United States Patent [19]

McVey

[11] 3,889,593

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[54] **ELECTRIC-SET NUMBERING WHEEL**

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[73] Assignee: **Addressograph-Multigraph Corporation**, Cleveland, Ohio

[22] Filed: **June 26, 1973**

[21] Appl. No.: **373,821**

[52] **U.S. Cl.** **101/110**; 101/93.21

[51] **Int. Cl.** **B41j 5/00**

[58] **Field of Search** ..... 340/172.5; 101/93 C, 99, 101/110, 45, 93.21; 235/7

[56] **References Cited**

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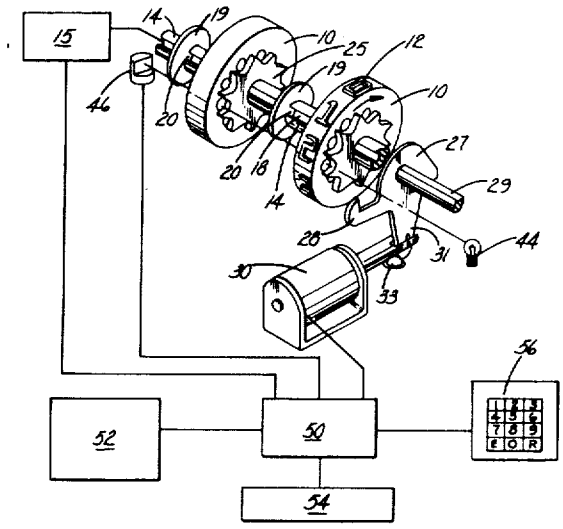
[57] **ABSTRACT**

A set of number wheels for a data recorder are aligned to serve as a variable data source by first establishing all wheels to a zero or home position. A controller provides a program. The controller is polled to determine the wheels in the series which are to remain at zero and these wheels are locked. All other wheels are driven in unison until the indicia thereon are aligned at a first position. The controller is again polled to determine which wheels are to remain at that position and they are locked. The process is repeated step by step until the entire set has been rotated to align a desired indicia series in a print-out or display path.

5 Claims, 6 Drawing Figures



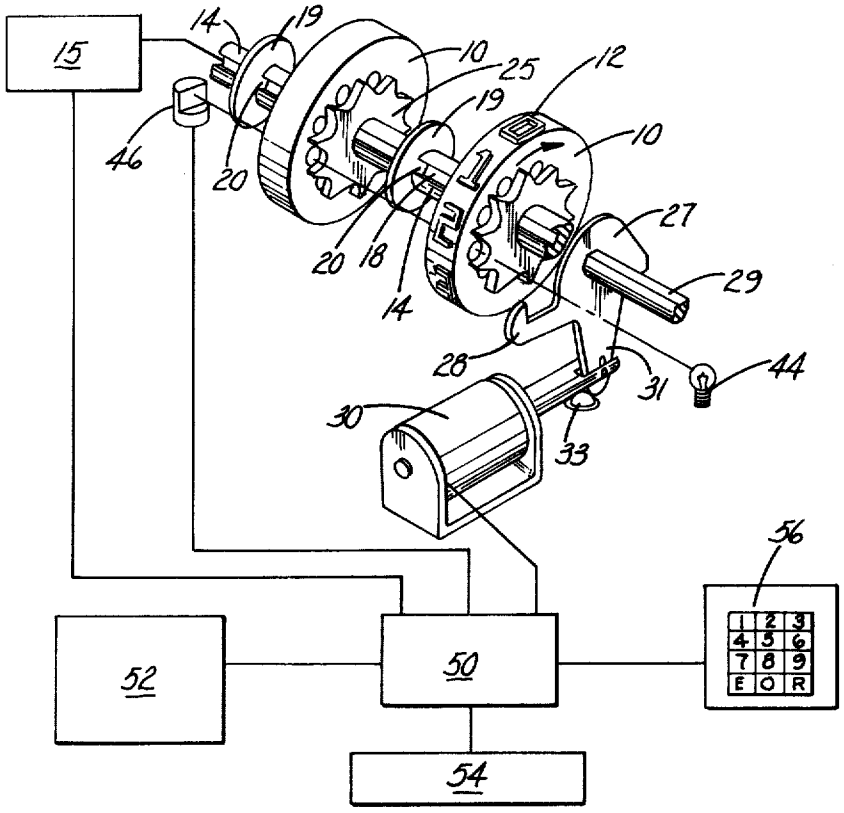


Fig. 1

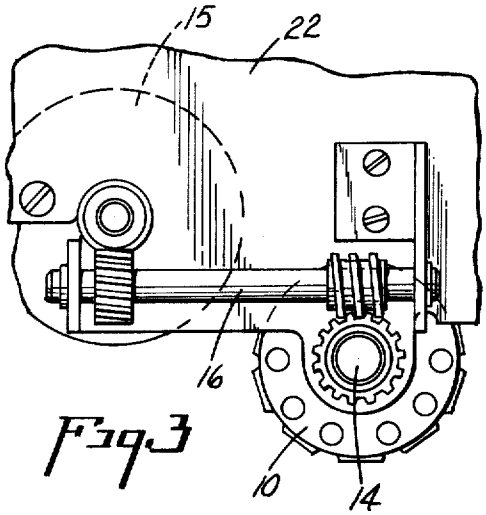


Fig. 3

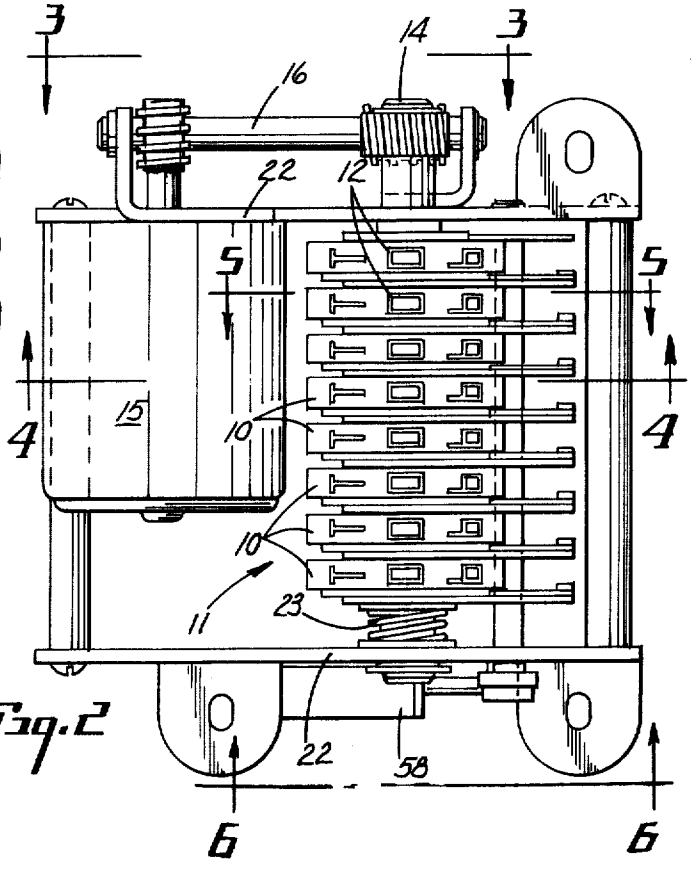


Fig. 2

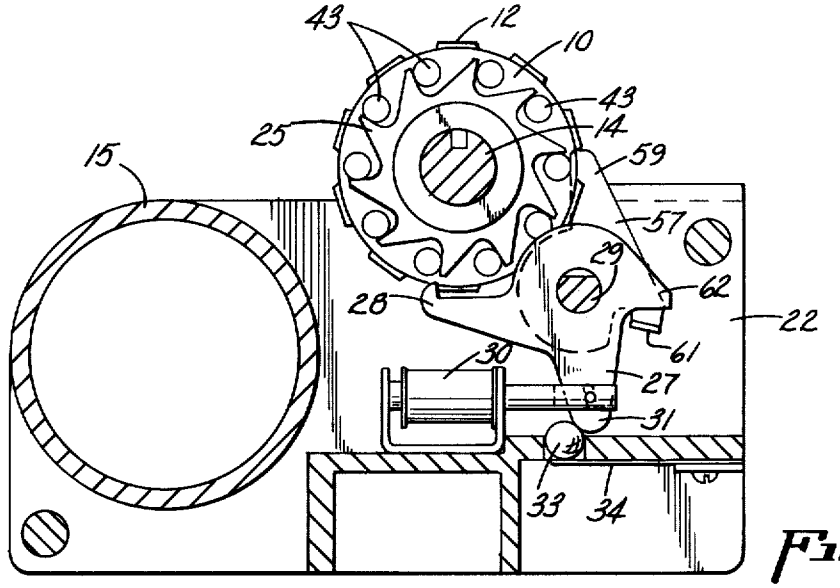


Fig 4

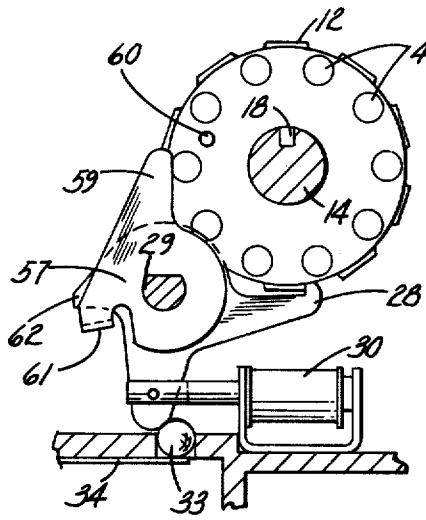


Fig 5

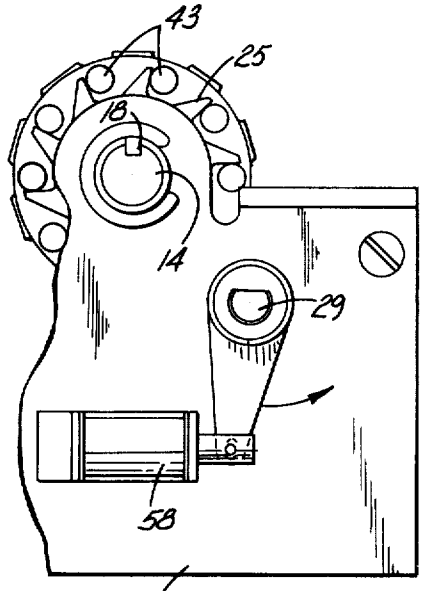


Fig 6

ELECTRIC-SET NUMBERING WHEEL

BACKGROUND OF THE INVENTION

Rotatable wheels with a series of numbers from one through nine and zero are the most common example of settable wheels in common use. The general populace is most frequently aware of such devices in a data recorder, such as used by oil companies to print credit billing. Digital clocks are another example. Industry uses such devices for digital read-out and print out from electronic sources. Cash registers and adding machines are further examples. All can set a series of characters by the concepts of this invention.

In order to bring this teaching within the ambient of more common knowledge, and with the field in which the inventor is most concerned and experienced, this text will be couched in terms of data recorders.

Heretofore the data print wheels of data recorders have generally been hand set. An operator will use a finger or stylus to actually rotate the wheel against the retard action of a detent. A more sophisticated and acceptable form is the oil company data recorder wherein the wheels are coupled to levers which are located on a keyboard. Generally the levers are longitudinally slidable to indicia numbers which indicate that when the lever is set to that indicia number the corresponding wheel in the machine will be in position to present an embossed or raised character to imprint that indicia.

SUMMARY OF THE INVENTION

The objective to be accomplished by this invention is to set up a series of print wheels into a relative rotary relationship to establish selected ones of the peripherally located indicia into a series. The most common indicia will be numbers, but alpha or alpha-numeric indicia may be desired. To simplify this teaching, a number machine is selected as the teaching embodiment. The separate wheels each are selectively rotated to put one of the indicia thereon into a position such that other wheels when likewise selected will align with that number and the entire series of selected numbers will then together be capable of communicating a desired information.

In the context of this teaching, the number series will comprise digits which are raised characters and serve as printing members to imprint a number on a print form. As an example, the numbers are most often used to represent monetary amounts of a credit transaction.

The intent of this invention, therefore, is to establish that number series through electronic control. A drive device attempts to rotate each wheel through one 360° rotation. A lock device intercepts that attempted rotation. The lock device is actuated by the controller, which controller continuously polls the wheel series to determine accurately where that series is at any particular moment in its possible rotary position.

In particular, the object of this invention is to provide a computer controlled electro-set numbering print head.

DESCRIPTION OF THE DRAWINGS

FIG. **1** is an exploded diagrammatic illustration of the construction embodying the principles of this invention;

FIG. **2** is a top plan view of a commercial data recorder numbering wheel set including the electrical-mechanical portions;

FIG. **3** is an end view taken from the line **3—3** of FIG. **2**;

FIG. **4** is an end view taken from the line **4—4** of FIG. **2**;

FIG. **5** is an end view taken from the line **5—5** of FIG. **2**; and

FIG. **6** is an end elevation taken from the line **6—6** of FIG. **2**, with portions broken away.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The physical structure of the preferred embodiment of the invention will be described first, and then the electronic controls and the use of the entire combination.

In FIG. **1**, two numbering wheels each bearing the reference character **10** are illustrated in exploded relationship. An entire set of the wheels is indicated by reference **11** in the FIG. **2**. There is no limit to the number of wheels in a set.

Each wheel **10** is constructed with a peripheral set of indicia **12**. In the context of the preferred embodiment, the indicia are numerals from one through nine and zero as used in the printing of date and variable amounts, such as money transaction.

The wheels **10** are journalled on shaft **14** in order that they may rotate on the shaft independently of shaft drive or rotation. A motor **15** drives the shaft in one direction at a uniform rate when energized. A worm and shaft drive train **16** are illustrated in FIG. **2** as the means to rotate the shaft, whereas the FIG. **1** illustration is diagrammatic.

The shaft **14** has a longitudinal groove. Drive washers **19** are provided with a tongue **20** to cause the washer to interfit with the shaft and rotate when the shaft rotates.

The several wheels **10** are placed on the shaft with individual drive washers between each of the wheels and the shaft loaded between side plates **22** of a machine frame. Then, by means of a spring **23** the entire stack of wheels **10** and drive washers **19** are pressed together toward one of the side plates. This construction provides a slip clutch for each wheel coupling the wheel to receive a drive urge from the shaft, although no wheel is directly connected to the shaft. The drive washers are driven and because of spring pressure from spring **23**, the washers transmit a friction drag drive effect to the wheels.

As thus far described, when the motor **15** is energized, the several wheels will rotate in unison with the shaft and continue to rotate as long as the shaft rotates. This invention provides for the locking of each wheel individually into its selected rotary position by grasping the wheel when it reaches the proper location and holding it there against the force of the clutch.

Each wheel **10** is provided with a ratchet face **25**. There is one tooth for each of the indicia **12** and the teeth are oriented along the face of the wheel such that when it is grasped in a particular lock station, a desired indicia member will be locked in a display path. By display path is meant a location where the indicia is aligned with other indicia for visual or print-out purposes. The tooth related to a particular indicia is not located at that indicia, usually, but at a convenient location where it can be grasped and locked. Nevertheless, the ratchet face is essentially uniform and there-

fore wherever a latch effect is used it may be oriented to stop a particular indicia in the display path.

The means for stopping the wheel in a selected location is illustrated in perspective view in FIG. **1.** It is referred to by numeral **27.** In FIG. **1** the pawl **27** is illustrated with a catch end **28** thereof poised ready to enter into engagement with a tooth on the ratchet face **25** which will hold the zero numeral in the print path. The pawl **27** is shown in FIG. **1** mounted upon a shaft **29.** The mounting is a journal mounting in order that the shaft **29** may serve only as a pivot point for the pawl **27.**

The pawl **27** is driven by a solenoid plunger **30.** Solenoid **30** need operate for only a very short period of time in order to pivot the pawl **27** from the inactive position shown in the drawings to an engaged position. The solenoid is attached to the pawl **27** at a lever end **31** of the pawl. The lever end **31** is a bull nose which is dimensioned to swing through a small arc which embraces the position of a ball detent **33.** A spring **34** urges the ball detent into the path of swing of the end **31** and therefore will tend to hold the pawl catch end **28** in a selected locked or unlocked position once established in that position.

Each wheel has through openings **43** located around the outer edge area of the wheel. There is one opening **43** for each indicia. Again, the location with respect to the indicia is established arbitrarily but each opening bears the same relationship to an indicia in order that location of an opening at an observation station is accompanied by location of an indicia in the display path. A light source **44** on one side of the wheel and a photocell **46** on the opposite side of the wheel will cause each of the openings **43** to act as a position sensing means wherein a gate is used to pass a signal upon arrival of the indicia related to that gate into the series position. Thus, as the openings rotate into alignment, they will allow light to reach the cell **46** to create an electrical impulse which can be observed by a control system for monitoring the position of the wheels.

With each of the several wheels **10** made with identical opening locations, when the entire stack of wheels is placed on the shaft **14** between the side walls **22,** and initially aligned, the light passage will go through the aligned opening just as it would with one. Because of the frictional engagement of the wheels, they will then rotate in unison and maintain the alignment. The light passage is akin to electrical passage which could be accomplished by conductive slugs in a nonconductive material, but light passage is more adaptable for metal wheels. The control system for this invention employs a controller **50** which turns the motor **15** on and off and pulses the solenoid **30** at the proper time.

Because the selection of wheels will not be uniform and most usually not preknown, the means to program the controller is a control system shown as including a computer **52** which may store information and provide data for the controller **50,** a credit card reader **54** and a keyboard **56** may also be included as means to provide information to the controller **50** for establishing the selection of indicia.

With the wheels set to the zero condition shown in FIG. **2,** and the controller **50** provided with information as to what combination is to be established in a series position, the controller **50** causes the light source **44** to pass light through a selected aligned series of the openings **43** to energize the photocell **46.** The controller then establishes which of the wheels is to remain at the zero position and will energize the solenoid **30** associated with those wheels. There is one solenoid for each wheel and therefore each wheel is selectively engaged in its work position by energizing the particular solenoid associated with the wheel.

After consulting the program and energizing the proper solenoids **30,** if any, the controller **50** will then energize the motor **15** to apply the drive force to all of the wheels. Any wheel locked at the zero position will slip and stay in the initial position but all other wheels will begin to rotate in unison. Hence, the openings **43** in any wheel which has not been locked will rotate in unison with one another and the rotating wheel will simultaneously present the second of the series of openings in alignment with the stationary opening of any wheel which has remained stationary. At that moment another passage of light will pass through the aligned openings to the photocell **46.**

At the moment of this second passage of light to the photocell **46,** the controller senses that all of the wheels not locked in the first operation are now positioned with the next in the series of indicia aligned in the display path position. The controller **50** then consults its program source and signals all wheels which are to remain at that location to be locked by signalling the solenoids **30** associated therewith to swing the catch end **28** into engagement with a tooth of the ratchet face **25** associated with that particular wheel.

This process is then repeated until the shaft **14** has made one complete revolution. With each increment of movement, the openings will come into alignment and give a pulse signal to the cell **46** whereupon the controller **50** will each time consult its program source and signal any solenoids **30** which are to lock selected wheels. Hence, in one revolution of the shaft **14,** each wheel in the set will rotate to its proper orientation and be locked in position against the drive of the shaft **14.** At that time the established indicia series may be used to imprint a document or be visually observed for its information.

After having established an indicia series in a display path, it is then necessary to return all of the wheels to the start or zero position before the next operation as described can take place.

To establish the home position, a pawl **57** is keyed to the shaft **29** on the side of a wheel **10** opposite from the location of the pawl **27** associated with that wheel. A solenoid **58** shown only in FIGS. **2** and **6** is used to drive the shaft **29** in a direction which will swing the pawl **57** in the opposite direction of the locking movement of pawl **27.** Such drive movement has no effect upon pawl **27** because the pawl **27** is journalled on the shaft **29.**

Pawl **57** has an abutment end **59.** Each wheel carries a pin **60** on the face of the wheel opposite from the ratchet face **25.** The location of pin **60** is such that whenever the abutment end **59** is moved to the abutement position by solenoid **58** the pin will abut the end **59** and cause the wheel to stop. By location of pin **60** in relationship to the zero position of the wheel, the wheel is caused to stop in the zero or starting position shown in FIG. **2.** The several pawls **57** are driven by solenoid **58** only long enough for shaft **14** to make one full revolution. In that period of time all wheels will have rotated into full engagement with the ends **59.** Pawl **57** carries a hook **61.** Pawl **27** has a driver receiving lever end **62.** Hook **61** bridges across to underlay the lever **62.** The hook and lever are dimensioned such

that rotation of pawl **57** will catch and drive pawl **27** to the disengaged position. In FIG. **4**, pawl **57** has been returned to its inactive position after the wheels have returned to zero, and the pawl **27** has been moved to its detented inactive condition. The system is now ready for another set and operation.

What is claimed is:

1. A number set device for use with a controller in establishing a number series in a data printer, comprising:

at least two number wheels each having a plurality of equal angular spaced indicia in a series about the periphery thereof;

a shaft, with drive means for rotating said shaft, and each wheel journaled on said shaft;

a slip clutch for each wheel coupling said wheel to receive a drive urge from the shaft;

an energy source;

each wheel being an insulator to transmission of energy from said source with restricted areas conductive to energy from said source;

said restricted conductive areas being in an equal angular spaced series corresponding one for one to said indicia series and all wheels being identical in such spacing, whereby all transmission areas are aligned whenever a print indicia of each wheel is in the said number series positions for printing, and one or more of said wheels may rotate while others may be held fixed in position and a new complete transmission series will become aligned regardless of the number of wheels turning or stopped when the drive means rotates said shaft a rotary angle equal to the angular spacing of said conductive restricted areas;

an energy responsive means positioned to be pulsed upon alignment of a set of said restricted areas;

brake means for locking each wheel separately in any one of the number of positions of the indicia alignment;

whereby each alignment of the energy transmission areas will produce a pulse which is counted by said controller, and the brake means for any wheel to be stopped at each rotary pulse position is set by said controller to lock the selected indicia in said print alignment.

2. A number set device as defined in claim **1**, wherein said restricted areas are light transmission openings, the energy source is a radiant generator, and the responsive means is a sensor.

3. The device of claim **2**, wherein said responsive means is a photocell and the radiant generator produces a light beam.

4. The number set device of claim **1**, wherein each wheel is journaled on said shaft and has a tooth on the side face thereof for each indicia position;

the brake means is a pawl to lock into a tooth for holding the wheel against rotation as the shaft continues to rotate;

and a reset system for each wheel comprising an abutment on a side face of each wheel at the identical relative position for each wheel, and an abutment pawl for each wheel all swingable into abutment position simultaneously as the brake pawls are all swung out of holding engagement simultaneously.

5. A number set device for use with a controller in establishing a number series and thereafter resetting to a neutral starting position, comprising:

at least two number wheels each having a plurality of indicia in a series about the periphery thereof;

a first shaft, with drive means for rotating said shaft, and each wheel journaled on said shaft;

* * * * *

UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 3,889,593

DATED : June 17, 1975

INVENTOR(S) : Charles W. McVey

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 6, after line 35, the following should be added:

a slip clutch for each wheel coupling said wheel to receive a drive urge from the shaft;

a series of teeth carried on a side surface of each wheel, one for each indicia;

a lock pawl for each wheel, a support shaft extending parallel said first shaft adjacent said wheels, said lock pawls journaled on said support shaft and having a hook end swingable between a tooth latching condition and a release condition, a solenoid drive means for each lock pawl to swing said pawl thereof into said latching condition, and an over-center holding means for holding the latched condition thereafter;

a reset pawl for each wheel, said reset pawl keyed to said support shaft, each wheel having a side surface in the same relative position representing said neutral starting condition, said reset pawls having a stop end swingable between an abutment position with said abutment surfaces, and a release position, a solenoid drive for rotating said shaft and the reset pawl thereon in unison to a selected position, said side abutment surface being related to a home or neutral starting position; said reset pawls and lock pawls having interference engaging surface means for swinging all said lock pawls to said release condition in unison as the reset pawls swing to said abutment position; and

means for actuating said lock pawls in a random sequence to catch and position each wheel in a predetermined rotary position, and thereafter activating said solenoid drive of the reset pawls to allow all said wheels to return to said neutral starting position.

Signed and Sealed this

seventh Day of *October 1975*

[SEAL]

Attest:

RUTH C. MASON
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents and Trademarks