Sept. 24, 1968 J. GOLDMAN ET AL 3,402,490

STORAGE DISPLAY SYSTEM

Filed Dec. 22, 1966 2 Sheets-Sheet 1

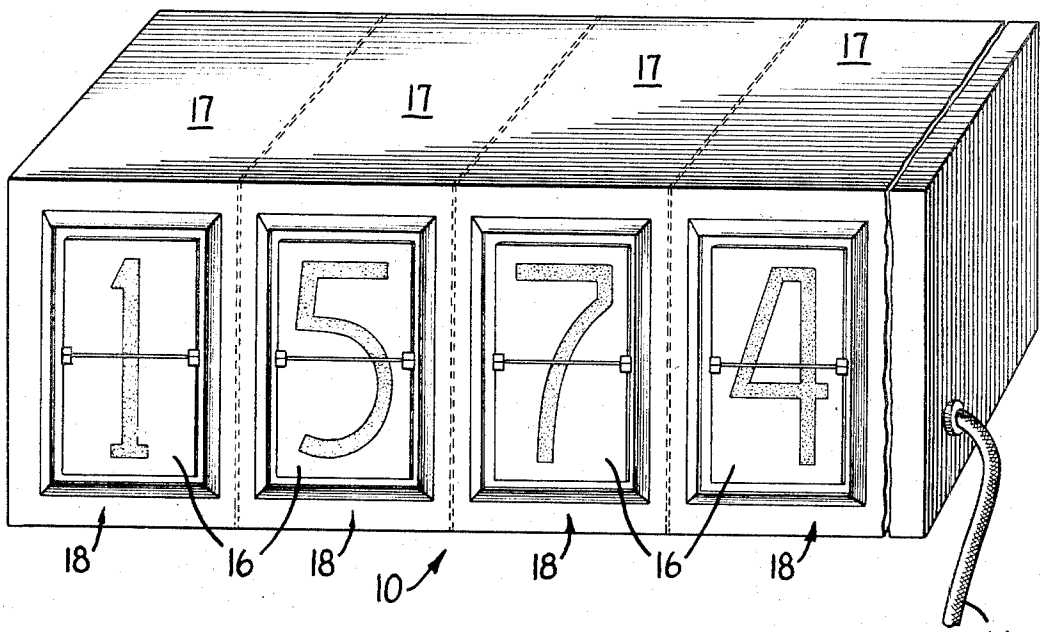
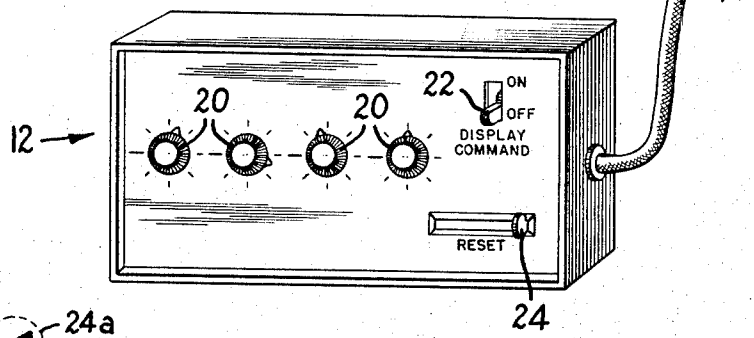


FIG. 1



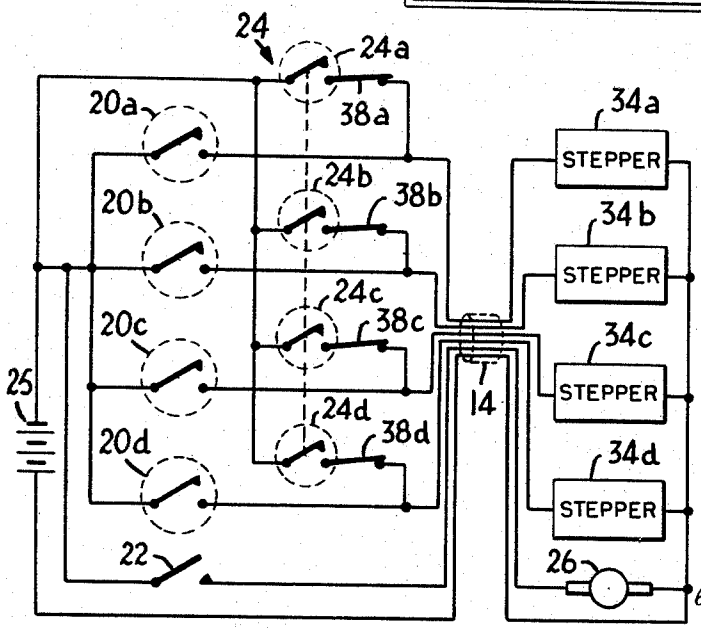


FIG.3

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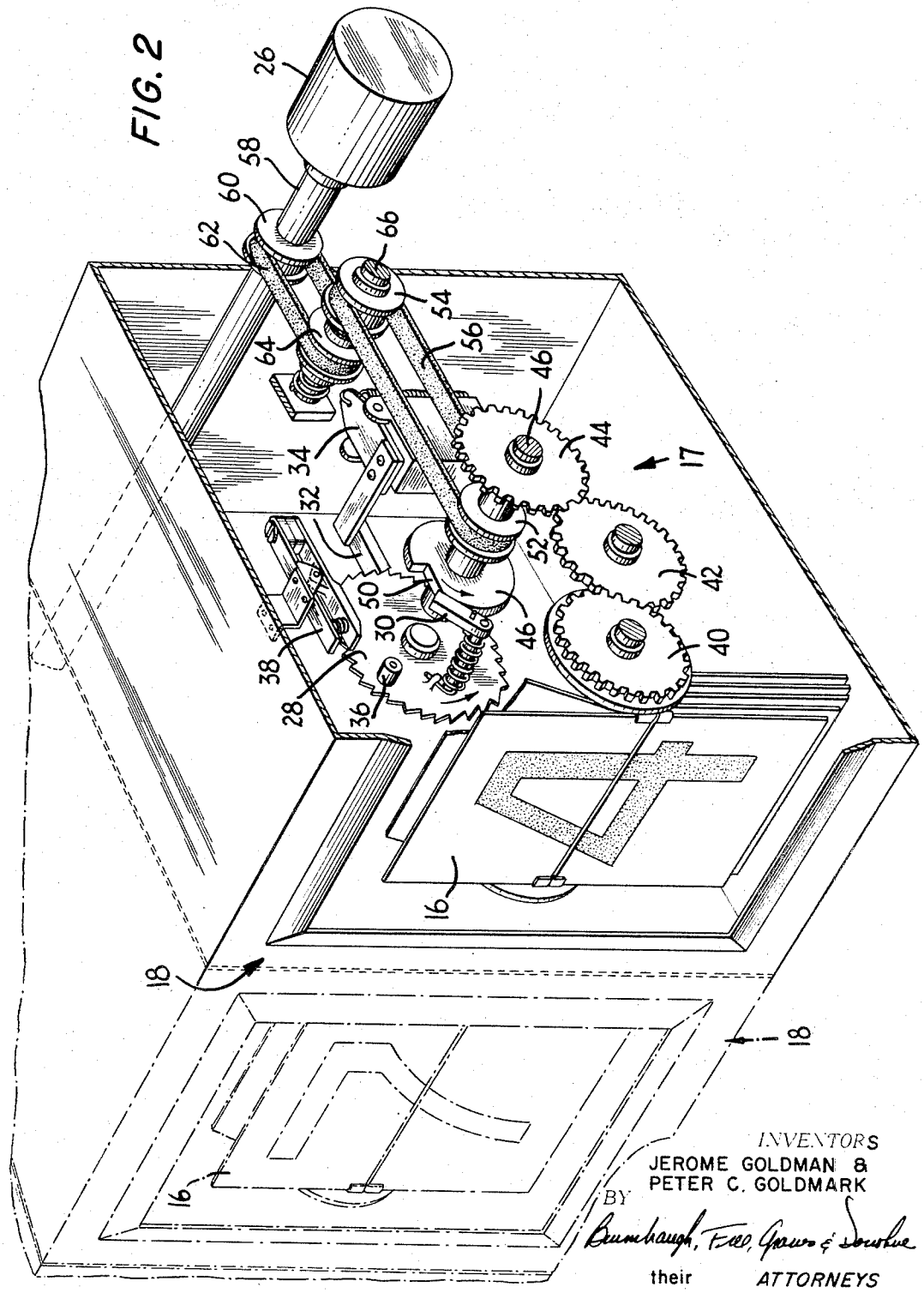
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Filed Dec. 22, 1966 2 Sheets-Sheet 2

FIG. 2



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United States Patent Office 3,402,490
Patented Sept. 24, 1968

3,402,490

STORAGE DISPLAY SYSTEM

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Filed Dec. 22, 1966, Ser. No. 603,812
11 Claims. (Cl. 40—35)

ABSTRACT OF THE DISCLOSURE

Apparatus which upon command displays preset multicharacter information by the rotation of indicia bearing elements, one for each character, to angular positions such that a preselected indicium on each of the elements is viewed through a viewing frame. Means for stopping the rotation of each of the indicia bearing elements, at preselected angular positions, are set prior to the occurrence of the display command.

This invention relates to storage and display apparatus. More particularly it relates to means for displaying multicharacter numerals, words or other information which may be readily preset to any desired combination of characters and actuated to display the preset combination upon the occurrence of a command signal.

Visual displays of numerical data and the like are used in many applications and various forms thereof have been devised. One well-known usage of such apparatus is in posting of results such as election returns, game scores, stock quotations, etc. on a board or panel for public viewing. To be effective the individual numeric or alphabetic characters of the display must be capable of being changed rapidly at will to form the desired combination and it must be possible to effect the changing of the characters from a remote point so as not to obscure display. Furthermore, to minimize confusion of the viewer, it is desirable to change all of the characters representing a given piece of information (and also, perhaps, all of the characters upon the entire information board) simultaneously and rapidly. Preferably, such control of the display should be possible from a remote point and entail a minimum of operator effort.

A successful form of such a remote control display system, used in a variety of applications, is disclosed in U.S. Patent No. 3,192,656 to John W. Christensen, assigned to the persent assignee. The individual digits of the display illustrated therein are capable of being changed rapidly at will to form the desired combination and the changing of digits may be effected from a remote point. Furthermore, the system of the aforementioned patent permits the simultaneous change of all digits in the display. The patented arrangement includes a motor and two rotary switches for each digit and the new information for determining the desired combination that is to be formed upon the simultaneous changing of the digits is programmed into the system by setting dials on a control panel. Upon application of power all of the motors of the individual display units are actuated in accordance with the programming to display the wanted combination of characters.

The primary object of the present invention is to provide an improved form of multicharacter display apparatus having simpler automatic means for presetting and effecting a simultaneous change of the characters in the display to form any desired combination.

Another object of the present invention is to provide such display apparatus which may be remotely controlled with a high degree of flexibility.

Briefly, a favored embodiment of the storage display system of the present invention comprises a plurality of

storage display units, one for each character, connected by suitable cable means to a remote, common control means. The latter includes a pulse source, such as of the telephone dial type, for each display unit, a source of reset pulses and a command signal source.

Each of the display units includes a rotatable shaft mechanically coupled to an indicia bearing element such that the angular position of the shaft determines which indicium is displayed through a viewing frame. Mounted on the shaft for rotation therewith is a circular interference cam with a detent in the form of a stop shoulder notched in its circumference. Information as to the next character to be displayed is preset or stored in each unit by positioning a means for stopping the shaft at a preselected angular position correpsonding to the particular indicium to be displayed. The stopping means comprises a rotatable disc carrying a stop member for engagement with the stop shoulder when the shaft has rotated to the angular position determined by the position of the disc. A stepping means responsive to pulses from the remote control means rotates the disc to an angular position related to the preselected angular position of the shaft coupled to the indicia bearing elements.

Each display unit is thus preset and all are changed to display the new indicia by a single motor coupled by slip clutch means to all of the individual shafts. The motor is actuated by a command signal from the control means. After the new display is set, and the motor stopped, all of the stepping means are pulsed to return the associated discs to reference positions to await new selections, without disturbing the then set display.

The foregoing and other objects, features, and advantages of the present invention will become more readily apparent from the following detailed description thereof, when taken in conjunction with the accompanying drawings in which:

FIGURE 1 illustrates a storage display system embodying the present invention;

FIGURE 2 illustrates a typical storage display unit for use in the system of FIGURE 1; and

FIGURE 3 is a circuit diagram for a four character display in accordance with the invention.

Referring to FIGURE 1, there is shown for purposes of example a multi-channel display **10** such as may be incorporated in a larger display board. A remote control console **12** is coupled to the display by means of a multiconductor cable **14**. Each of the display units **17** includes indicia bearing elements **16** such as of the book flap type disclosed in the aforementioned patent which is visible through a viewing frame **18**.

The control console **12** includes a control panel having a plurality of selector means **20** for presetting or programming information into each storage display unit **17**, a display command control **22** and a reset switch **24**. Each of the selector means **20** provides upon actuation a predetermined number of electrical pulses corresponding to the particular character to be preset and may, for example, be in the form of a conventional telephone dial. The reset switch **24** operates a pulse source of any convenient type which produces upon each actuation a number of pulses at least sufficient to reset each display unit to a reference position. Thus if each display unit included the digits 0 to 9, the reset pulse source would produce enough pulses when actuated to return each unit to the "Zero" position.

The pulses representing the information to be stored and the reset pulses are transmitted from the selector means **20** and the reset source, respectively, to each storage display unit through suitable conductors in the cable **14**. The display command signal is also transmitted through a conductor in the cable **14** to an electric motor **26** in the display **10** (see FIGURE 2). As will be de-

scribed in detail hereinafter the motor **26** is mechanically coupled to each of the display units **17** and, upon actuation simultaneously changes all of the individual displays in accordance with the preset information.

In FIGURE 2 there is shown the construction of one of the display units **17**, with the supporting frame, shaft supports, etc. eliminated to simplify the illustration. It will be understood that the elements shown therein will be mounted on a suitable base which carries appropriate bearings and supports for the various rotating elements.

Each storage display unit **17** comprises a serrated edge disc **28**, such as a ratchet wheel, upon which is mounted a spring loaded member **30**. The member **30** is supported at the end of a pin extending axially from the disc **28** and spring biased in a clockwise direction.

The disc **28** is mounted on a suitable shaft and rotated in step fashion by means of a pawl **32** driven by a solenoid **34**. The latter receives the pulses from the control console and moves the pawl **32** up and down to rotate the disc **28** in incremental fashion in the counter-clockwise direction.

The disc **28** also includes a pin **36** on its flat surface which cooperates with a switch **38** to effect the reset function, as will be described in detail hereinafter. The switch **38** is so arranged that when the disc **28** is stepped around, the pin **36** will be moved to a point at which it opens the switch **38**. This in turn will cause the stepping solenoid or motor **34** to stop.

The split flap indicia elements **16** illustrated are of the type shown in the aforementioned patent and are mounted about a shaft coupled for rotation with the gear **40**. The latter is coupled through idler gear **42** to a drive pinion **44** fixed to the shaft **46**. Thus, on rotation of the latter, a change in the indicia being displayed can be effected.

Also mounted on the shaft **46** for rotation therewith is an interference cam **48** having a notch **50** in its periphery to engage the member **30**. The shaft **46** as well as gear **44** and interference cam **48** are driven in the counter-clockwise direction by means of pulleys **52** and **54** and belt **56**.

Drive power for the pulley **54** is obtained from the motor **26** by means of shaft **58**, pulley **60**, belt **62**, pulley **64**, and shaft **66**. The pulley **54** is mounted on shaft **66** by means of a slip-clutch so that it will not be rotated by the shaft **66** upon application of a holding force to any of the members coupled to it.

As indicated in FIGURE 2 the shaft **58** extends the entire length of the display and is mechanically coupled by corresponding pulleys **60** and belts **62** to each of the individual display units. Thus, upon application of power to the motor **26**, the shaft **66** of each of the units is caused to rotate in the counter-clockwise direction.

For ease of illustration, the wiring of the stepping solenoid **34**, sensing switch **38**, and the motor **26** were not shown in FIGURE 2. A suitable circuit arrangement for the four character display illustrated is shown in FIGURE 3, wherein like elements in the several units are distinguished by the letters *a* through *d* respectively. An appropriate power source **25** provides power for each of the stepping solenoids **34***a* through *d* in the display units and the drive motor **26** over conductors in the cable **20**. The switch **22** completes the power circuit to the motor **26** when closed.

Each of the stepping solenoids **34***a* through *d* is coupled to the power supply by means of respective selector means **20***a* through **20***d*. As indicated above the selectors may be of any form that provides a pulse output, such as a telephone dialing arrangement, wherein the number of pulses is related to the desired character to be displayed. Thus, each of the selector means **20***a* through **20***d* may be individually actuated to operate its associated stepping solenoid.

The reset arrangement includes a pulsing circuit **24** including separate pulsing elements **24***a* through **24***d* for each of the stepping solenoids. Each of these may, for example, be in the form of a spring loaded switch which makes and breaks a predetermined number of times for each actuation. In series with each such reset pulser is the sensing switch **38**. As will be described hereinafter, when the disc **28** is stepped so that the pin **36** reaches a predetermined reference position, the switch **38** is opened to stop further actuation of the stepper from the reset source.

In operation, each of the display units is preset or programmed by actuation of the associated selector means **20** in accordance with the desired digit to be displayed. Actuation of each selector means energizes its associated stepper **34** a predetermined number of times to rotate the ratchet disc **28** to a predetermined angular position. The member **30** is likewise moved to a preselected orientation, the spring biasing retaining it in contact with the peripheral edge of the interference cam **48**.

When all of the individual display units in the particular bank have thus been preset or programmed, the operator presses the command or set switch **22** to operate the motor **26**. The latter, through the pulley and belt arrangements described in connection with FIGURE 2, rotates the shaft **46** until the stop or detent **50** on the interference cam **48** engages the end of the member **30**. The resistance thereby afforded to further rotation of the shaft **46** causes the pulley **54** to slip with respect to the shaft **66** without interfering with the operation of the motor **26**. The latter may be arranged to rotate for a predetermined time or number of revolutions so as to assure that each of the shafts **46** in the display units will make at least one revolution.

Revolution of the shaft **46** also rotates the split flap display through the gear train to present an indicium corresponding to the present position of the ratchet wheel **28**. Actuation of the motor **26** therefore results in a change of all of the display units essentially simultaneously in response to actuation of the switch **22**.

Once the new characters are displayed, the operator actuates the reset switch **24** to make available a predetermined number of stepping pulses at each of the stepping solenoids **34**. The number of pulses is sufficient to insure that in each unit the ratchet wheel **28** is rotated counterclockwise until the pin **36** opens its respective sensing switch **38**. This establishes the reference position for each display unit without interfering with the existing display.

Once the reset has been accomplished, the operator may then proceed to program or preset each of the display units to present a new character upon the next command. This also is accomplished without affecting the existing display.

It can be seen from the foregoing that the invention provides a simple, reliable construction for providing a multi-character display. The apparatus may be readily controlled to simultaneously change all of the characters to present a preset or programmed indication. The new information to be displayed may be preset into the apparatus while the previously set information is still available to view. Thereafter, the new display may be effected simply by pressing a button.

It will be apparent that many modifications and variations of the foregoing structure may be effected by those skilled in the art, without departing from the spirit of the invention. For example, any form of incremental motor drive may be used to actuate the preset mechanism, in place of the solenoid stepper illustrated. Similarly, a drum or other type of display may be used in place of the split flap type shown and many variations of the mechanical and electrical arrangements will be obvious to those skilled in the art. Accordingly, it is desired that the invention be limited only by the scope of the appended claims.

We claim:

1. Display apparatus comprising a plurality of individual display units, each of said units including mov-

able means bearing a plurality of indicia for selective display, means including a selectively positionable stop means in each of said units for storing information representative of an indicium to be displayed, a different position of said stop means corresponding to each of said indicia, cam means adapted to engage said stop means coupled to each of said indicia bearing means for movement therewith, and means coupled to all of said display units and responsive to an activating stimulus to move each of said cam means into engagement with said stop means, thereby causing said respective indica bearing means to display the selected indicia corresponding to the stored information.

2. Display apparatus according to claim 1 wherein said indicia bearing means and said cam means are rotatable and said means to move said cam means comprises an electric motor having a shaft coupled to all of said cam means, whereby all of said cam means are simultaneously rotatable.

3. Display apparatus according to claim 2 wherein the coupling between said shaft and each of said cam means comprises slip means, whereby continued operation of said motor after engagement of a cam means with its associated stop means will not result in further rotation of said cam means.

4. Display apparatus according to claim 1 further comprising control means operable from a remote point for selectively positioning each of said stop means at any one of a plurality of predetermined positions.

5. Display apparatus according to claim 4 further comprising reset means operable from said remote points for positioning all of said stop means to corresponding reference positions.

6. Display apparatus according to claim 5 wherein the activating stimulus for said means to move said cam means is supplied from said remote point.

7. A single character display unit suitable for use in a multicharacter display comprising, a rotatable indicia bearing element for selectively displaying any one of a plurality of indicia, cam means having a detent portion coupled to said indicia bearing element for rotation therewith, a rotatable disc carrying a stop member for movement along a circular path intersecting the path of the detent portion on said cam means, means for rotating said disc to position said stop member at one of a plurality of points along its circular path representing a selected indicium, and means to rotate said cam means to bring said stop member and detent portion into engagement, whereby said indicia bearing element is also rotated and said selected indicium is displayed.

8. A display unit according to claim 7 wherein said disc is notched along its circumference and said means for rotating said disc includes electromechanical means having an armature and responsive to pulses of electrical energy to move said armature into engagement with successive notches on said disc thereby to rotate said disc to an angular position dependent upon the number of pulses applied to said electromechanical means.

9. A display unit according to claim 8 wherein said disc and said cam means are rotatable about the same axis and said stop member comprises a pin extending axially from said disc toward said cam means, and an arm rotatably mounted at the free end of said pin and spring biased to rotate about said pin in a direction opposite to said disc, said arm riding on the peripheral edge of said cam means.

10. A display unit according to claim 9 wherein said means to rotate said cam means comprises an electric motor and slip means coupling said motor to said cam means, whereby said cam means stops rotating upon engagement of said detent portion with the stop member while said motor continues to rotate.

11. A display unit according to claim 8 further comprising sensing switch means, and pin means mounted to said disc for movement along a circular path such that said pin means contacts and opens said sensing switch means at a point on said circular path, said point establishing a reset reference position for said disc, whereby said pulses driving said electromechanical means are interrupted and said disc rotation ceases when said disc has rotated to said reference position.

References Cited

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3,142,054	7/1954	Burri.	
3,192,656	7/1965	Christensen	40—72 XR
3,212,395	10/1965	Bailey	40—35 XR

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U.S. DEPARTMENT OF COMMERCE

PATENT OFFICE

Washington, D.C. 20231

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,402,490 September 24, 1968

Jerome Goldman et al.

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

In the heading to the printed specification, lines 3 to 5, "Noah's Lane, Norwalk, Conn. 06851, and Peter C. Goldmark, Rockrimmon Road, Stamford, Conn. 06903" should read -- Norwalk, Conn., and Peter C. Goldmark, Stamford, Conn., assignors to Columbia Broadcasting System, Inc., New York, N. Y., a corporation of New York --.

Signed and sealed this 3rd day of March 1970.

(SEAL)
Attest:

Edward M. Fletcher, Jr.
Attesting Officer

WILLIAM E. SCHUYLER, JR.
Commissioner of Patents