July 3, 1956 A. R. JACKSON 2,752,880

CHARTS OR INDICATORS

Filed July 15, 1952 2 Sheets-Sheet 1

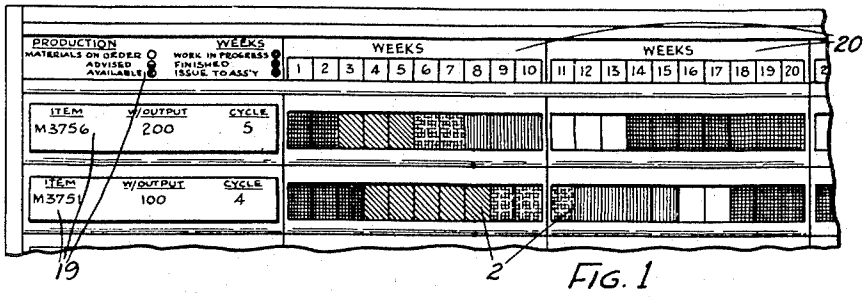


FIG. 1

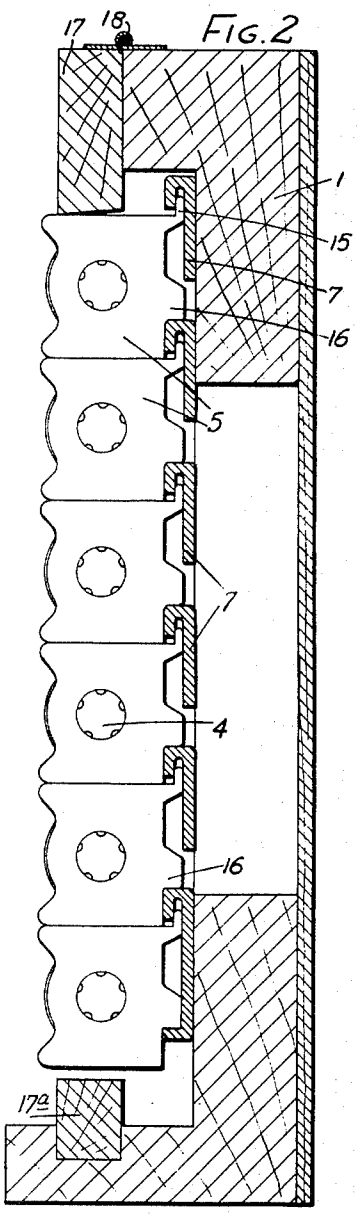


FIG. 2

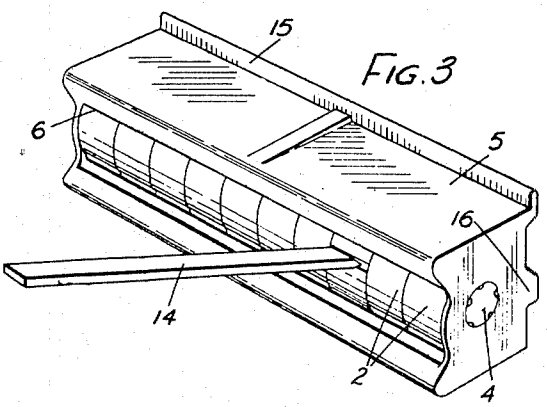


FIG. 3

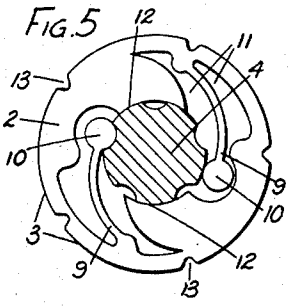


FIG. 5

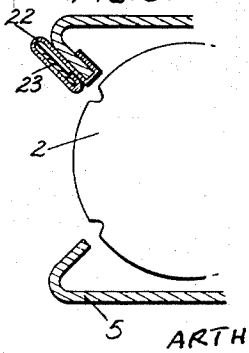


FIG. 6.

INVENTOR:
ARTHUR REX JACKSON

BY:

ATTORNEY:

July 3, 1956 A. R. JACKSON 2,752,880

CHARTS OR INDICATORS

Filed July 15, 1952 2 Sheets-Sheet 2

FIG. 4.

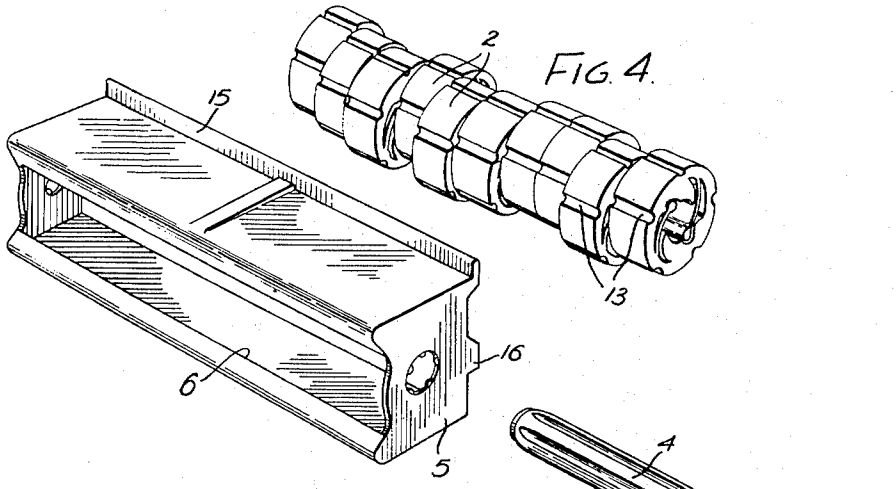


FIG. 10

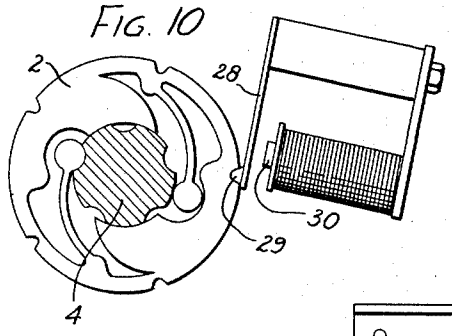


FIG. 8

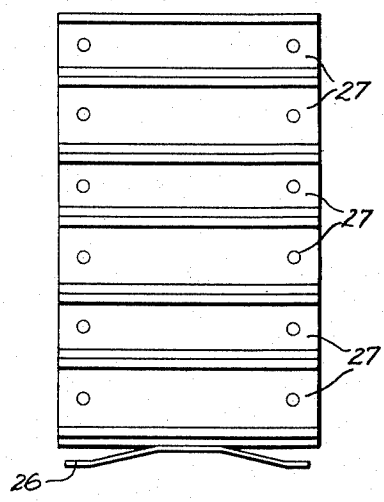


FIG. 9

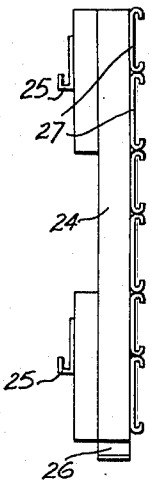
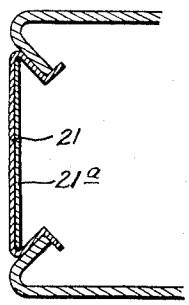


FIG. 7



INVENTOR:
ARTHUR REX JACKSON

BY:

ATTORNEY:

United States Patent Office 2,752,880 Patented July 3, 1956

2,752,880

CHARTS OR INDICATORS

Arthur R. Jackson, London, England

Application July 15, 1952, Serial No. 298,917

Claims priority, application Great Britain July 19, 1951

8 Claims. (Cl. 116—133)

This invention relates to charts or indicators generally and is primarily although not exclusively applicable to charts of the kind generally known as bar charts in which a series of bars of various colours may be built up to display pictorially or graphically details or statistics revelant to the running of a business, factory or other organisation, such as for example, details of output over a particular period, stocks, sales, allocations, attendances, availability of a company's products and so forth.

It will be appreciated that such a chart will enable a director or other responsible person to see at a glance how a particular production order is proceeding through a factory from the raw material stage to the final product and consequently any situation which may arise may be instantly appreciated and the appropriate action taken.

Although many proposals have been put forward from time to time and a few have found practical application, for example, coloured discs located in slots formed in metal panels, cords extensible over pulleys and pegged in appropriate holes formed in a board, simple pegs inserted into holes, channels designed to receive pre-cut lengths of coloured strips and the like, few of these previous proposals are capable of universal application to the many charting and graphic display needs of business and military requirements as each such previous proposal had only a particular sphere of practicable application.

The chief object of the present invention is to evolve a construction of chart or indicator having a more universal application than hitherto which may be built up and extended on a unit basis and be operated easily and expeditiously and will not involve the use of loose components or parts which might be liable to become lost or accidentally displaced.

A chart or indicator in accordance with the present invention includes a plurality of annular discs or multi-sided disc-like components arranged concentrically side by side for individual angular movement about their axes, the periphery of each disc or like component being divided into a plurality of segments or divisions contrastingly coloured and/or marked with numerals, letters or other markings, each disc or like component having means for frictionally locating it in any angular position into which it has been moved.

In order that the invention may be clearly understood and readily carried into effect the invention is hereinafter described with reference to the accompanying drawings in which:

Figure 1 is a fragmentary front elevation of a bar chart in accordance with the invention:

Figure 2 is a vertical section of the same drawn to an enlarged scale:

Figure 3 is a perspective view of one of the indicator units:

Figure 4 is a perspective view showing the component parts separated.

Figure 5 is an end elevation showing one of the indicator discs in position on its associated spindle:

Figure 6 is a fragmentary sectional view showing one method of mounting the index holders:

Figure 7 is a similar view illustrating an alternative method:

Figures 8 and 9 represent in front and side elevation a further construction of index holder:

Figure 10 represents diagrammatically one method of moving the discs angularly from a remote point.

In the construction illustrated the invention is shown applied to a bar chart, the chart being built up on the unit principle and includes a supporting frame indicated generally by reference numeral 1 in which the various indicator units are mounted in juxtaposition. By building the bar chart on the unit principle a suitable number of standardised units can be assembled together end to end and side by side to suit particular requirements, whilst the capacity of the bar chart can be increased if and when required by adding further units from time to time. Each unit includes a plurality of annular disc-like components 2 which can conveniently be in the form of synthetic resin mouldings or metal castings, the periphery of each disc-like component being divided into segments, for example, five segments 3 which are coloured contrastingly, for example, black, white, red, yellow and green. The disc-like components are mounted concentrically side by side in close juxtaposition on a spindle 4 about which spindle the disc-like components hereinafter referred to as discs can be rotated as required to show an appropriate colour.

The spindle is held stationary and is carried in a box-like casing 5 in which, for example, ten discs are mounted, the casing having a frontal aperture 6 of sufficient depth to expose a complete segment of colour on each of the discs. It will, of course, generally be necessary to employ a plurality of such casings complete with their associated discs and arranged end to end to build up a bar of appropriate length. It is proposed that a plurality of such casings shall be arranged end to end and mounted on a common guide rail 7, a series of such rails being arranged one above the other in spaced relationship so that the indicating device will show a plurality of bars one beneath the other, each bar being sub-divided into subsidiary bars of contrasting colour as may be necessary to meet the requirements, the general effect obtained being shown in Figure 1.

The spindle 4 on which the discs are mounted which spindle may, for example, carry ten discs, is fluted as at 8, there being, for example, five flutes formed in the periphery of the spindle. The spindle 4 is preferably of the general form illustrated in Figure 4 whilst the casing is formed with holes at its opposite ends to receive the spindle. The spindle tapers near one end to provide a lead whilst the hole at the opposite end of the casing if not truly circular but provided with inwardly directed parts which enter the flutes in the spindle to prevent the latter's rotation.

In the preferred form of disc illustrated each disc is produced as a moulding or extrusion, the general shape of disc being shown clearly in Figure 5 each disc being produced from a thermo-plastic or thermo hardening synthetic resin material, the component including two integral arms 9 which are curved throughout their length and are formed at their ends into the shape of annular bead-like protuberances 10 which co-operate with the flutes in the spindle to locate the disc in any of ten alternative positions there being five flutes in the spindle which on rotation of the disc are successively engaged by the protuberances 10 the latter coming into operation alternately. The interior of the disc is so moulded as to leave a free space 11 on the opposite sides of each arm so that each arm can flex the required amount to ride out of the flutes

as the disc is rotated whiles the disc is interiorly shaped to provide two oppositely arranged bearing surfaces **12** of arcuate shape.

Each disc is formed around its periphery with a plurality of transverse notches **13** which separate the differently coloured or differently marked segments of the disc's periphery the notches serving for the entry of the extremity of a pointer **14** in the manner indicated in Figure 3 or of a human finger nail. A double ended pointer with spade ends of different widths would enable more than one of the discs to be engaged and rotated together. With five colours on the periphery of the disc and five flutes on the spindle alternately engaged by the two arms the disc can be turned to expose one colour only or half of one colour and half of another adjacent colour.

It is preferred to mould each disc from polystyrene which is found to have sufficient inherent springiness to ensure the required flexure of the arms, the arms by their positioning being enabled to be made comparatively long in relation to the diameter of the disc.

Although it is preferred to construct the discs as mouldings they may alternatively be produced in the form of a long extrusion, the extrusion being afterwards cut at equally spaced points throughout its length to produce a plurality of discs of the appropriate thickness.

Instead of constructing the discs with integral arms, a spring may be used similar in shape to a caliper gauge, the extremities of the spring being formed to act as detents to engage the flutes in the spindle, thereby lightly retaining the disc in its predetermined position. Ten different angular positions can be obtained as hitherto by providing two detents diametrally positioned and operating in conjunction with five flutes in the spindle.

The coloured segments of the periphery of each disc may be produced by painting the segments in contrasting colours or the coloured segments may be in the form of inserts which are moulded separately in coloured form and subsequently secured together or to a central core part of the disc. As a further alternative the discs may be produced from metal in the form, for example, of die castings suitably coloured or otherwise marked by printing or by means of transfers.

Each casing **5** is preferably produced by a moulding operation from a thermo-plastic or thermo hardening synthetic resin material and is formed along its upper rear edge with an upstanding flange or rib **15** which is adapted to enter a channel formed in the rail **7**, each casing being formed with a shoulder or protuberance **16** at each end adapted to rest on the rail immediately beneath.

The casings are assembled one above the other and end to end in the supporting frame by tilting each casing in the process of placing it in position starting at the bottom and as the casings cannot be removed without first tilting them, the frame is provided with a hinged part **17** extending along its upper edge which when turned upwardly about the hinge centre **18** will permit of such tilting movement. The hinged part may be locked normally in its operative position to prevent unauthorised removal of the casings.

The lowermost rail is shown shaped slightly differently from the remainder in that it has a forwardly directed lower flange on which the shoulders **16** on the lowermost casings rest. Alternatively the lowermost casings may rest on a part such as **17***a* of the frame. If desired all the rails may be similar in cross-section to the lowermost rail.

Referring now to Figure 1 it will be seen that the bar chart includes on the left hand side an index **19** giving the individual number of each item to which the chart applies and along its upper edge with a time chart **20** which in conjunction with the bars of colour exhibited give a visual indication of the number of components represented under each item in various stages of manufacture. The time chart is calibrated in weeks and of course the chart may be of a length sufficient to cover a whole year's output, if desired. The amounts will be read off from the right hand end of each bar from the numerical scale above and as the work proceeds the discs will be turned individually to expose the required colours and give a visual indication of how the work is proceeding through the shops.

The indexes **19** and time chart **20** may as shown in Figure 7 be associated with casings which do not contain discs each casing being closed at the front by a transparent cover plate **21** which is shaped to grip the edges of the frontal opening in the casing and to lie flush with the front thereof, an index slip **21***a* being carried behind the window so formed.

As an alternative suitable clips **22** may be affixed along the upper frontal edge of each casing, each clip containing an index plate **23**, the clip and index plate in this case being applied to a casing which does include a set of indicator discs.

Figures 8 and 9 illustrate a further modification in which an index plate carrier **24** is of a shape and size corresponding to a plurality of casings, the carrier being provided with channel shaped clips **25** on its rear face which engage the channel shaped parts of the rails **7**, a spring **26** being provided at the lower end adapted to bear on one of the lower rails and hold the parts together. The carrier is provided on its front face with a series of index plate holders **27**.

Instead of mounting the units on rails they may be secured in any other suitable way. For example, each unit may be provided with one or more rearwardly directed projections adapted to enter holes or slots formed in a panel or other support, the units being individually removable and replaceable.

In Figure 10 is shown a simple electrical device for imparting a predetermined angular movement to its associated disc. In this case the spindle **4** will be driven continuously at slow speed the device which includes a pawl in the form of a spring arm **28** terminating in a detent **29** preventing consequential rotation of the disc by virtue of the entry of the detent into one of the notches **13**. The device includes an electro-magnet **30** and on the windings of the latter being energized for a predetermined period the detent **29** will be moved clear of the notch thus permitting the disc to be turned with the spindle for a determined period of time, the period of time determining the angle through which the disc is turned and the colour or marking which is moved into view.

It is proposed that one such device shall be associated with each disc or a single device shall be provided for each row in which latter case the spindle may be fixed and the device be of such a nature that it will in fact impart a predetermined degree of angular movement to a disc opposite which it is placed, the device being slidable lengthwie of each row into any desired position.

The arc of movement described by each disc would be controlled by a time mechanism, thus for example, if it required ⅕ second to move a disc through an arc of 72° the pawl would be lifted out of engagement with the disc and be released to re-engage upon the passage of ⅕ second. The principle of selection and control of electrical impulses on a time cycle is well known in telephone automatic equipment and might with advantage be used in carrying out the present invention.

One application of the invention would be the transmission of statistical and other data from a remote point so as to enable this to be set up in graphical form on the chart or indicator or a number of such charts or indicators could be controlled from one master station. In this way the latest production situation could simultaneously be electro-mechanically plotted in the (*a*) factory line, (*b*) planning office, (*c*) Works Manager's Office and (*d*) Headquarters' control. Similar information could from time to time be given in respect of sales and financial data.

A further application of the invention is to achieve a link up with accounting machine mechanisms so that the operation of the machine in the compilation of figures in register boxes would simultaneously be reflected in graphical form on the visual indicating devices, or where the indicator was employed to show figure markings a reproduction of the figures in the machine registers could be simultaneously set up on the indicator boards. Such a link up as is envisaged in carrying out the present invention could also make use of punched card accounting mechanisms which are characterised by the passage of pre-punched cards through selecting mechanisms actuated by the position of the holes punched in the cards. A simultaneous actuation of the indicating devices would be achieved.

Instead of either of the electrical controls hereinbefore described any other form of remote control mechanism may be employed which may be wholly mechanical or may even take the form of radio transmission through the ether.

Instead of using coloured segments the discs alternatively can have numerals around the periphery so that the device can also be used as a counter or a combination of colour charting and numerals.

Alternatively the colours themselves can be employed as a numerical code, for example, black might indicate numeral **0**, white **2**, red **4**, yellow **6** and green **8**. Odd numbers, i. e. **1** might be indicated by black:white, whilst white:red might indicate **3**, red:yellow **5**, yellow:green **7** and green:black **9**.

Although normally the spindles carrying the discs would be fixed it may be so arranged that they could be revolved together with their associated discs so as to turn up a whole line of colours simultaneously, a detent anchored to the box engaging the flutes of the spindle to hold the latter in any of the five positions and a knurled disc, for example, being associated with the spindle to enable it to be easily rotated.

For example, the discs may be individually locked against rotation, the spindle being slowly revolved continuously or intermittently by an electric motor or other source of power. By releasing the appropriate disc or discs for a predetermined period they will as a result of the engagement of one of their arms with a flute in the spindle be moved angularly, the angle through which they are moved depending upon length of the period of release.

Although in the construction described five segments of colour or other markings and ten positions of rotation are referred to any number of segments and rotational stops may be provided for special applications.

The units will normally be mounted on rails and slidable thereon for two purposes, in the first case to make the device more adaptable to enable the user to mount up any desirable combination of indexing casings or coloured or numeral carrying disc casings. In the second case the arrangement makes provision for the lateral displacement of charted information. For example, a contract may be broken down into its main constituents by colour bars against a calendar scale showing how long each operation is planned to take. The contract, for example, may be planned to take 100 days, but the relationship to the calendar will depend on the starting dates. If these are altered the line of units can be slidden along the rails to the new data alignment without re-setting the individual discs. Similarly, a series of jobs can be loaded to a factory machine tool, colour bars of appropriate time length being set up for each job. If the estimate of time for any particular job is diminished or exceeded the clock timing of the succeeding job is manifestly altered from the estimate, the line of units representing the total load of any one machine being then slidden along the rails to the adjusted clock timing. Notwithstanding the desirability of slidable mounting

of the units there may arise conditions where a more permanent fixing of the position of units is desirable. Units can be screwed down to panels or walls or they may be furnished with tongues for engagement into slots perforated in the supportnig medium which may be in the form of continuous strips or panels or any other appropriate manner. Any suitable means may be provided for locking the boxes in any adjusted position and for locking the discs against unauthorised rotational movement.

Instead of the information being read from left to right and obtained from the units comprising a horizontal row the information may be read virtually in columnar form the column or columns being built up from discs in the rows of units arranged one above the other.

I claim:

1. A bar chart comprising a supporting frame, elongate open ended guide means fixed in said frame, a plurality of indicator units slidably insertable into and withdrawable from opposite ends of said guide means and supported by the latter in end to end relation with respect to each other, each of said indicator units being withdrawable from one end of said guide means for insertion in the other end thereof to shift the remaining indicator units along said guide means, each of said units comprising a casing having at the front thereof a longitudinally arranged sight window, a plurality of coaxially arranged indicator discs disposed in abutting relation with each other and mounted in said casing for controlled individual rotational movement, each of said discs being provided about its periphery with a plurality of differently colored segments, said segments each being of a width approximately equal to the width of said sight window so that a bar of a particular color is observable through the sight windows of the casings and can be of any selected length as determined by rotational movement of the individual discs, means for locking said discs against accidental rotational movement and permitting of such movement for setting said discs, and visual index means associated with said discs to enable an observer to read information pictorially portrayed by the length and color of the bar made up by the segments of discs observable through the sight windows in the casings.

2. A chart according to claim 1, further characterized by a fluted spindle fixed in each of said casings for rotatably supporting said discs, and resilient means associated with each of said discs and cooperating with the flutes of said spindles to hold the discs relative to the spindles.

3. The device of claim 2, said resilient means comprising at least one inwardly directed arm on each of said discs and engageable in said flutes to locate the associated disc against accidental displacement while permitting of angular movement when desired.

4. A bar chart comprising a supporting frame, a plurality of individually replaceable and interchangeable indicator units mounted in said frame in end to end relation with respect to each other, each of said units comprising a casing having at the front thereof a longitudinally arranged sight window, a plurality of co-axially arranged indicator discs disposed in abutting relation with each other and mounted in said casing for controlled individual rotational movement, each of said discs being provided about its periphery with a plurality of differently colored segments, said segments each being of a width approximately equal to the width of said sight window so that a bar of a particular color is observable through the sight window of the casings and can be of any selected length as determined by rotational movement of the individual discs, means for locking said discs against accidental rotational movement and permitting of such movement for setting said discs, visual index means associated with said discs to enable an observer to read information pictorially portrayed by the length and color of the bar made up by the segments of discs observable

through the sight windows in the casings, a fluted spindle fixed in said casing for rotatably supporting said discs, and resilient means associated with each of said discs and cooperating with the flutes of said spindle to hold the discs in relation to the spindle, said resilient means comprising at least one inwardly directed arm on each of said discs and engageable in said flutes to locate the associated disc against accidental displacement while permitting of angular movement when desired, each of said discs and its associated arm being integrally formed of synthetic resin material, said arms being constructed and proportioned to be inherently resilient.

5. A device according to claim 4, each of said discs being generally annular in configuration and having its inner surface formed with opposed, arcuate bearing surfaces for engagement with the peripheral surface of its supporting spindle, said arms extending inwardly intermediate said bearing surfaces and being provided on their free inner ends with enlarged portions for reception in said flutes.

6. A device according to claim 5, each of said spindles being formed with an odd number of flutes, and each of said discs being formed with two arms, whereby said discs may be moved into a number of positions twice that of said flutes and be held in each of said positions by engagement of one of said arms in one of said flutes.

7. A device according to claim 2, each of said casings being integrally formed of synthetic resin and having its opposite ends adapted to non-rotatably support one of said spindles, each of said casings being internally of a length equal to the combined thicknesses of the contained discs.

8. A bar chart comprising a supporting frame, a plurality of individually replaceable and interchangeable indicator units mounted in said frame in end to end relation with respect to each other, each of said units comprising a casing having at the front thereof a longitudinally arranged sight window, a plurality of coaxially arranged indicator discs disposed in abutting relation with each other and mounted in said casing for controlled individual rotational movement, each of said discs being provided about its periphery with a plurality of segments each having characteristic indicia, said segments each being of a width approximately equal to the width of said sight window so that a series of a particular indicia is observable through the sight windows of the casings and can be of any selected length as determined by rotational movement of the individual discs, means for locking said discs against accidental rotational movement and permitting of such movement for setting said discs, and individual index means associated with said discs to enable an observer to read information portrayed by the length and indicia of the series made up by the segments of discs observable through the sight windows in the casings, said frame comprising a plurality of vertically spaced downwardly opening channels for supporting a plurality of said casings in superposed relation with an adjacent upper casing seated on each channel and an adjacent lower casing partially received in the respective channel, each of said casings being removable from its supporting channels by forward upward swinging movement out of its seating engagement with the adjacent lower channel and rearward downward swinging movement out of the adjacent upper channel, and a movable frame part adapted for abutting engagement with the upper one of said superposed casings for holding said casings against forward upward swinging movement and removal from said channels, said frame part being movable to permit said casings to be swung and removed from said frame.

References Cited in the file of this patent

UNITED STATES PATENTS

155,741	Mernan	Oct. 6, 1874
471,986	Watson	Mar. 29, 1892
561,666	Johnson	June 9, 1896
630,855	Brooks	Aug. 15, 1899
937,308	Johnson	Aug. 15, 1899
1,150,314	Stephens	Aug. 17, 1915
1,495,707	Marino	May 27, 1924
1,653,440	Slayton	Dec. 20, 1927
1,753,786	Kinkel	Apr. 8, 1930
2,021,236	Greattinger	Nov. 19, 1935
2,121,390	Roland	June 21, 1938
2,349,452	Musolino	May 23, 1944
2,585,420	Ailes	Feb. 12, 1952
2,627,682	Markey	Feb. 10, 1953

FOREIGN PATENTS

359,824	Great Britain	Oct. 29, 1931
410,253	Great Britain	May 17, 1934
645,639	France	July 3, 1928