Sept. 28, 1937. M. L. HASELTON 2,094,122

INDICATOR

Original Filed Jan. 27, 1930 2 Sheets-Sheet 1

Fig. 1.

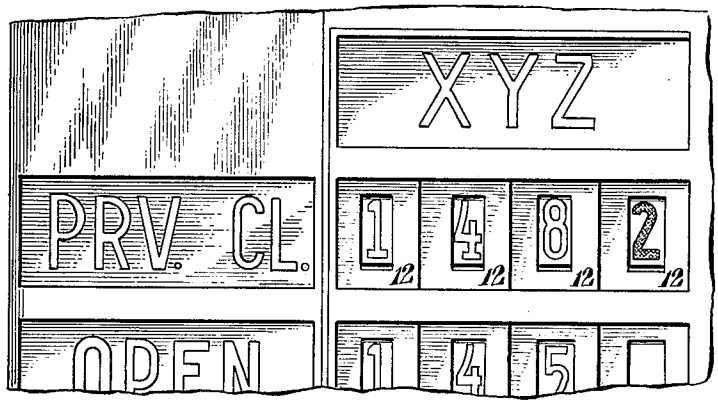


Fig. 2.

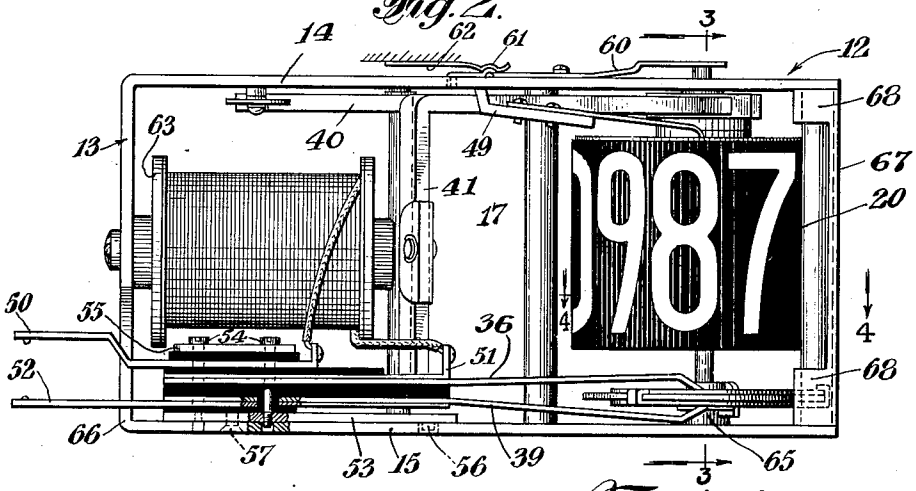


Fig. 3.

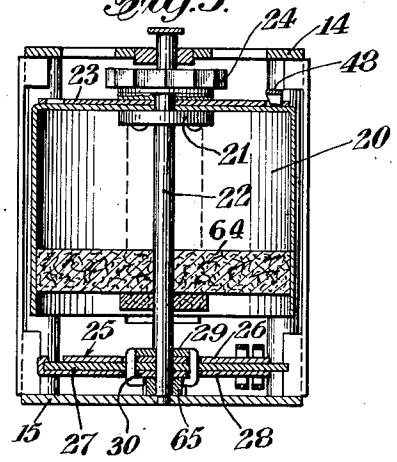
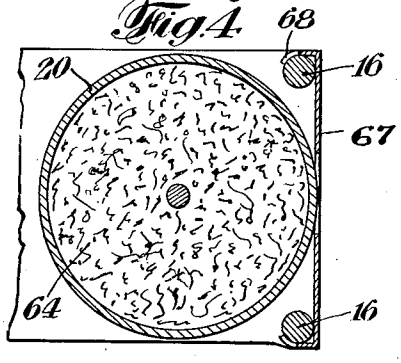


Fig. 4.



INVENTOR
Merton L. Haselton
BY
Ward, Crosby & Neaf
ATTORNEYS

Sept. 28, 1937. M. L. HASELTON 2,094,122

INDICATOR

Original Filed Jan. 27, 1930 2 Sheets-Sheet 2

Fig. 5.

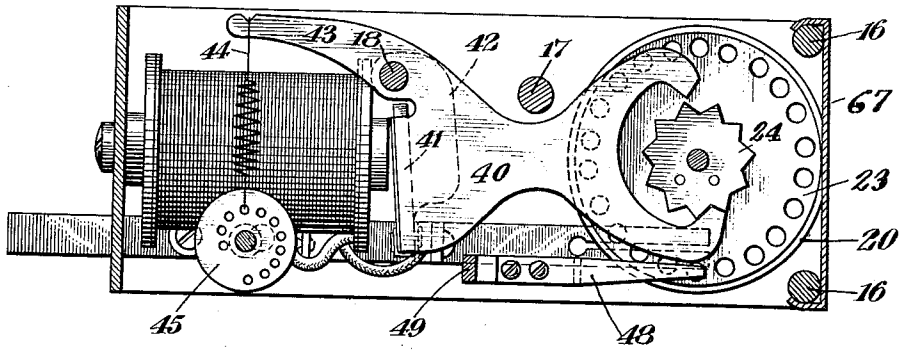


Fig. 6.

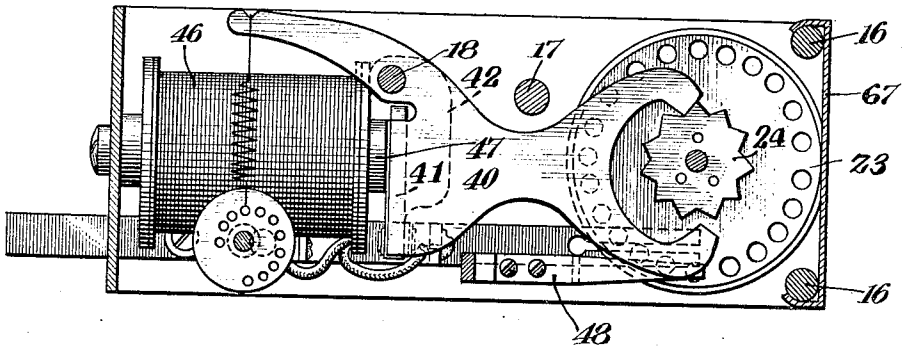


Fig. 7.

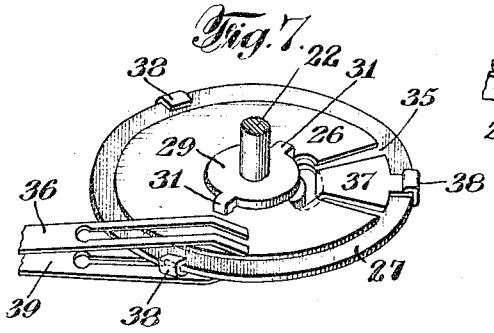


Fig. 8.

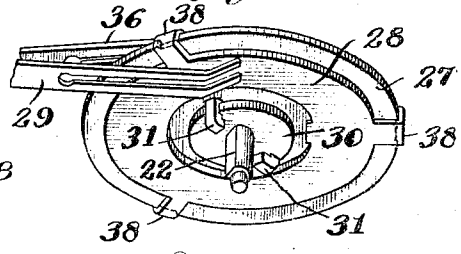
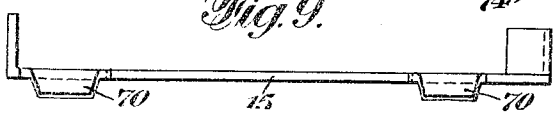


Fig. 10.



Fig. 9.



INVENTOR
Merton L. Haselton
BY
Ward, Crosby & Neal
ATTORNEYS

Patented Sept. 28, 1937 2,094,122

UNITED STATES PATENT OFFICE

2,094,122

INDICATOR

Merton L. Haselton, Rye, N. Y., assignor to The Teleregister Corporation, New York, N. Y., a corporation of Delaware

Original application January 27, 1930, Serial No. 423,599. Divided and this application February 20, 1931, Serial No. 517,186. Renewed February 12, 1934

14 Claims. (Cl. 177—328)

This invention relates to indicating systems and more particularly to an improved indicator unit construction of the character shown in my application Serial No. 423,599, filed January 27, 1930, of which this application is a division.

Among the objects of this invention are the provision of improved indicating means which is highly dependable, efficient, and silent in operation, inexpensive to manufacture, maintain and assemble, and which is especially adapted for indicating digits of a large plurality of numbers on a quotation board.

The invention consists in the novel features of construction, arrangements, combinations of parts and electrical connection as hereinafter described, but by way of example only, as being illustrative of preferred embodiments of the invention.

Other objects will appear from the following description taken in connection with the accompanying drawings, in which

Fig. 1 shows a portion of a stock quotation board disclosing several indicator units in position;

Fig. 2 is a left side view of an indicator unit;

Fig. 3 is a vertical section on line 3—3 of Fig. 2;

Fig. 4 is a horizontal section on line 4—4 of Fig. 2;

Fig. 5 is a top plan view of the movable parts in the position they occupy when the actuating magnet is deenergized;

Fig. 6 is a view similar to Fig. 5, showing the parts in the position they occupy when the magnet is energized;

Fig. 7 shows the upper side of the commutator as viewed in Figs. 2 and 3;

Fig. 8 shows the lower side of the commutator;

Fig. 9 shows the lower wall or base of the indicator frame provided with positioning lugs; and

Fig. 10 is a cross section of the base in position in the board.

The indicator unit 12 disclosed for illustrative purposes, may be mounted in a stock quotation board as illustrated. Each item of information concerning a stock may be displayed by four or more or fewer indicator units as desired and the right hand unit may indicate fractions, as for example, two-eighths may be indicated by a two (2) preferably of different color from the whole digit indicia, one-four-eight (148). The latter may be white indicia in a black background and the fraction indica may be orange in a black background.

Each indicator unit 12 preferably comprises a U-shaped frame 13 of magnetic material, the top and bottom walls 14 and 15 of which are held spaced by posts 16, 17 and 18 having shoulders abutting the inner faces of the walls and secured in the outer faces of the walls by spinning operations.

Each indicator unit comprises a drum 20 secured to a flange 21 on a vertical shaft 22 mounted in bearings in the top and bottom walls 14 and 15. The upper end of the shaft is journaled in a bronze bearing in the upper wall 14 to provide a better bearing for this end of the shaft to which the actuating force is applied.

Secured against the outer face of the drum 20 is a steel disk 23 provided with a circular series of holes equal to twice the number of teeth on a star wheel 24, which is spaced therefrom by spacer disks. The star wheel, spacers, perforated disk and drum are preferably secured to the flange 21 by rivets arranged at the apices of an isosceles triangle or in any other equivalent manner to insure proper assembly of the parts on the shaft and with relation to a commutator 25 at the other end of the shaft which comprises a bronze disk 26, an insulating disk 27, a second bronze disk 28 and hub members 29 and 30, all of which parts except the disk 28, are provided with holes to fit the flattened end of the shaft. This insures proper assembly of all the parts on the shaft fixed with respect to each other. The disks 26 and 27 are provided with holes through which extend clamping fingers 31 on the hub member 29. These fingers engage in notches in the hub member 30 and their ends are bent against the outer face of the hub member 30. The hub members are secured in position on the shaft by spinning.

The drum is provided with indicia 1 to 0 and a blank space between the 0 and 1. The disk 26 is cut away as at 35, the arrangement being such that the disk is engaged by a spring brush 36 whenever the indicator shows a number through the mask 67. As the drum is moved into position to display the blank position, the contact between disk 26 and brush 36 is broken. The brush 36 when the drum is in this position, engages a sector 37 of the disk 28 which as shown occupies the space provided by the cutaway portion of the disk 26. This sector is blanked with the disk 28 and is extended through a hole in the disk 27 and is bent into position and held there by one of the radial fingers 38 on the disk 28 which engage peripheral notches in the disk 27 and have their ends abutting against the disk 27 with one of them engaging the sector 37. The lower disk 26 is insulated electrically from the

upper disk 26 and the indicator shaft. The disk 28 is a continuous ring and is at all times engaged by a spring brush 39. Each brush 36 and 39 is preferably split as shown to provide for better contact with the disks.

The star wheel 24 which as stated is connected to the indicator shaft and indicator drum, may be actuated by a double pawl or fork member 40 pivoted on the spacer post 18 which is preferably of bronze so as not to interfere with the magnetic lines of flux through the armature as will be apparent.

The fork 40 is of the general form shown, comprising a bearing on the shaft 18 in its main portion, and provided with a right angular armature portion 41 which terminates in a portion 42 parallel to the main body portion constituting a second bearing on the shaft 18. The armature portion 41 as shown in Fig. 2 terminates close to the walls 14 and 15 to provide a substantially continuous path for the lines of magnetic flux through the frame, armature and core of the magnet later referred to. The main body portion of the fork 40 is extended as at 43, to which is secured a return spring 44, anchored for purposes of adjustment in one of a spiral series of holes in a disk 45 rotatable on a pin supported in the top wall 14 of the frame. The spring normally holds the fork in the position shown in Fig. 5.

A magnet 46 is secured in the end wall of the frame and is provided with a core 47 cooperating with the armature portion 41 of the fork 40. Fig. 6 shows the fork 40 attracted by the core 47 of the magnet.

The construction of the parts is such that energization of the magnet 46 will move the fork 40 from the position shown in Fig. 5 to that shown in Fig. 6 which rotates the drum one twenty-second of a revolution. Deenergization of the magnet permits the spring to return the fork into the position shown in Fig. 5 and rotates the drum another twenty-second of a revolution. These two movements of the fork will rotate the drum to display the next indicia. The drum is held in position after each such movement by a spring pawl 48 secured to a lip 49 struck in from the upper wall 14, and having its free end cooperating with the holes in the disk 23.

The terminals of the winding of the magnet are preferably soldered to plates 50 and 51, Fig. 2, insulated from each other, the plate 51 being in contact with the brush 36. The brush 39 engages a plate 52 insulated from the plate 51 and brush 36 and from a base plate 53 to which all these parts are secured by screws 54, whose heads bear on a washer plate 55 insulated from the plate 50, and whose shanks are insulated from all the metallic parts of this assembly except the base plate through which they are threaded and beyond which they extend and engage in apertures in the lower wall 15. The base 53 is provided with a pin 56 engaging a hole in the wall 15. The base plate is drawn against and secured to the wall 15 by a screw bolt 57.

When the drum is in any of its several indicating positions, the magnet may be energized by a circuit through the plate 50, coil of magnet, plate 51, brush 36, disk 26, shaft 22, and to ground through a spring finger 60 secured to the upper wall 14 and having its free end bearing on the end of the shaft and its other end engaging a hole in the wall 14 to maintain the free end on the shaft. The spring finger 60 is provided with a hump or raised portion 61 which engages a spring clip 62 when the frame is in position within the quotation board to retain the indicator unit in place and to ground the circuit to the frame to which the clip is secured. The spring also retains the shaft 22 in its lowermost position and prevents any endwise vibration thereof.

The magnet may be successively energized until the disk 26 breaks contact with the brush 36 to break the ground connection and to contact with the sector on the disk 26 which if not grounded through the brush 39 will prevent further energization of the magnet and consequently the drum will stop and exhibit the blank space through the mask. By this means, as a series of impulses causes the drum to be moved toward the blank position, the ground for this circuit will be broken as the indicator drum reaches the blank position.

The plate 52 which engages the brush 39 may now be grounded, which through the disk 28 and its sector 37 engaging the brush 36, provides a ground for the circuit of the magnet to move the drum to indicate one (1). After it has arrived in this position, the ground through brush 39 is again broken and the ground connection is again made through the indicator shaft, and the drum is rotated a number of steps equal to the indicia to be displayed with the exception that it is moved ten steps for the zero position. Of course the circuits might well be completed by other means than grounding.

The heel end of the core is provided with a copper slug or washer 63 to cause the magnet to release slowly to counteract the action of the spring and thereby prevent a hammer blow engagement between the fork and star wheel. The noise produced by engagement of the fork and star wheel is further reduced by the use of a fiber or non-metallic star wheel. Such a star wheel of non-magnetic material also avoids any liability of "sticking" action with respect to the fork arising from residual magnetism.

The indicator drum is preferably made of thin sheet metal and its open end is provided with a cork disk 64 secured thereto by glue or shellac to provide for rigidity and also to prevent the drum from acting as a bell and accentuating the noise produced by the fork and star wheel. As shown, this cork disk may be provided with a thicker central portion acting as spacing means in the event the cork should become released from the drum and drop against the commutator.

A fiber washer 65 on the shaft 22 maintains the commutator spaced from the wall 15.

The armature is preferably covered by a sheet of fibrous material to reduce noise and to prevent direct contact of the armature and core to provide for free releasing movement of the armature without any "sticking" action arising from residual magnetism. The frame 13 is cut away as at 66, Fig. 2, to provide space through which the free ends of the plates 50 and 52 extend.

The mask 67 comprises a generally rectangular thin plate with a central opening as shown in the figures, and with its side edges bent at right angles. Near each corner and on the side edges is a bent clip portion 68 which may be sprung over the posts 16 as shown to removably retain the mask in position. The end of the side edges and portions 68 engage the inner faces of the walls 14 and 15 of the frame and thus position the mask vertically. By using short bent portions and locating them at the corners of the mask, it is obvious that the portion of the mask imme-

diately adjacent the drum will not be distorted during assembly or disassembly nor when the mask is in position. This is important as the small clearance shown in Fig. 4 is necessary to bring the indicia near to the outer surface of the mask. Any binding action between the mask and drum would tend to cause imperfect operation.

As shown in Fig. 9 the base **15** of the indicator frame may be provided with lugs **70** cooperating with a raised portion **72** (Fig. 10) on the base of the indicator compartment in the quotation board. As shown a continuous sheet may be provided with alternate raised portions **72** and depressed portions **74** and this may constitute the support for a series of indicator units.

While only one embodiment of the invention has been shown, and this in connection with a specific use, it is to be understood that this is for illustrative purposes and that various features can be modified and that the invention can be used in various other forms of devices and machines in which items of information are to be displayed, registered or recorded.

The indicator unit disclosed, which was designed primarily for use in connection with an automatic broker's blackboard, comprises an electromagnetically operated drum bearing the indicia from 1 to 9, zero and blank. This drum rotates about a vertical axis to permit the use of a digit having a vertical dimension greater than the horizontal dimension with a minimum of board space. If the digits were arranged upon a drum revolving about a horizontal axis the circumference of said drum would be considerably greater than that of the arrangement shown. Since these drums must have clearance, a horizontal drum shaft would require greater vertical spacing between adjacent horizontal rows of indicator units. The inertia of the drum having a greater circumference would be increased in accordance with the physical laws governing such matters, and the speed of operation would be proportionately reduced. Since the drum comes to rest twice for each successive digital movement, there are eleven equally spaced rest positions and eleven additional equally spaced rest positions interposed between each of the first named eleven positions for the drum for each revolution of the same. The energy required to start and stop the drum increases with the inertia of the drum, and for a fast operating unit this inertia should be kept to a minimum, as has been done in the case of the indicator unit shown in these applications. The tendency to overthrow in the case of a drum having a large inertia with the same speed of operation is greatly increased. The arrangement of vertical drum axes eliminates the necessity for a side member to support the drum which results in a corresponding decrease in the horizontal spacing of adjacent digit indicators of the same assembly.

During the operating stroke of the driving fork, the inertia of the drum assembly may cause the star wheel to move momentarily past its rest position, and since pressure may be at this time exerted by the driving fork against the next succeeding face of the star wheel tooth, the drum will start rotating reversely. If, during this reverse rotation, the driving fork moves in the other direction, there is a possibility that the opposite tooth of the fork will engage against the non-working face of the star wheel, causing the drum to continue its reverse movement until the tooth of the driving fork has reached the bottom of the star wheel tooth with the result that the drum will move back to the rest position where it stood before the pulse was received. To overcome this difficulty, the ratchet spring **48** has been shown engaging with the perforated disk **23** in such manner that the drum is not permitted to move backwardly beyond the corresponding rest position. This insures reliability of operation, as required for blackboard service.

The arrangement of the fork and star wheel shown permits very close spacing between adjacent digits on the drum, since the drum is centered in the rest position by the tip of the driving fork resting against the bottom of the star wheel tooth by the action of the coil spring **44**.

The indicator frame serves not only to support the unit, but furnishes a portion of the circuit required for the attraction of the armature. It is of just sufficient size to protect the drum from mechanical injury and permit insertion into a supporting panel with a minimum of clearance between adjacent drums of the same assembly in a horizontal direction.

The electromagnet is provided with a copper slug **63** on the heel end of the magnet to retard the decay of the flux in the coil and lessen the force of a blow of the fork against the star wheel on the release stroke of the armature. A minimum operated air gap between the armature of the magnet core is assured by means of an armature shade to eliminate these parts coming into direct contact and retarding the release of the armature due to the decreased reluctance of the ferric circuit. The armature is mounted on a phosphor bronze bearing shaft to insure accuracy of movement and ease of operation. The armature and driving fork are of one-piece construction, with tabs formed parallel and close to either side of the top and bottom frame members to insure a minimum of reluctance in the ferric circuit at these points.

The ratchet spring is mounted on a lip or tab struck from the top of the frame and integral therewith to provide means for adjusting the tension of the ratchet spring against the disk **23** by bending said tab.

The arrangement of the star wheel and fork above, and the commutator below, the drum does not require any additional spacing in the horizontal direction between the adjacent drums required for these members, the additional space being in a vertical direction.

The commutator shown in Figs. 7 and 8 is of the revolving disk type, making engagement with commutator springs **36** and **39**. The commutator spring **36** is connected to one winding of the electromagnet and completes a circuit for the operation of the same in all positions, except the home position, to commutator disk **26**, and from thence through the drum shaft and spring **60** bearing thereon, spring **62** to one side of the battery. As the commutator disk **26** is open in the blank position of the drum the commutator spring **36** is no longer in engagement therewith but is in contact with segment **37** which is integral with the insulated commutator disk **28** and in circuit with brush **39** to which is connected, through the slip connection **52** at the rear of the unit, one side of the battery.

The cork disk **64** is firmly attached to the indicator drum and the drum shaft to give mechanical support to the lower portion of the drum, and to eliminate the objectionable noise of the indicator unit in operation. The clearance between the drum and the mask **37** is small to avoid the possibility of viewing more than one

character when the unit is in the rest position. This small clearance is maintained throughout the entire revolution of the drum by the cork disk.

The driving fork comprises long and short arms so that a maximum rotational force is applied to the drum on both the operate and release strokes of the armature with a minimum of radial thrust at the drum bearing. If these forks were of equal length a greater component of force would be exerted in a radial direction with a corresponding loss of the turning moment applied to the drum. This condition is obtained in part by the location of the armature bearing to one side of the magnet core. Such an arrangement provides unequal degrees of movement of the drum for the operate and release strokes, which compensates in part for the action of the magnet in the building up and decay of the flux thereof for one cycle of operation in combination with the action of the coil spring **44**.

For maximum efficiency of the unit under a given set of operating circuit conditions particular adjustment of the retractile spring **44** is required. This adjustment is obtained by inserting a hooked end of the retractile spring in one of the various holes in the adjusting disk **45**, the holes thereof being arranged in a spiral.

What I claim is:

1. In an indicator, an indicator shaft, a ratchet wheel secured to said shaft, a pawl for operating said ratchet wheel step by step, a metallic drum indicator closed at one end and open at the other end, means securing said closed end to the shaft, and a resonance reducing disk supporting the open end of the drum on said shaft.

2. The combination of an indicator shaft, an open ended metallic indicator drum secured to said shaft, a resonance reducing disk on said shaft and in engagement with the interior surface of the open end of said drum, a star wheel secured to said shaft, and a fork for actuating said star wheel.

3. In an indicator, an indicator shaft, an indicator drum closed at one end and open at its other end, means securing said closed end on the shaft, and a resonance reducing disk of small inertia supporting the open end on said shaft.

4. A market quotation board comprising a large number of groups of indicator units for posting information regarding stocks or other items, the indicator units of each group being disposed in substantially abutting relation to each other to reduce the compass thereof, each of the indicator units comprising a frame, an indicator drum mounted in said frame for rotation about a vertical axis, the drum having a diameter substantially equal to the width of the frame and of smaller length than the height of said frame to provide a space between the end of the drum and the frame for receiving drum operating means, a plurality of closely spaced digits on the periphery of said drum each of a height appreciably greater than twice the width thereof to cause the digits to be legible at a greater distance from the indicator unit for a given width of the digits, a mask on the front end of said frame provided with an elongated rectangular aperture of substantially the same transverse dimension as the length of the chord subtended by the space allotted to each of the digits, a shaft supporting said drum within the lateral confines of said frame and in position to project the drum into said aperture, the outer front surface of the mask lying in a plane substantially coincident with a plane tangent to the central front curved surface of the drum which extends into said aperture, and a drum operating means for causing the drum to display any selected one of said digits.

5. An indicator frame comprising a generally U-shaped member, posts connecting the corners of the free ends of the legs of said member, an apertured indicator mask resting against said posts, and tongues on the edges of said mask engaging said posts to hold the mask in position.

6. An indicator frame comprising a generally U-shaped member, posts connecting the corners of the free ends of the legs of said member, an apertured indicator mask resting against said posts, and spring tongues adjacent the corners and on the side edges of said mask for spring clip engagement with said posts, said tongues having one of their side edges in engagement with said legs of said frame member to prevent movement parallel to the posts.

7. In mechanism of the character described, the combination of a rotatable indicator, a star wheel connected to said indicator, an operating magnet, and a unitary armature and actuating fork comprising a main member on which the fork is formed, an armature member extending at right angles to said main member and provided at its free end with a portion extending parallel to said main member and provided together with said main member with pivotal supporting means.

8. In mechanism of the character described, comprising a generally U-shaped frame of magnetic material, an indicator shaft supported in the legs of said frame, a star wheel of non-magnetic material on said shaft, an operating magnet secured to the bight of said frame, an actuating fork of magnetic material cooperating with said star wheel, and an armature on said fork.

9. An indicator unit comprising a generally U-shaped frame member of rectangular stock, spacers connecting the corners of the free ends of the legs of said member, and an indicator shaft supported in the legs of said member at a point between said spacers and the bight of said frame member.

10. An indicator frame comprising opposed rectangular spaced frame members, spacers secured to the corners of said frame members, and an apertured indicator mask removably secured to said spacers.

11. The combination of an indicator frame, an indicator drum mounted in said frame for rotation about a vertical axis, indicia on the outside face of said drum, and a mask on the front end of said frame provided with an opening receiving a part of the face of said drum and being of a sufficient width to expose one indicium at a time and to conceal adjacent indicia from view, said mask and said frame having complemental means in frictional engagement with each other and relatively slidable with respect to each other to releasably secure the mask to the frame.

12. The combination of an indicator frame comprising spaced side walls, members connected to said side walls close to the front ends and the side edges of said walls, a mask located between the front ends of said walls, and means on said mask engaging the lateral outside faces of said members and the opposed faces of said walls for positioning said mask on said frame.

13. In an indicator construction, an indicator frame, an indicator shaft supported on said frame, an indicator on said shaft having a plu-

rality of indicating positions, a star wheel on said shaft having a corresponding plurality of teeth, an operating fork for rotating said indicator from a rest position to the next rest position by a to-and-fro movement of said fork, a ratchet disk provided with a plurality of shoulders equal to twice the number of teeth on said star wheel, and a pawl cooperating with said shoulders to prevent a reverse movement of said ratchet wheel after operation by said fork during either of its to-and-fro movements.

14. In an indicator, an indicator shaft, an indicator drum mounted on said shaft, said drum being closed at one end and open at the other end, driving means for said drum associated with the closed end thereof, and a sound muting device comprising a cellular disc on said shaft and having its periphery in engagement with the inner surface of said drum adjacent its open end.

MERTON L. HASELTON.