April 7, 1970 R. MORRISON 3,504,622

PRINT WHEEL SETTING AND DETENTING MEANS WITH ELECTRICAL CONTROLS THEREFOR

Filed Sept. 13, 1968 3 Sheets-Sheet 1

FIG. 1.

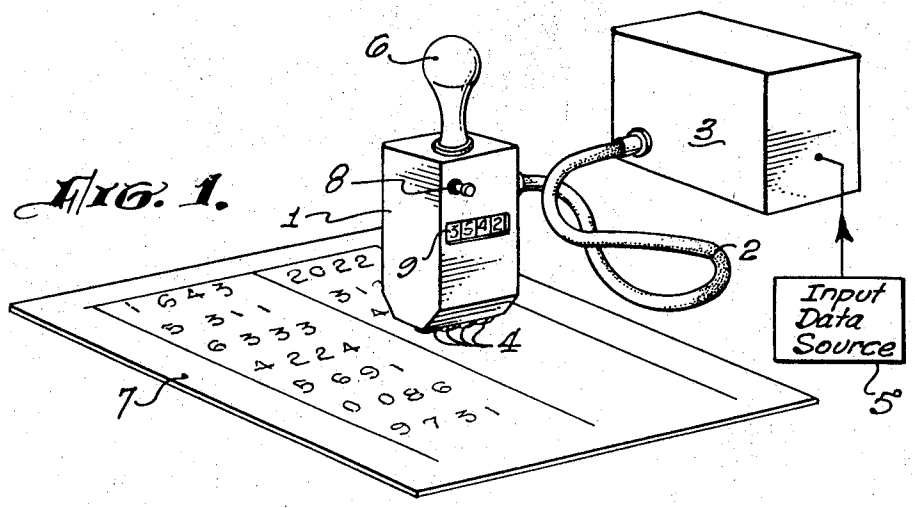
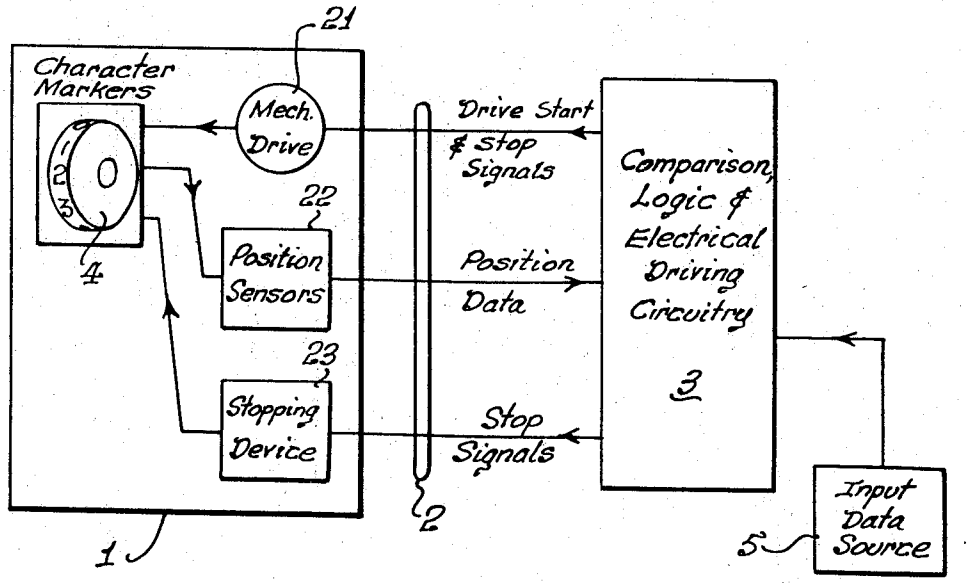


FIG. 2.



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FIG. 3.

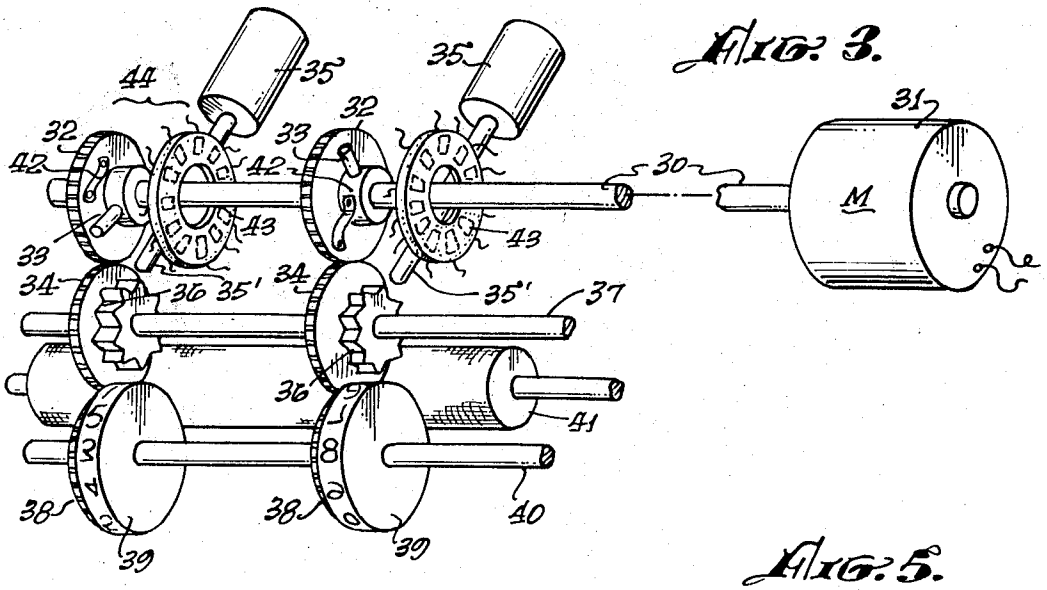


FIG. 5.

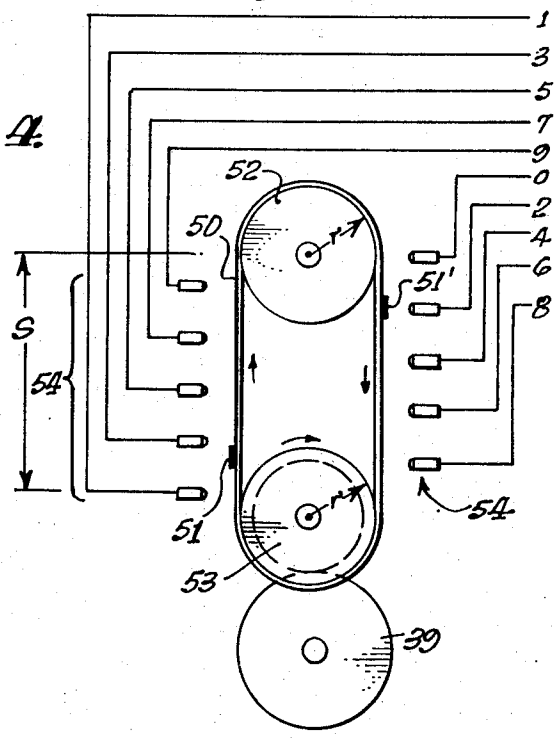
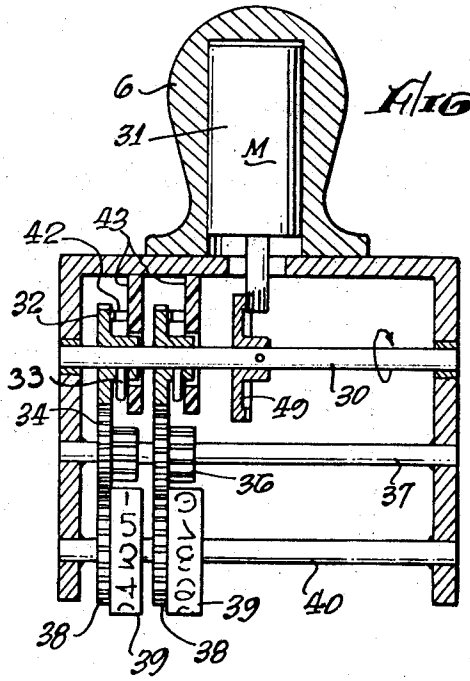


FIG. 4.



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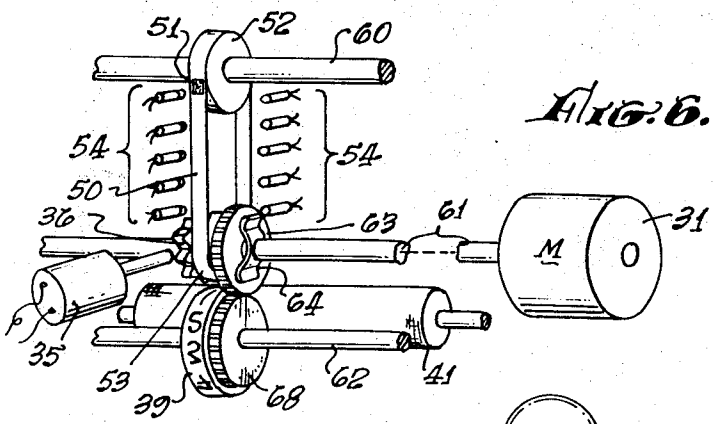


FIG. 6.

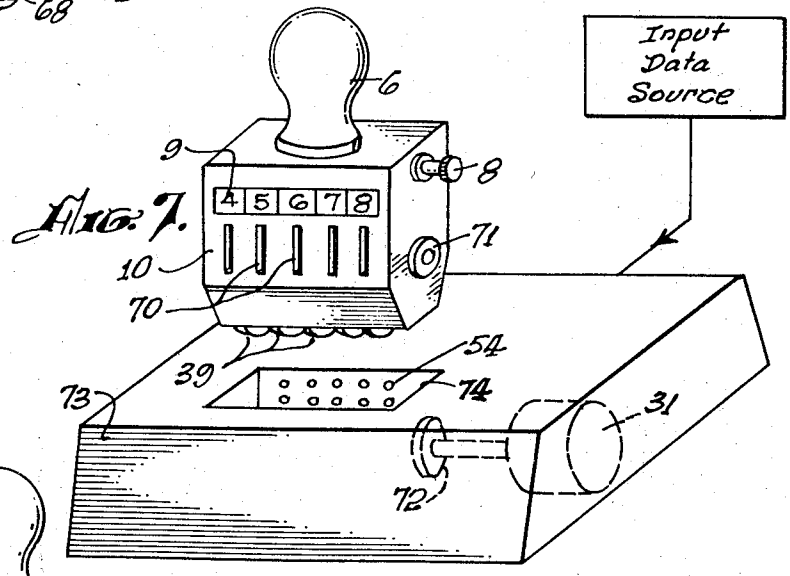


FIG. 7.

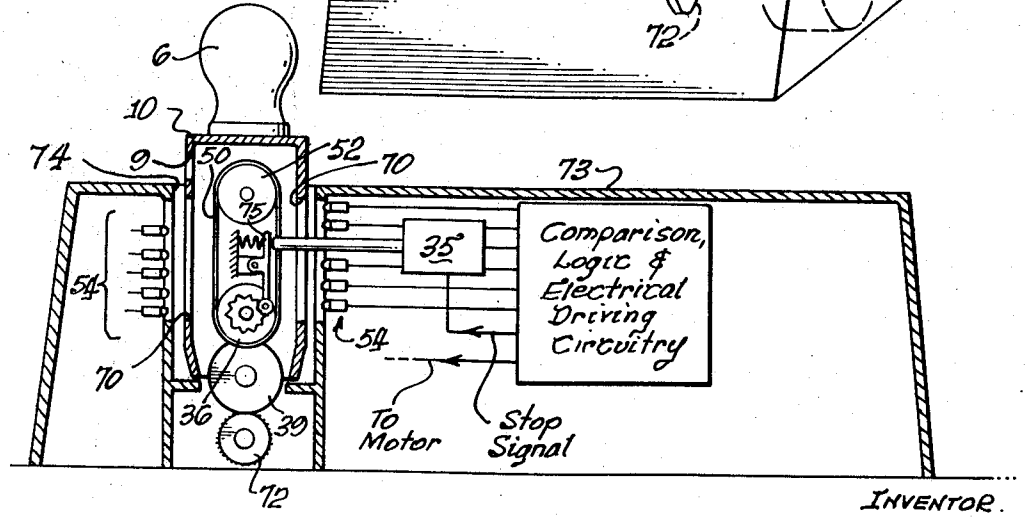


FIG. 8.

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3,504,622

PRINT WHEEL SETTING AND DETENTING MEANS WITH ELECTRICAL CONTROLS THEREFOR

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Int. Cl. B41j
U.S. Cl. 101—99 8 Claims

ABSTRACT OF THE DISCLOSURE

A small hand-held stamp has a series of wheels or belts which carry type for marking numbers or other characters. These are positioned automatically in response to electrical signals, as from a computer. On demand, the stamp sets itself to the desired data. It may then be used manually to mark the data on an ordinary sheet of paper, a printed form, or a manufactured article. In one form, number wheels are rotated quasi-continuously through individual slip clutches. The position of each wheel is sensed, and each is stopped automatically at the correct position as determined by comparison and logic circuitry.

A form is shown in which the hand stamp is connected by a flexible cable to a control box which contains the comparison, logic, and driving circuitry. Another form shown uses no cable; the hand stamp is inserted into a cavity in a control box, where it is automatically set. It is then removed for use.

This invention relates to alphanumeric marking, printing, or stamping devices. In particular, it relates to a portable marking device which may be set or controlled remotely either in space or in time, so that it may be held by hand or other means and used to mark characters on an ordinary sheet of paper, a printed form, an article of manufacture, or other independent, physically separate medium, while the characters that it marks are determined and controlled remotely and automatically by means of a computer, an electronic digital measuring instrument, or other data processing apparatus.

This invention makes it possible, for example, to stamp, mark, or print test data or special identifications on manufactured articles, or to mark calibration, identification. monetary, or business data on an ordinary sheet of paper, a bank pass-book, or on any printed form, under automatic remote control: the operator need only apply the portable marking device to the medium, and it will automatically record the data without any error or further attention. In contrast, conventional automatic marking or printing devices can function only with their own internally-stored paper, in the form of rolls or "Z-Fold" packets of fixed width and nature, and are not at all adaptable to pre-existing papers, forms, pass-books, articles of manufacture, or other special media.

In the drawing:

FIG. 1 is a simplified perspective view of the exterior of one form of the invention;

FIG. 2 is a block schematic diagram of the functioning of the form of the invention of FIG. 1;

FIG. 3 is a partial semi-diagrammatic, partly-exploded view of a portion of the internal mechanism of a form of the invention according to FIG. 1;

FIG. 4 is a partial semi-diagrammatic cross-sectional view of a non-exploded form of FIG. 3;

FIG. 5 is a diagram of a portion of a modification of the invention showing the disposition and relations of a belt and of sensors;

FIG. 6 is a semi-diagrammatic partial perspective view of a mechanism of a modification of the nature of FIG. 5;

FIG. 7 is a simplified perspective view of the exterior of another form of the invention;

FIG. 8 is a simplified, partially-diagrammatic cross-sectional view of the form and modification of FIG. 7.

In FIG. 1, a portable marking device **1** is shown connected by a flexible cable **2** to a control box **3**, which controls the positions of character-marking elements (such as number wheels) **4** in device **1**, in accordance with signals transmitted to box **3** from an external signal source **5**. The portable marking device **1** may be held manually by a handle **6** and used to mark or print such remotely-controlled data on a printed form, sheet of paper, or other external medium **7**. It will be seen that the data recorded on medium **7** is completely independent of any machine requirements as to the dimensions, physical disposition, or properties of medium **7**, so long as it is capable of receiving the mark. It may be a page in a book. The device **1** may also have a visual display window **9** and a manual actuator **8**, such as a push-button. The display **9** will normally display the same data that the marking elements **4** are positioned to mark or print, for the information of the operator. This display **9** may be effected by means of character-bearing wheels, belts, or other such expedients on, or linked to, the elements **4**, or by optical devices.

The actuator or button **8** may be used to command the device **1** to reset itself, via the control box **3**, to the next piece of data that it is desired to mark or print.

FIG. 2 shows a block schematic diagram of the functions of the system of FIG. 1. The block **1** contains the main functional elements required in the portable marking device **1**, and the block **3** the main elements in the box **3** (FIG. 1). The interconnections are indicated generally at **2**, corresponding to the cable **2** of FIG. 1. The portable marking device **1** contains mechanical driving means **21** which drive the character marking elements, such as number wheels, **4**. Driving means **21** may be a motor housed in the device **1**, or may be a remotely-located motor, housed for example in control box **3**, driving the character-marking elements **4** thourgh a flexible shaft. The mechanical drive in either case is quasi-continuous. That is, it is initiated on command, as from the push button **8** (FIG. 1), and continues without further manual control until the character markers **4** have all completed at least one revolution or traverse. The character markers **4** may be driven through individual slip-couplings or clutches off a common shaft, so that any or all may be stopped at different points in their travel, by means to be described presently, and so present the correct combination of type characters to the record medium **7** (FIG. 1).

In FIG. 2, the means to determine where to stop the character markers **4** (of which only one is shown, for simplicity), involve the sensing of the position of each marker **4**. Position sensor **22** does this, and sends position information back to the control box circuitry **3**. The circuitry in box **3**, in turn, determines when each of the marker elements **4** is in the position required to mark the correct data, in known manner, and sends "stop" signals along conductors of the cable **2** back to the marking device **1**. Here, in response, stopping devices **23**, which may be solenoids, stop each marker element **4** at the correct point. It should be noted that this is a parallel process, i.e., the marking elements **4** are rotated simultaneously by the driving means **21**, and each of these elements are stopped by means **23** sometime in the course of, substantially, a single revolution or traverse, so that the whole setting process for all the marking elements takes but a short time, for example ½ second.

Referring now to FIG. 3, there is shown one contemplated embodiment of the internal mechanism of the portable marking device **1** of FIG. 1, shown in a partial per-

spective view, partly exploded. The mechanism required for marking two different characters or digits is shown for simplicity and clarity, although it is understood that in practice a complete marking device **1** may have enough mechanism to print a line of, say, from 6 to 10 characters, by merely repeating the assemblies shown.

In FIG. 3, a shaft **30** is driven quasi-continuously (defined earlier) by a motor or equivalent means **31**. The shaft **30** carries gears **32**, which are mechanically connected to it by slip couplings indicated schematically at **33**, so that the gears **32** normally rotate with shaft **30**, but may be stopped individually by solenoid and detent devices **35**, **35'**, **36**, while the shaft **30** may continue to rotate. These are described below.

Gears **32** engage gears **34** which can rotate freely on a fixed shaft **37**. Fixed to gears **34** are detent wheels **36**. Plungers or the like **35'** of solenoids or other stopping devices **35** may engage the detent wheels **36** so as to stop them (together with gears **32** and **34**, and parts attached thereto), at selected points in their circumferences. Engaging gears **34** are additional gears **38**, which are fixed to number-printing or character wheels or the like **39**, freely rotatable on another fixed shaft **40**. Character wheels **39** may carry raised type, which may be linked by passing against an ink roller **41**.

In operation, motor **31** rotates shaft **30**, and the gear trains **32**, **34**, **38** together with type wheels **39**, until "stop" signals are received from the control box **3** (FIG. 1), whereupon the solenoids or the like **35** are energized and stop the character wheels **39** at the correct points by engaging plungers or the like **35'**. The signal to stop the rotation of each wheel is derived from position sensing information via the control circuitry **3** (FIGS. 1 and 2). The sensing of each wheel position may be performed, for example, by contacts on stationary plates **43**, which are engaged by contact fingers **42** mounted on the rotatable gears **32**. Any suitable type of sensing may be used, such as photoelectric. The contacts or other types of sensors are indicated in dotted lines on the plates **43**, and are connected to wires such as are indicated at **44**, which go into the cable **2** (FIG. 1).

FIG. 4 is a partial cross-sectional view of an assembly according to FIG. 3, illustrating how the components may nest together to form a compact assembly. Here, the motor **31** may be housed inside the handle **6**, and drive shaft **30** through suitable gearing or other means **49**. The remaining components are as in FIG. 3. Contact or sensor plates **43** are located close to the gears **32**, and their large central holes clear the hubs of the gears **32** and the slip clutches or limited-torque couplings **33**. The detent wheels **36**, together with their gears **34**, occupy substantially the same space, along the direction of the shafts, as the assemblies of gears **32** and contact plates **43**, and also substantially the same such space as the character wheels **39** and their gears **38**. The gears **32**, **34**, **38** may be quite thin. In FIG. 4, the solenoids **35** would be in the back of the assembly, and their showing is omitted for clarity.

FIG. 5 is a diagram of a portion of a modification of the invention, in which the position information is obtained by means of an endless belt or the like, with non-contacting sensors, such as photoelectric, capacitive, or inductive sensors of known types. The belt is indicated at **50**, running on pulleys or sprockets indicated at **52**, **53**. One of these is coupled, as by gearing, to a character whetl **39**. The sensors are indicated generally at **54** (in this case there are 10 of them shown), and the sensing points or indices on the circumference of the belt which are sensed are indicated at **51** and **51'**. If the sensors are photoelectric, the sensing points **51**, **51'** may be optically reflective spots or they may be holes; if the sensors are inductive, they may be spots of magnetic material; if the sensors are capacitive, they may be spots of metallic foil or of electrically conductive paint. In this diagram of FIG. 5, the sensors **54** are in two staggered rows, to avoid crowding, and there are two sensing points or spots **51**, **51'**, spaced half the belt's circumference apart. The circumference of the belt is twice the circumference of either pulley or sprocket **52**, **53**. Under these conditions, one or the other spot **51**, **51'** will pass under each of the sensors during a single revolution of the pulleys.

The relationships required to sense explicitly the angular position of pulleys such as **53** are more generally as follows:

Let s be the total length of the row of sensors, as shown in FIG. 5, and L be the total length of belt **50**, and N the number of pulley circumferences that equals the belt length L. Then it is required that

$$s=\frac{L}{N}$$

Also, the number N' of sensing points such as **51**, **51'** must be equal to N. In the particular example illustrated in FIG. 5,

$$N=N'=2$$

and

$$s=\frac{L}{2}=\frac{N\pi r}{2}=\pi r$$

Referring now to FIG. 6, there is shown a preferred construction for a mechanism to realize the functions of FIG. 1 by the general method illustrated in FIG. 5. FIG. 6 is a partial, simplified diagrammatic perspective view, and shows, for clarity, the mechanism associated with only one character wheel. In practice, such mechanism would usually be repeated to provide several characters, such as 6 or 10, as is obvious. Belt **50** and pulleys **52**, **53**, and sensors **54**, are provided similarly to FIG. 5. Pulley **53** is fixed to a detent wheel **36** and also to a gear **63**; and the whole group is carried on a shaft **61**, to which it is rotatably connected by a slip coupling or limited-torque coupling, which may take the form of an arched flat spring element **64**. The center portion of spring **64** is fixed to the shaft **61**, as by soldering or by engaging a flat portion on the shaft. The end portions of spring element **64** bear frictionally on a side portion of gear **63**, and so may drive it in rotation when the shaft **61** is rotated by a motor means **31**. Other suitable kinds of slip coupling, such as ratchet mechanisms, may be employed, consistent with the desired compactness.

Gear **63** drives another gear **68**, which is fixed to a character wheel **39**, both being free to rotate on a fixed shaft **62**. Pulley **52** is free to rotate on another fixed shaft **60**.

The detent wheel **36** is engageable by a stopping device, such as the plunger of a solenoid **35**, similarly to FIG. 3. In operation, the position of index, spot, or sensing point **51** on belt **50** is sensed by sensors **54**; operation is the same as described in connection with FIG. 2. When that sensor in the group **54** is energized which corresponds to the correct character on wheel **39**, the control circuitry energizes the stopping device **35**, and holds the wheel at that point. Simultaneously, the same process will be going on in all the other mechanisms corresponding to the additional characters or digits.

It will be noted that in the embodiments of FIGS. 5 and 6, the sensors are arranged in substantially straight rows outside of the mechanism itself. This fact makes it possible to locate the sensors outside the case of the marking device, which leads to a form of the invention in which the connecting cable **2**, of FIG. 1, can be eliminated, and other elements including the motor means **31** may also be located outside the case. This form of of the invention is illustrated in FIGS. 7 and 8.

FIG. 7 is a simplified exterior perspective view of this other form of the invention. In FIG. 7, a normally stationary housing or box **73**, which may rest on a desk

or a table, contains the sensors **54**, the motor means **31**, and the necessary control circuitry, as well as the stopping devices **35**. In the box **73** is a cavity **74**, into which the hand stamp or marking device **10** may be manually inserted. When it is so inserted, apparatus in the box **73** can automatically set the characters on stamp **10** to the correct readings. Device **10** may then be removed from the cavity **74** and used to mark the characters onto any desired medium. The process may then be repeated.

The visual display **9** on the marking device **10**, FIG. 7, repeats the data which the marking elements **39** are set to mark, for the information and assistance of the operator. This display **9** may be effected by various means known to the art, and detailed showings are omitted for clarity of illustration. One method is to mark characters on the belts **50** (FIG. 6), and to position the viewing window or area appropriately. In the particular arrangement shown in FIGS. 5 and 6, the sequence of characters would be repeated twice around the length of the belts **50**.

In the other form of the invention illustrated in FIGS. 1, 3, and 4, the characters for the visual display **9** may be marked on appropriate movable elements such as gears **32**, or on other elements, or with the auxiliary employment of optical devices.

Referring to FIG. 8 in conjunction with FIG. 7, the marking device **10** may be provided with windows or the like **70**, through which the sensors **54**, located in box **73**, can sense the sensing points on the belts **50**. Operation is the same as in FIGS. 5 and 6, and will not be described again in detail. Device **10** may also be provided with a driven element **71**, such as a disc with a clutch facing, which is connected internally to a shaft such as **61** (FIG. 6). When stamp device **10** is inserted into the cavity **74** in box **73**, element **71** may engage another clutch element connected to motor means **31**, so that the shaft such as **61** is driven from the outside.

Stopping devices such as solenoids **35** may also be located inside the box **73**, as shown in FIG. 8, and protrude through openings in the casing of device **10** to engage detent devices **75** therein, in the manner shown. An inking roller **72** may be provided in the bottom portion of box **73**, which contacts the character wheels **39** when device **10** is inserted into the cavity **74**. As the character wheels **39** are rotated by motor means **31**, the type faces will automatically be inked.

It will be seen that, in this form of the invention, a substantial portion of the list of functional components is relocated from inside the marking device **1** or **10**, to the stationary box such as **73**; and the cable **2** (FIG. 1) is eliminated. The principal functional components required in the device **10**, FIGS. 7 and 8, are slip-coupling means driving character-marking elements, and means connected to these elements which carry movable indicia or sensing points whose positions may be sensed from the outside.

In FIG. 8, the detent mechanism **75** engaging detent wheel **36** is preferably of the normally-locked type, as illustrated. During the rotation of the character wheels and other elements, stopping device **35** would push the top of the detent lever to the left, releasing detent wheel **36** and permitting it to rotate. At the end of the operating cycle, it would release, permitting the spring-loaded detent lever to engage wheel **36** and lock it into place, insuring that the character wheels **39** remain in proper alignment.

Belts such as **50** may be of any suitable type, or they may be chains. A chain could for example be made of non-magnetic material except for one or more links made of iron or the like; these links would constitute the spots or indicia **51** (FIGS. 5 and 6), and could be detected by magnetic or inductive sensors. A preferred type of belt is the kind known as a timing belt, made of an elastomeric material and having internal teeth, which engage teeth (not shown) in the usual manner on pulleys or sprockets such as **52, 53**.

An important feature of the present invention is that the marking devices such as **1, 10** are portable. The term "portable" in this specification is used to mean that the marking device is of size, weight, and nature to be brought to the medium to be marked—as in the case of a hand stamp marking a printed form—in contrast to those prior devices such as typewriters and computer printers, where the medium (such as a roll of paper) is brought to or stored inside the marking device or machine.

I claim:

1. A portable marking device adapted to mark characters on external media, comprising

(a) an upright housing having a handle thereon and adapted to be manually grasped and upper and lower parallel shafts carried by the housing,

(b) marker rotor means including marker rotors carried by the lower shaft in the housing to define and to be rotatable about a lower lateral axis, there being circularly spaced outwardly exposed character markers on said rotors, and

(c) operating means to controllably rotate the marker rotor means including a rotary driver and drive rotors carried by an upper shaft within the housing to define and to be rotatable about an upper lateral axis, the drive rotors connected in drive transmitting relation between the driver and said marker rotors,

(d) said operating means including control means to selectively interrupt the transmission of drive from said drive rotor means to said marker rotor means upon presentation of at least one selected character marker for marking said media, said control means including holding structure extending within the housing and above the level of the marker rotors but outwardly of said drive rotors to selectively interrupt rotation of the drive rotors, said holding structure including solenoids, circularly spaced outwardly facing shoulders carried by the drive rotors, and holding elements linearly movable by said solenoids into and out of selective engagement with said shoulders.

2. The device of claim **1** wherein said driver rotates and said operating means includes slip couplings connected between said driver and said drive rotors and within the housing whereby the driver may continue to rotate while rotation of said drive rotors is interrupted by said holding elements.

3. The device of claim **1** wherein said control means includes sensing means to sense the degree of rotation of said marker rotors, input means to transmit input data corresponding to selected marker presentation to said media, comparison logic circuitry connected to said sensing means and to said input means to receive said input data and responsive thereto to produce control signals, said solenoids being responsive to said control signals to move said elements into drive rotor shoulder engagement when selected markers are presented for marking said media.

4. The device of claim **3** wherein said sensing means include relatively rotatable conductors which are rotatable with said drive rotors.

5. The device of claim **3** wherein said sensing means includes a belt driven in synchronism with drive rotor rotation, elements to be sensed carried by the belt, and an element sensor in sensing proximity to the belt.

6. The device of claim **1** including indicia on said operating means within the housing, said housing having a window through which said indicia is visible, said indicia being movable relative to the window so that indicia moved into full window view corresponds to a marker presented for marking said media.

7. The device of claim **1** including a receptacle having a well into which said housing is downwardly receivable, said receptacle containing said driver and a portion of said control means.

8. The device of claim 1 including an ink roller located to be engaged by said character markers in response to initial rotation of said marker rotor means by said driver.

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U.S. Cl. X.R.

101—59, 95; 346—33, 141