a plurality of posts 120. One suitable motor 106 is a Hurst motor-gear Model EA.

THE CARRIER ASSEMBLY FOR THE ENCODER

The Encoder Carrier

The encoder carrier assembly 26 comprises the previously mentioned encoder carrier 160 which presents a contoured abutment surface 162 for manually inserting the carrier into the initial encoding position with the identification device 31 disposed in the groove 28. The carrier 160 comprises a slide body 164 disposed beneath the groove 28 the bottom surface 166 of which is spaced above the apparatus base 85. The carrier 160 provides support for the ram to drive balls into the device 31, which is carried by the carrier 160. The top slide plate 161 is rigidly joined to the slide body 164 by an erect connector 163. The body 164 contains two longitudinally directed parallel guide-bores 168 through which guide rods 170 slidably extend in close tolerance relation so that the carrier 160 is precisely displaced from the illustrated at-rest position of the FIG. 6*a* to the initial encoding position inside the apparatus 20.

The two guide rods 170 are anchored to the base 85 by block mounts 172 secured at each end of the rods. When in the initial encoding position, the carrier 160 will be disposed immediately below the base 84 of the ram assembly such that the left row of encodable blind recesses 33 in the identification device 31 as viewed in FIG. 6*a* will be disposed in alignment with the bottom opening of the ball-issuing vertical bores 86.

A cable clamp 180 mounted to one side of the body 164 tightly grips a cable 182 (see especially FIG. 6*b*), which cable passes around spaced pulleys 184 and 186 to a takeup mechanism, generally designated 190 (FIG. 7) and hereinafter more fully described.

The Takeup Mechanism

When the carrier 160 is moved to the initial encoding position, the takeup mechanism 190 will rotate counterclockwise as viewed in FIG. 7 against its spring-bias allowing enough cable 182 to leave the drum sufficient to accommodate the mentioned displacement of the carrier 160. The mechanism 190 is so biased as to rewind the distributed cable 182 as the carrier 160 is incremented back to its at-rest position.

With particular reference to FIG. 8, the takeup assembly, which is constructed as are carriage return drums currently used in typewriters, comprises a central shaft 200 rotatably mounted in bearings upon support brackets 202 and 204. A windable spring bearing 206, an indicator drum 208 and the pulley takeup drum 192 are all non-rotatably mounted upon the shaft 200. The takeup drum assembly 190 is biased by windable spring assembly 206 as is conventional, the spring being wound by displacement of the carrier 160 from the at-rest to the initial encoding position. The bias of the wound spring provides the force for returning the carrier 160 to the initial at-rest position under control of the escapement mechanism 220, best illustrated in FIGS. 9*a* and 9*b*.

The outside surface of the flange 212 of the pulley indicator drum 208 carries a sequence of numerals corresponding to the number of rows of blind recesses in the identification device. The numerals on the flange 212 are so ordered that when the carrier 160 is depressed into its initial encoding position and the indicator drum 208 is correspondingly rotated, the number identification of the left (first) row of the identification device (the first row to be encoded) will appear at the window 40. As the carrier 160 is indexed a row at a time back toward its at-rest position, the indicator drum 208 will correspondingly index so that numerals successively higher in increments of plus one successively appear at the window 40 to at all times provide visual identification to the operator of the exact row ready to be encoded.

The Escapement Mechanism

The escapement mechanism 220 (FIGS. 9*a*, 9*b* and 10) is activated by an escapement solenoid 222, which is mounted upon a bracket 224 to the base 85 of the apparatus 20. When the escapement solenoid 222 is activated and its armature 226 retracted, the escapement pawl 228 will be momentarily lifted out of engagement with an escapement rack 230 which is rigidly secured to one side of the body 164 of the encoder carrier 160. When the pawl 228 is lifted free of the rack 230, the force of the takeup drum assembly 190 exerted through the cable 182 upon the carrier 160 will cause the carrier to index one increment closer to the at-rest position. Continued displacement of the rack 230 and the carrier 160 is prevented by an instantaneous return of the pawl 228 into restraining engagement with the rack 230 caused by a return spring.

Structurally, as can be seen by reference to the FIGS. **9***a*, **9***b* and **10**, the armature **226** of the solenoid **222** is pivotally coupled to an escapement lever **232**, the counterclockwise rotation of which, as viewed in FIG. **9***a*, is restricted by stop pin **234** mounted so as to project to one side of the bearing housing **236**. The housing **236** is secured to the base **85** and rotatably carries a shaft **238** to which the lever **232** is non-rotatably coupled at one side of the housing **236**. The escapement pawl **228** has an off-set portion **240** which is non-rotatably secured to the shaft **238** on the opposite side of the housing **236**.

The mentioned indexing of the carrier **160** by release of the pawl **228** from engagement with the rack **230**, causes a corresponding indexing of the indicator drum **208**. When the indexing is complete, the indicator drum will display the number representative of the row into which balls may be inserted.

The Ram Assembly

The ram assembly **30** best illustrated in FIGS. **11** and **12**, provides the force necessary to drive a selected two of the five vertically-erect pins **250** (FIGS. **11** and **13**) from the illustrated position to a downwardly-displaced position such that two balls **27** which are respectively disposed in each of the previously described vertical bores **86**, one ball in each of the two selected bores are driven into the aligned blind recess **33** of the identification device **31** (see especially FIG. **13**) by the two pins. Each pin **250** is biased toward its illustrated elevated positions shown in FIG. **13** by a spring **252** which abuts against the lower surface of an enlarged head **254** of the pin and against the top surface **100** of the ram base **84**. Each spring **250** is also normally held in the elevated, at-rest position by engagement of a detent headed pin **256** with female, mating groove **258** of the pin. The detent headed pin **256** is trapped for reciprocable movement in a horizontal passageway **260** in the base **84** and is spring-biased by the spring **262** against the groove **258**. A plug **264** restrains the other end of the spring **262**.

In like manner, a detent ball **266** restrains the one encoding ball **27** in each vertical bore **86**, as illustrated in FIG. **13**. The detent ball **266** is trapped within a bore **268** which is plugged at **270** such that one end of the spring **272** butts against the plug and the other against the mentioned detent ball **266**.

With particular reference now to FIGS. **11** and **12**, the manner in which the ram assembly **30** displaces two selected pins of the five will be described. The ram **290** of the assembly **30** is generally U-shaped as viewed in FIG. **11** and contains two oppositely extending pairs of lugs **292** in which are disposed vertical bores which slidably receive slide rods **294**. The slide rods **294** are retained in their illustrated vertical orientation by reason of being rigidly anchored to the base **84**. The guide rods **294** respectively pass through vertical bores disposed within inwardly directed lugs **296** of the ram frame **298**. As can best be visualized from FIG. **11**, the frame **298** is configurated as an inverted U and is rigidly anchored to the assembly base **84**.

A horizontally disposed pin **300** is non-rotatably anchored to the ram **290** and spans between the legs **302** and **304** of the ram so as to rotatably pass through an aperture **306** disposed in horizontal orientation near the top of each of five pins key **308**. Each pin key **308** when at rest hangs by force leaf spring **311** into the position illustrated in solid lines in FIG. **12** so that the right edge **310** abuts the left surface of the stop bar **312**. In this at-rest position downward movement of the ram **290** from the illustrated position to the encoding position will cause the driving surface **314** of the driving head of the pin key **308** in question to miss or not engage the head **254** of the associated pin **250**.

Provision is made for displacing two of the five pins (during a single cycle of the ram **290**) from the solid position of FIG. **12** to the dotted line position. The manner and mechanism for doing this will be hereinafter more fully explained. In any event, when a given pin key **308** is disposed in the active dotted line position of FIG. **12**, downward movement of the ram **290** will cause the hammer surface **314** of that pin key **308** to engage the head **254** of the associated pin **250** causing that pin to drive the ball **27**, located in the associated vertical bore **86**, into the aligned recess **33**. The stop bar **318** restricts the clockwise rotation of each pin key **308** as viewed in FIG. **12**.

The ram assembly **30** utilizes an overcenter linkage **330** to provide adequate mechanical advantage for driving the ram **290** into its lower, ball-inserting (encoding) position. The overcenter linkage consists of four links **332**, two of which are rotatably coupled by pin **334** to the top of the ram **290**. The other two of links **332** are likewise rotatably coupled to the lower portion of a clevis **336** which is bolt-secured to the frame **298** central of the crossbar at the top thereof, utilizing the connection pin **338**. Each link **332** is connected rotatably at one end thereof to a central overcenter drive shaft **340**. Spacers **342** separate a pull link **344** from the inside two links **332** (see FIG. **11**). The pull link **334** is also secured at a horizontally-disposed bore **346** at one end thereof to the pin **340** (see FIG. **12**).

Thus, when the ram solenoid **350**, attached at plate **352** to the ram frame **298**, is activated, the plunger **354** is retracted. The plunger **354**, being pin connected at **356** to the pull link **344**, displaces the link **344** toward the right as viewed in FIG. **12**, causing a straightening of the dog-leg configuration of the overcenter links **332**. This drives the ram **290** from its illustrated at-rest position to its ball-inserting position. The link **344** and the overcenter drive linkage **330** return to their at-rest illustrated positions when the solenoid **350** is deenergized by force of a return extension spring **360** which spans between an aperture **362** in the associated **344** and a groove in the distal end **364** of a pin **366** secured to the clevis **336**. optical reader.

A series of five position solenoids **400**, only one of which is illustrated in FIG. **12**, responds to the depression of a button on the keyboard **32** such that two of the five solenoids **400** are activated by an electrical signal from the encoder circuit logic. Each solenoid **400** is secured to the plate **352**, and, upon actuation, the plunger **402** thereof is retracted causing displacement of the associated code link **404**, which takes the configuration of a bell crank and is restrained by a spring **406**. Each spring **406** abuts against a recess surface **409** in the plate **352** and against the code link **404** around the fillet at the base of a projection **408** about which the spring **406** turns.

The mentioned retraction of the plunger **402** and associated link **404** causes a clockwise rotation of the associated crank **410** which is rotatably connected to the link **404** by means of a pivot pin **412**. Each crank **410** pivots upon a common shaft **414** which bridges between the legs of a bracket **416**, which bracket is secured to the frame **298**.

The mentioned clockwise rotation of a given crank **410** will cause the tow **418** of the crank to engage the associated pin key **308** displacing the key from the solid to the dotted position illustrated in FIG. **12**.

Thus, by pushing a button upon the keyboard **32**, the operator will actuate two of the five solenoids **400** immediately preceding actuation of the ram solenoid **350** thereby displacing two of the five pins key **308** so that the two hammer surface **314** thereof are disposed immediately above the associated head **254** of two pins **250**. As the ram **290** descends responsive to the actuation of the solenoid **350**, two of the five pins **250** will be displaced to insert two balls **27** into two of the five blind recesses **33** aligned with the bores **86**. The other three pins key **308** will pass harmlessly to one side of the associated pins **250**.

The Verifier or Reader

In general, the purpose of the reader or verifier portion of the apparatus **20** is to provide an accurate operator check to insure that the identification device **31** was properly encoded with information representations, in the form of balls, by the previously described encoder.

The Reader Carrier Assembly

When the identification device **31** is to be verified for correctness, it is placed in the reader carrier **430** of the reader carrier assembly **44**. The slot or stepped bore **42** is reserved for this purpose and a contoured abutment surface **432** is provided for the operator, using his thumb, to slide the carrier **430** from the inactive position illustrated in FIG. **1** to an initial reading position within the apparatus **20**. Thereafter, the code verification occurs automatically and the numeric equivalents of the code on a row-by-row basis are illuminated at the display panel **52** (FIG. **1**). In addition to the top plate **431**, the carrier **430** integrally comprises vertically erect columns **434** which also serve as spacers and a bottom, horizontally disposed slide plate **436**, which is reciprocably received in side notches **438** of spaced tracks **440**. The tracks **440** are preferably formed of nylon or similar plastic material to accommodate smooth displacement of the slide plate **436** with a minimum of wear. The slide plates **440** are suitably anchored rigidly to the base **85** of the apparatus and extend through the optical reader.

Importantly, the device-receiving upper plate **431** contains a row of vertically-disposed apertures **442** which are aligned horizontally with the blind recesses **33** of the device **31** when inserted into the stepped opening **42**. The number of holes **442** correspond to the number of rows of blind recesses **33** and serve in conjunction with the hereinafter described optical reader to issue "permit-to-read" signals used to perform certain electrical tests among which is one designed to advise the operator that a certain error has occurred.

As is evident by reference to FIG. **15**, after the reader carriage **430** has been rectilinearly displaced into the housing of the apparatus to its initial reading position, release by the operator causes the carriage **430** to immediate return to its original at-rest position without further operator action. This is due to the fact that the carriage **430** is attached to a closed loop cable **450** anchored at **452** and **454** to the spacers **434** and passing around four pulleys **456** as illustrated to an attachment site **458** to a cable attachment bar **460** eccentrically, non-rotatably anchored near the leading end of a piston rod **462**. The closed loop cable assists in reducing or eliminating chatter. The piston rod extends from a dashpot cylinder **464** which is anchored rigidly to the base of the apparatus **85** by use of a bracket **466**. The eccentric cable attachment bar **460** is also secured to one end of an extension spring **468**. The other end of the spring **468** is anchored to the base **85** at pin **470**. Consequently, when the carriage **430**, in its initial reading position, is released by the operator, the spring **468** is substantially extended exerting tension upon the piston rod **462** and urging the closed loop cable **450** in a counterclockwise direction as viewed in FIG. **15**. The force of the spring **468** returns the carrier **430** to its initial at-rest position external of the housing of the apparatus at a substantially uniform rate controlled by the rate of venting of the dashpot cylinder **464**.

The Optical Reader

When the identification device **31** is correctly positioned for initial reading, it is located within the optical transducer reader **480** (see FIGS. **16** and **17**). The reader **480** comprises an inverted U-shaped opening **482** into which the tracks **440** are disposed and through which the carrier **430** reciprocates. The reciprocation of the carrier **430** will correctly interpose the identification device **31** between upper and lower masks **484** and **486**. The masks **484** and **486** have five vertical bores **488** and **490** respectively, each bore **488** being in alignment with one bore **490** and with one blind recess **33** in the device **31**. An additional vertical bore **492** in the upper mask is aligned with a similar bore **494** in the lower mask, and together are successively aligned with each "permit-to-read" bores **442** in the top plate **431** of the carriage **430**. A light source **496** and a reflector **498** are suitably disposed below the bores **490** and **494** causing light to travel through the last-mentioned bores when the lamp **496** is illuminated. If no ball is present in the device **31** between aligned top and bottom bores, the associated photo transistor disposed immediately above the top bore and carried by the board **500** will turn on and provide an increased voltage level to its output lead **502**. When no light is received due to the presence of an opaque ball **27** in the aligned blind recess **33**, a relatively low voltage level is maintained by the associated photo transistor **504**. Encoder Circuit Logic

Thus, in the described manner, as the identification device **31** is displaced from its initial reading position to its at-rest position, the photo transistors scan row-by-row and input voltage levels within the photo transducer block, either high or low. The circuit logic converts the outputs of the photo transducer block into a human readable output at the display panel **52** (FIG. **1**). Timing signals are similarly generated by the photo transistor **506** as light passes through the bores **494** and **492** each time a "permit-to-read" hole **442** is in alignment with the last-mentioned bores.

ENCODER CIRCUIT LOGIC

Specific reference is now made to FIGS. **18** and **18***a* which illustrate the encoder circuit logic **520**. When supply power is initially activated the position solenoid, time delay and ram solenoid are all turned off. The switch SW **1** of the disable circuit **521** is in a position such that the entire circuit is grounded. Capacitor C_1 of the one shot power source **522** has charged to a positive voltage through resistor R_1 with a short time constant.

The operator then depresses a key, 0 through 9, of the keyboard which may be Model SB-033, manufactured by ALCO Electronic Products, Inc., of Laurence, Massachusetts. With this, a single positive going pulse is applied through one line **523** to the diode decoding circuit **524** which turns on the appropriate two of the five SCR's **1–5** of the position latch circuit **525** which energize and latch the coils of the two associated position solenoids **400** which represent the number of the depressed key in two out of five code. The R-C circuits on the gates of the SCR **1–5** prevent "turn-on" due to stray electrical noise.

When the two position SCR's are actuated, a positive-going voltage is deployed through the decoupling diode group, D26–30, and through the current limiting resistor R_5, into the gate of SCR **7**. This turns on SCR **7** which then turns on the time delay circuit **526**.

The time constant of the circuit is controlled by resistor R_3 and capacitor C_2. When capacitor C_2 has charged sufficiently, it turns on SCR **6** through resistor R_4. SCR **6** then supplies voltage to energize the ram solenoid **350**.

The solenoid operates the described mechanical devices which, together with the position solenoid, encodes the identification device with the appropriate code. When the ram solenoid or solenoids **350** have pressed the balls **27** into the blind recesses **33**, it mechanically switches switch SW **1** to momentarily disconnect the common ground **527** from the circuit. This causes all SCR's to turn off and thereby causes all solenoids to return to their relaxed positions.

It is important to note that the cycle will not repeat itself until the initiating key is released and the capacitor C_1 can become recharged.

Finally, when switch SW **1** de-activates the circuit, it also provides a pulse which causes the encode-carrier to advance into position for the next operation by grounding one end of the coil of the escapement solenoid **222**.

Depression of the space bar provides a signal through line **530** also causing the encoder carrier and identification device to advance one position.

Reader Circuit Logic

The output of the transisters **504** and **506** in the optical transducer **507** consists of five information lines **503** bearing the two of five code signals A through E and one timing line **503***a* bearing the so-called "permit-to-read" signal F. See FIG. **19**. The "permit-to-read" signal is conditioned by the delay and shaping circuit 556 to provide a short window pulse. The window pulse is used as a timing signal and will be further explained thereinafter.

The five lines 503 from the transducer 507 are input to a two of five BCD Converter 558.

A row counter 560 counts the number of rows of encoded or information sites which have been read by the optical reader at any given point in time. The row counter 560 outputs a signal to the row checker 562 through the line 563 when its count is the same as the number of rows to be counted.

The converted output information from the BCD converter 558 consists of four signals communicated through lines 565, the four signals bearing the same numeric information as the two of five signals but in BCD (Binary Coded Decimal) format. BCD is useful since most printers, computer terminals, etc., use the BCD format. Therefore, the BCD output can be channelled to a computer 566 and/or a printer 568. The BCD conversion is also useful in determining correct parity of the numeric information. Parity is defined to exist when the two of five code is converted into an acceptable BCD number. The check to determine whether parity exists is made using in the parity generator 570 and the parity checker 572.

The output of the parity generator is significant only at one instant of time for each row of the encoded plate. This time is determined by the window pulse emanating from the delay and shaping circuit 556 and reaching the parity checker 562 through line 564. The parity checker 572 waits until the window pulse occurs and then outputs a signal which depends on the existence of parity in the parity generator 570 at the time the window pulse occurs. Valid parity is indicated by a low voltage output from the generator 570. A high output from the generator 570 indicates that at the indicated instant in time no acceptable parity condition was detected.

If no parity exists at the instant in time when the window pulse occurs, a signal will be sent from the parity checker 572 through the line 567 to the parity fail light 569 providing a visual warning to the operator at window 48. Also, the parity checker disables further output through line 582 to the OR circuit 584 thereby terminating the read cycle.

In the event that the row checker 562 receives a signal from the delay and shaping circuit 556 after having received a signal from the row counter, during the same cycle, the row count light 574 is illuminated, indicating to the operator at window 50 that an error has been made.

Also, when parity exists at the time the window pulse is received, the parity checker 572 outputs a signal to the OR circuit 584 through line 582. The OR circuit transmits the signal to the shift input of the circulating MOS storage shift registers 586. The registers 586 also receive the four BCD signals A'–D'.

When the shift pulse occurs in the registers 586 the BCD information derived from the two of five BCD converter is shifted into storage. After the cumulative number of shift pulses received equals the number of rows to be read on the plate, the storage registers in 586 are fully loaded. At this time, the free-running clock 588 transmits clock pulses through the OR circuit 584 to shift the input of the storage registers 586 causing the information in the registers to serially circulate continuously.

At the time of each circulation, the recirculating output from the last storage stage is also inserted into the BCD to seven-segment converter 590. Thus, the stored rows of information are recirculated as they are output from the registers 586 to the converter 590.

The 7-segment conversion is necessary in order to drive the 7-segment display lights 592, eight of which are presently preferred. However, if more than eight rows of sites on the identification device 31 are used, an equal number of lights 592 could be used. Each display light may comprise a Mosaic Indicator Model MS–6A manufactured by ALCO Electronic Products, Inc., of Laurence, Mass.

The seven outputs of the converter 590 are individually connected in parallel to the corresponding lamp segment, of which there are seven identified by the numerals 593–599, in each of the eight seven-segment display lights 592.

In order to avoid simultaneous display on each light of each numeral represented by the 7-segment data, only one light 592 is grounded at any one point in time. The grounding of the lights 592 is controlled through the grounding circuits 606. The grounding of the lights 592 occurs in sequence corresponding to the sequence of the output of rows of 7-segment converted data issuing from the converter 590.

More specifically, the timer 602, which is clocked by the OR circuit 584, governs the sequential grounding of the lights 592.

The timer 602 generates signals selectively to ground only one light at a time in order, synchronous with the shifting of the storage registers and the output of information from registers 586 to converter 590. If fewer lights 592 are used than the number of encoded two of five information rows, a signal from a selector switch 608 to the timer 602 can be used to sequentially display numerals corresponding to the data in sets.

Optical Transducer

The sensing mechanism which responds to the presence or absence of a ball in alignment with the bores or optical windows 488, 490, 492 and 494 of the optical reader 480 is the optical transducer 507. The optical transducer 507 consists of six photo-sensitive transistors 504 and 506, w, which may be Model LS600 manufactured by Texas Instruments, Inc. In each case, with specific reference to FIG. 20, if a ball is not present to impede the transmission of light, the corresponding photo-sensitive transistor becomes saturated allowing the supply voltage to appear at its emitter output. If a ball is present, the light path is interrupted, causing the corresponding photo-sensitive transistor to assume the off state, in which its emitter output is close to zero volts.

Each emitter output is connected to the input of an integrated inverter 712–717. These inverters output five numerical-bearing signals A–E, corresponding in voltage to the presence or absence of a hole in the five positions of a row of the identification device 31 being read. These information signals are coded into two of five code, in which the numerals from zero to nine can be represented by two and only two balls per row or two and only two high voltage level outputs by the inverters 712–716. The output of the inverter 717 corresponds to holes 442 in the top plate 431 of the reader carrier 430, as previously mentioned. The output of the inverter 717 is, therefore, a "permit-to-read" signal, notifying the remainder of the electronics each time a new row of information becomes aligned with the optical windows in the optical reader 480.

The BCD Converter

The two of five code signals from the optical transducer 507 are input to the coding gates in the two of five BCD converter 558. See FIG. 21. The two of five code is decoded into the numbers 0 through 9. For example, the numeral one is represented by signals A and B from inverters 512 and 513 being at the high voltage level, such as five volts, and the signals C, D, and E from the inverters 714–716 being at the low voltage level, such as approximately 0 volts. The Nor gate 724 responds to the condition of signals C, D, and E simultaneously by switching its output to the high level. This high level is one of the inputs to the Nand gate 726.

In this example, signals A and B, also inputs to Nand gate 726 are also high. Since all inputs to the Nand gate 726 are high simultaneously, its output is low. A low level at the output of the Nand gate 726 indicates that the number encoded in the row in question of the identification device 31 was one. The output of each of the other Nand gates representing numbers 2 through 9 in this particular example will all be high. Thus, the one correct number has been uniquely decoded.

By observation, it should be noted that the sets of Nor and Nand gates represent the various possible combinations of high and low outputs comprising the signals A–E.

The next step in the BCD conversion is to generate BCD signals from the encoded numbers.

The output of the several Nand gates **728–731** form the BCD representation of the decoded number. The output of the Nand gate **528** is considered to represent the numeral 1 when high. A high output from the gates **729–731** represent the numerals 2, 4 and 8, respectively. The weighted outputs of these four gates must be summed to determine the decimal number which they represent. Thus, to form the BCD representation of the number, the output of gate **726** is an input to the gate **728**, since they both represent the number 1. The output of the gate **742** is input to the gate **729**, since both represent the number 2. The output from the gate **744** representing the number 3 must be input to both gates **728** and **729**, since three must be represented in the BCD by the sum of the numerals 2 and 1. The remaining numbers are similarly converted whereby the signals A'–D' are obtained.

Parity Generator

With continued reference to FIG. **21**, it should be noted that parity is said to exist when a number on the identification device **31** is converted to a recognizable BCD number by the BCD converter, or when an uncoded row (one without balls) is detected. The gate **736** has as inputs the outputs of the BCD gates **728–731**, i.e., signals A' to D', or a positive indication of zero from the gate **738** or a signal that a space was decoded from the gate **740**.

If any valid condition is detected by the gate **736**, its output is low. Otherwise, its output is high, indicating that at the instant in time in question (no acceptable condition is being detected by the parity generator **570**. The output of the gate **736** passes to the parity checker **572**.

The Delay and Shaping Circuit

With reference to FIG. **22**, the delay and shaping circuit **556** shapes the "permit-to-read" pulse output F from the gage **717** of the optical transducer **507**. In so doing, a window pulse is generated which is used for timing in the parity checker **572**. The output F from the gate **717** is inverted by gate **742**, and input to the monostable circuit represented by gates **744** and **746**. The monostable circuit responds only to the leading, or positive-going edge of the pulse from the gate **742**. The duration of the pulse from the gate **744** is preferably set to sixteen milliseconds, approximately one-half the duration of a row-read operation. The monostable circuit formed by the gate **748** and **750** preferably generates a 5-microsecond pulse, positioned in time by the leading edge of the pulse from the gate **744**. This short pulse is a window pulse for use in a parity checker circuit **572**.

Parity Checker

With continued reference to FIG. **22**, the purpose of the parity checker **572** is to determine if correct parity exists at the same time that the window pulse from the delay and shaping circuit **556** occurs.

The window pulse from the gate **748** is input to the gate **752** along with the parity signal output from the gate **736** of the parity generator **570**. When the window pulse goes low for its short duration, the output of the gate **752** will go high if parity is then correct. This is the normal in-expected occurrence. This pulse is inverted by gate **754** and input to gate **756**, which merely inverts the pulse again unless the gate is disabled by a previous parity failure.

Parity Failure and Terminate Read

With continued reference to FIG. **22**, the circuitry for turning on the parity fail light and for terminating the read cycle will now be described. This circuitry receives the inverted parity signal from the parity generator **570** and outputs a pulse from gate **758**. This pulse and the pulse output of a gate **752** are normally mutually exclusive. The inverted output of the gate **758** is used to set flip-flop **760**, which disables gate **756** and turns on the parity fail light **762**. In this fashion, the operator is warned of the failure and the pulses from the gate **756**, which load the registers **586**, are disabled terminating the read cycle as far as electronics are concerned.

The OR Circuit

The OR circuit **584** illustrated in detail in FIG. **23** formulates the shift pulse for the circulation storage registers **586**. The OR circuit **584** operates in two modes. During mode 1, the reader carrier holding the identification device **31** is inserted into its initial reading position in the mechanism causing the switch **764** to be open. When this switch is open a high level is introduced to gate **766** through a delay circuit.

Since gate **766** is non-inverting, a high level is input to gate **768**, enabling the passage through the gage of the shift pulse from the gate **756** of the parity checker **572**. Gate **770** also passes the pulse which is input to a level-shifting circuit **772**. The level shift is necessary since in the mentioned example the integrated circuit gates output voltage levels of 5 and 0 volts, while the shift pulse used by the circulating storage registers **586** must have 10 volt and negative 6 volt levels.

During mode 2, when the read operation is completed, the reader carrier with the identification device is fully extended and the switch **764** closes. The switch **764**, therefore, grounds the input to gate **766** and disables gate **768**. However, because of inverter **774**, gate **776** becomes enabled allowing the pulses from the free-running clock **588** to propagate into the level shifter **772**.

Thus, the OR circuit **584** transmits either the pulse generated by the parity and the "permit-to-read" signals (when in the read mode) or the free-running clock pulse (when in the second mode). In both modes, the end result is the generated by level shifter **772** of a signal capable of causing the circulation storage registers **586** to shift.

Circulation Storage Registers

When reference to FIG. **24**, the storage registers **586** operate in the same two modes as does the described OR circuit **584**. The switch-generated output of gate **766** is used to control whether new BCD numbers are allowed to enter the storage register **586** or whether the number just output from the registers is fed back around and reinserted into the registers. Since the function of the circuit is identical for each of the four BCD values, only the 8-weighted path is described. The 8 -weighted value from gate **731** (signal D') is input directly to gate **774**. If switch **764** of the OR circuit is open as in mode **1**, gate **774** is enabled, passing the 8-weighted signal through gates **778** and **780**, the latter being required as an interface element. The 8-weighted signal is then presented to the input of the MOS device **782**. Then, at the next shift pulse from the level shifter **772** to the MOS device **782**, the 8-weighted value is shifted to the next register.

During mode 2, gate **774** becomes disabled. The input signal to the MOS device **782** is then derived by the feedback path from the last stage of the MOS device **782** back into the first state of **782** through gates **776**, **778** and **780**. In mode 2, the data in the MOS devices circulate at a rate determined by the free-running clock.

Row Checker

With reference to FIG. **22**, in mode 1 only the number of rows of blind recesses in the identification device **31** should be read. However, due to electronic malfunctioning and other causes, more than the maximum number of "permit-to-read" pulses from gate **744** may be detected by the row checker **562**.

After the maximum number of rows have been detected, the flip-flop **784** sets, enabling gate **786**. Then, if another pulse from gate **744** is detected, gate **786** goes high. This signal is input to the row count light circuitry to turn on the light.

Row Count Light

The row count light circuit shown in FIG. 22, receives row count error signals from the gate 786 and sets flip-flop 788. The buffered flip-flop output turns on transistor 790, causing the row count lamp to be illuminated.

BCD to 7-segment Generator

With reference to FIG. 25, when mode 2 commences, the BCD numbers which exit the circulation storage registers 586 only to be reinserted are also input to a commercial integrated circuit device 92. For example, device 792 may be Model 930759 BCD to 7-Segment integrated circuit, manufactured by Fairchild. This device generates the required levels to turn "on" the light segments of the 7-segment displays 592. These signals are amplified to a higher voltage, e.g., 20 volts, which is accomplished by pairs of transistor 794.

7-Segment Displays

With continued reference to FIG. 25, the displays 592 are indicator lamps which contain seven lights which can be turned on individually. Any of the decimal digits can be approximated by lighting combinations of the 7-segment lamps. The outputs of the amplifying transistors 794 are connected to all of the corresponding segments of all eight 7-segment displays 592. The segment lamps will turn on, however, only when the ground circuit for the particular indicator housing the segment lamps is activated. The effect is to present the number in the last stage of the circulating storage registers 586 to all of the eight displays, but only to ground a particular display on which the number is to be illuminated.

The shift pulse and the grounding circuits are controlled synchronously by the free-running clock 588. When the next shift pulse occurs, the next number in the registers 586 is presented to the BCD to 7-segment converter 590 and from there to all of the eight displays simultaneously, but only the next indicator is grounded, displaying the number. The numbers, therefore, cycle at the clock rate and the lights are turned on in succession by the same clock. The cycle rate is high, for example, 200 complete cycles per second. Thus, the lamps do not appear to flicker. This technique is a significant cost reduction factor, since only one BCD to 7-Segment Converter 590 is required, instead of eight.

The Free-Running Clock

With reference to FIG. 26, the free-running clock 588 consists of a standard unijunction oscillator circuit 796 followed by a Schmitt trigger 798 to help improve the pulse shape. Preferably, the pulses occur approximately 6,400 times per second. The flip-flop 800 divides the rate in half, outputting a sample wave at 3.2 KHz. The squarewave is input to the monostable circuit 802 which outputs a train of 5-microsecond pulses at the rate of 3.2 KHz.

The Timer

The timer 602 is driven by the clock 588 through the OR circuit 584 and it generates the sequential signals to ground the 7-segment display indicators 592. Its input is the output of the OR circuit 584 issuing from gate 770 prior to the level of shifting. The pulse drives three toggle flip-flops 804 (FIG. 27) which operate as a counter. The eight possible states are decoded by the gates 806 and input through gates 808 to the transistors 810 which actually ground the indicator lamps 592. The timer 602 causes the transistors 810 to saturate in succession at the clock rate.

The Selector Switch

The selector switch 608, illustrated in FIG. 27, is an operator-accessible switch to select the particular numbers to be displayed at the display panel 52. Since only eight indicators are available and more signals may be stored in the circulation registers 586, the operator must chose to display either the first set or the second set of numbers. This is accomplished by the selector switch 608, which enables the gates driving transistors 810 only for the appropriate set of signals.

The Grounding Circuits

As indicated previously, the lamp grounding is accomplished simply by causing the transistors 810 to saturate in succession at the clock rate. In so doing, each transistor when saturated will provide a path to ground for the current in the lamp to which it is connected.

Reset

Since many timing functions within the electronics must operate in synchronism, a reset pulse R_p is required. This pulse occurs when the reader carrier and the identification device are inserted fully into the reader thereby closing the switch SW 765 (FIG. 23). This reset input pulse resets flip-flop elements in the row checker, the row count light circuit, the parity fail light and the timer.

The invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. The present embodiments are, therefore, to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description, and all charges which come within the meaning and range of equivalency of the claims are therefore to be embraced therein.

What is claimed and desired to be secured by the United States Letters Patent is:

1. In an apparatus for encoding a device with information representations comprising:
   a set of encoding structures enabled by electrical signals to move from an initial position to an encoding position and circuitry means comprising power source means, circuit means for controlling the encoding structure and silicon-controlled rectifiers, the rectifiers being interposed in electrical communication between the power source means and the control circuit means to continuously maintain a power supply to the control circuit means over an extended period of time following receipt of one shot of power from a power source means.

2. Apparatus according to claim 1 wherein said set of encoding structures comprises
   means registerable with each member of a row of potential information sites in an identification device;
   means for predetermining which of the registerable means are selected to impress representations upon the device;
   means for actuating the predetermined ones of the registerable means until the representations are impressed upon the device.

3. Apparatus as defined in claim 2 wherein the registerable means comprises a plurality of displaceable impressing pins and wherein said driving means comprises a reciprocable drive train imparting a driving force through only the predetermined ones of the impressing pins.

4. Apparatus according to claim 1 wherein said set of encoding structures comprises
   drive means accommodating reciprocable displacement and, when activated, exerting a driving force;
   means normally spaced out of responsive contact with the drive means and comprising means aligned with respective information-receiving sites of an identification device and operable to insert data indicia within said device at said respective sites; and
   means selectively interposed between and drive means and the spaced means to activate only predetermined ones of the aligned means to impress data indicia in corresponding information-receiving sites only.

5. Apparatus as defined in claim 4 further comprising means for indexing the identification device to bring another set of information-receiving sites into impressing relation with the aligned means.

6. Apparatus as defined in claim 5 wherein said indexing means comprises means for stepping the identification device from set to set without actuation of the driving means.

7. Apparatus as defined in claim 4 further comprising carriage means for receiving the device at an initial location,

means biasing the carriage means toward the initial position and means accommodating displacement of the carriage means against the bias into an encoding location.

8. Apparatus as defined in claim 7 further comprising cable means connecting the carriage means to takeup means and means associated with the takeup means for displaying indicia representing the particular set of information-receiving sites available for being impressed with information.

9. Apparatus for impressing information representations upon an identification device having sets of information-receiving sites comprising:

drive means accommodating reciprocable displacement and, when activated, exerting a driving force;

means normally spaced out of responsive contact with the drive means and comprising means aligned with each one of the set of information-receiving sites;

means selectively interposed between the drive means and the spaced means to activate only predetermined ones of the aligned means to impress representations in corresponding information-receiving sites only;

said drive means comprises an overcenter linkage exerting a generally vertically-directed force and further comprising a ball-receiving chamber situated between the identification device and each aligned means and a spherical ball disposed in the chamber so that when the generally vertical force actuates the predetermined ones of the aligned means, the ball will be impressed into a ball-receiving recess in the device for each of the actuated aligned means.

10. Apparatus as defined in claim 9 further comprising ball supply means for delivering balls to the ball-receiving chamber.

11. Apparatus as defined in claim 10 further comprising agitating means disposed between the ball supply means and the ball-receiving chamber for insuring a continuous supply of balls to the ball-receiving chamber.

12. Apparatus according to claim 1 wherein said set of encoding structures comprises

means for positioning a predetermined number of a plurality of actuating levers into alignment with corresponding impressing pins, the device to be encoded being disposed so that a set of encodable sites is in an encoding position relative to the impressing pins,

means for actuating a ram into engagement with the predetermined actuating levers so that each corresponding impressing pin causes a code indicia to be inserted within the device in the selected ones of the encodable sites; and

means triggering an escapement mechanism for indexing the device so that another set of encodable sites becomes disposed in the encoding position relative to the impressing pins.

13. Apparatus as defined in claim 12 further comprising means for rectilinearly displacing the information device from an initial position into an encoding position and wherein said escapement means comprises (a) means for urging the information device toward its initial position and (b) means accommodating limited incremental displacement of the device toward the initial position upon actuation of the triggering means.

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