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Strandberg, Jr. et al.

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[54] TIME ACCUMULATOR FOR ACCUMULATING WORKERS' TIME ON THE JOB

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[52] **U.S. Cl.** .....**235/92 T,** 235/92 PD, 235/92 R, 346/20

[51] **Int. Cl.**.....**G07c 3/10**

[58] **Field of Search**.....235/92 T, 92 PD, 92 FP, 61.6 R; 58/23, 25; 346/20

[56] **References Cited**

UNITED STATES PATENTS

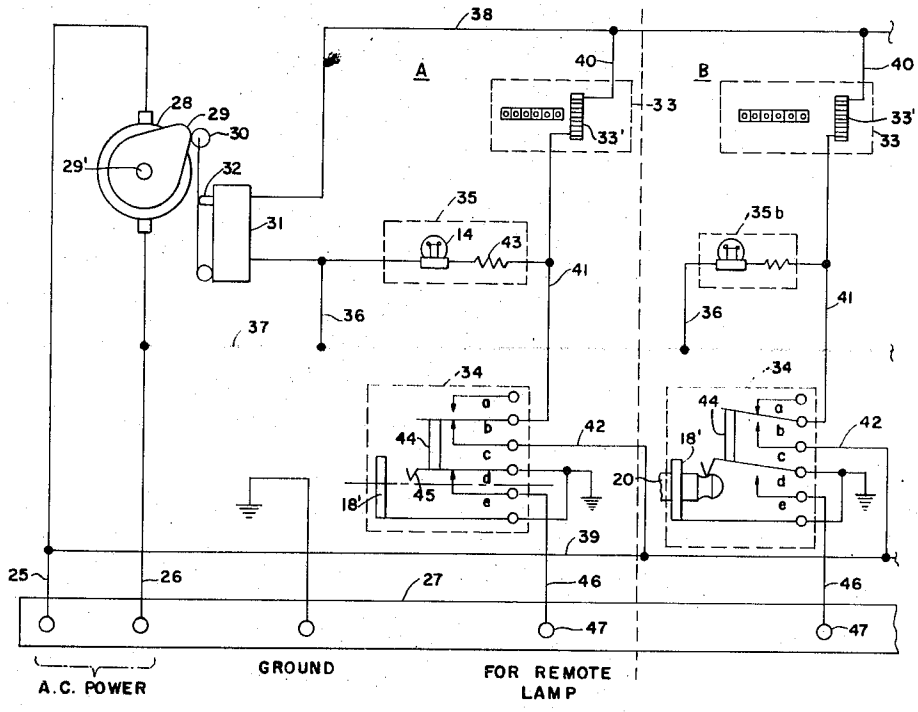
3,221,150	11/1965	Goodwin	235/92 PD
2,529,869	11/1950	Fredstrom	58/25

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[57] **ABSTRACT**

An apparatus for accumulating the time spent by individual workers on a job comprising a source of periodic electric timing pulses and worker assigned time accumulator units connected in circuit with the source of periodic timing pulses. Each of the time accumulator units includes an electrical counter for counting the periodic timing pulses and a normally closed switch requiring a separable actuator to open the switch. A worker when not on a job will insert a worker assigned separable actuating device in the normally closed switch to open the switch and stop the counter from counting the periodic timing pulses. When the worker goes on a job, the separable actuator is removed from the normally closed switch to permit the switch to close and the counter to resume counting the periodic timing pulses while the worker is on the job. Plural time accumulator units may be connected in parallel circuits to receive the electric pulses from the source of periodic electric timing pulses in accordance with the requirements for workers on a job, there being one time accumulator unit for each worker on the job within the capabilities of the apparatus. The apparatus includes a box-like housing having a display panel, the front face of which has a plurality of similar display areas, each display area having a workers's identification, an indicator for the worker's accumulated time on a job and an aperture through which the worker inserts a separable actuator to open the normally closed switch located behind the display panel of the particular worker's time accumulator unit.

12 Claims, 5 Drawing Figures



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2 Sheets-Sheet 1

FIG. 1.

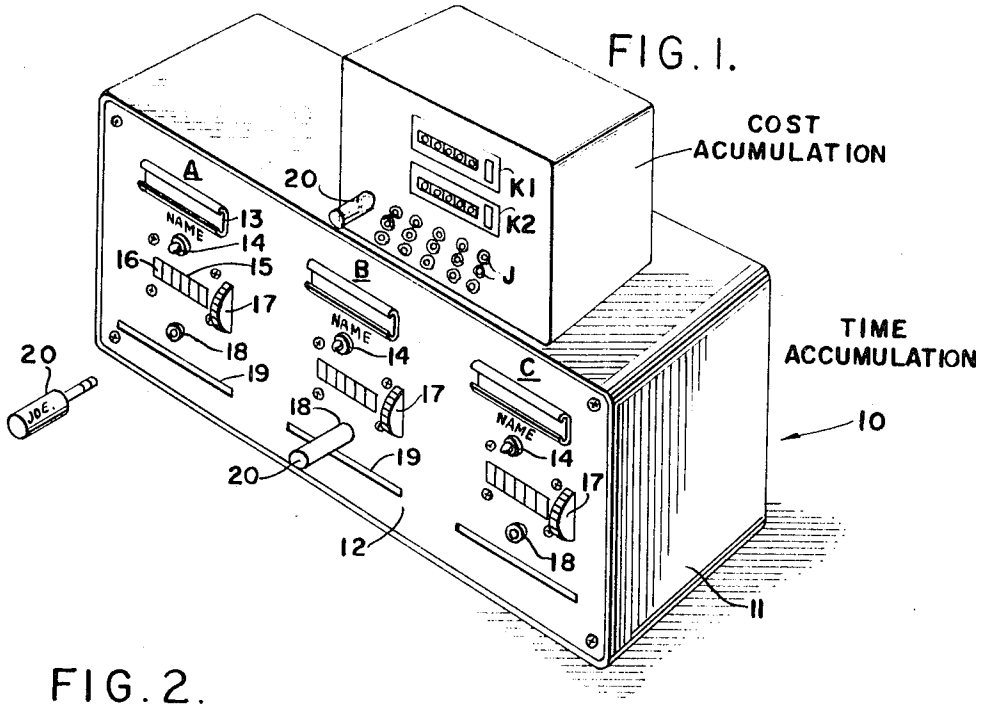


FIG. 2.

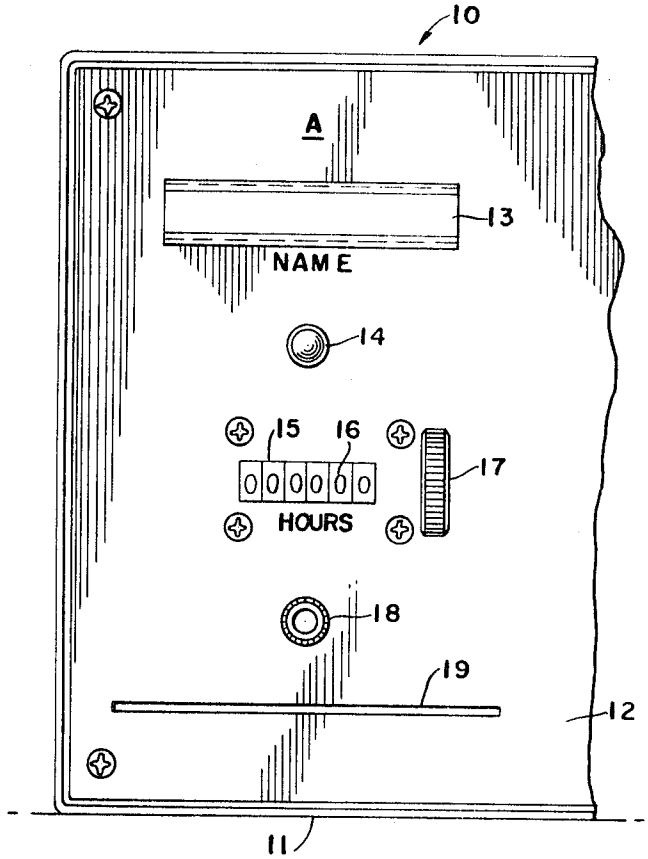


FIG. 3.

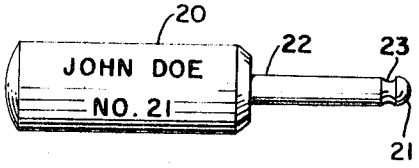
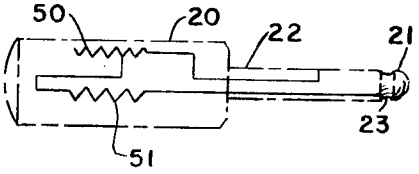


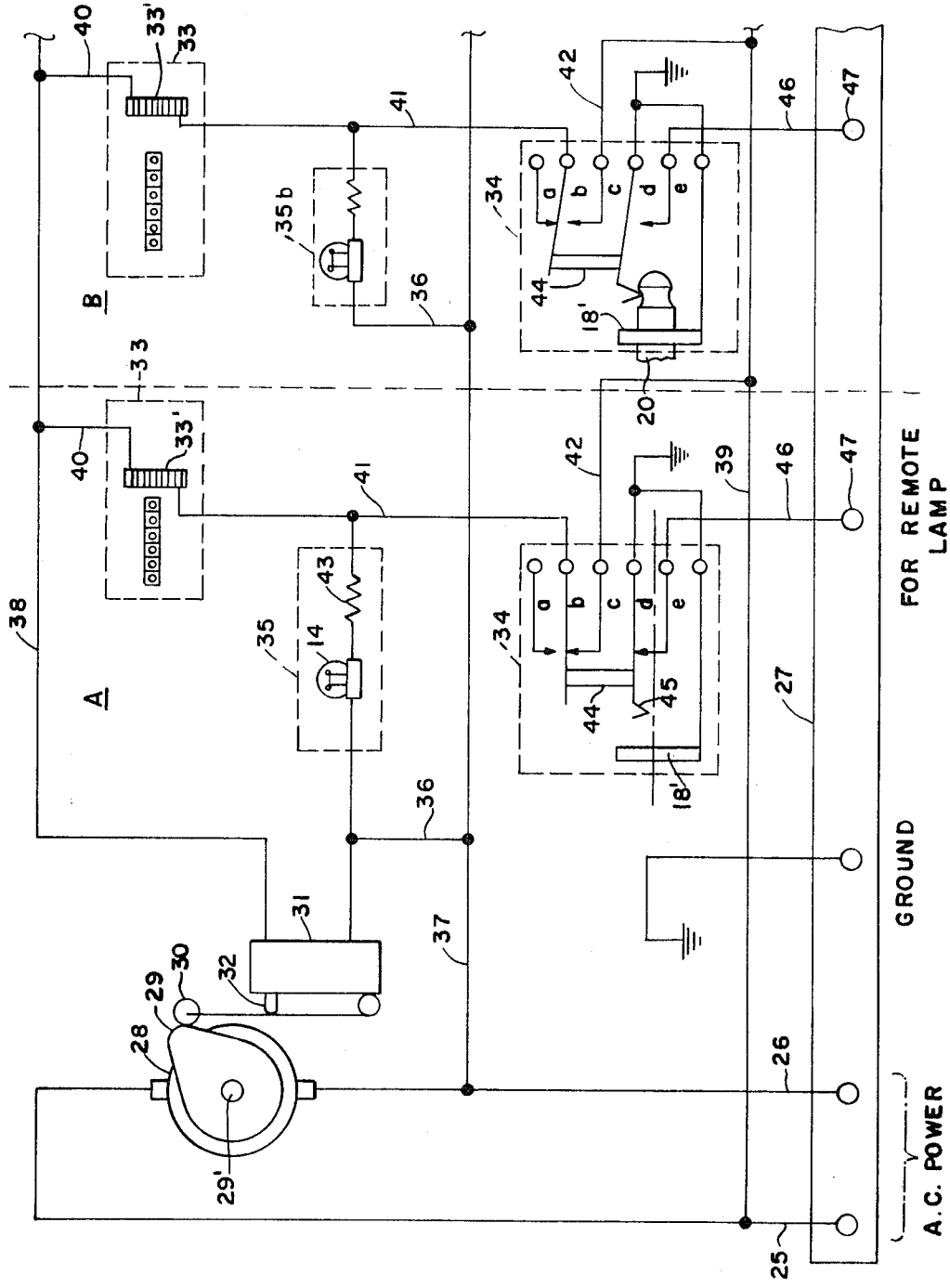
FIG. 5.



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FIG. 4.



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TIME ACCUMULATOR FOR ACCUMULATING WORKERS' TIME ON THE JOB

This invention relates to apparatus for accumulating the time spent on a job by one or more workers.

The apparatus disclosed herein is to be used in conjunction with the Cost Accumulator and Method for Cost Accumulating disclosed in the co-pending patent application Ser. No. 2,693, filed Jan. 14, 1970 in the names of Charles F. Strandberg, Jr. and Robert C. Strandberg and assigned to the same assignee as the present application.

In the cost accumulator disclosed in the aforesaid co-pending patent application each worker on a job is assigned a rate programmed resistance plug the resistance value of which is calibrated in accordance with a particular worker's pay scale. The cost accumulator comprises an electric oscillator whose frequency is a function of the resistance value of a resistance-capacitance timing circuit which includes parallel connected jacks into which the worker's rate programmed plugs are inserted when the workers are on a job and from which the plugs are removed when the workers go off a job. The frequency of the electrical oscillator is varied as the workers, one or more at various times, plug-in and withdraw their rate programmed plugs from the cost accumulator. Means is provided within the cost accumulator for producing electrical pulses corresponding in frequency to the output frequency of the electrical oscillator, and additional means is provided for counting the pulses and giving an indication of the number of pulses counted. Since the oscillator frequency varies as a function of the composite pay rate of all the workers on a job at a given instant, the accumulated count over a period of time can be made to be an indication of the accumulated cost of the job as the job progresses.

It is an object of the present invention to provide a time accumulator which will accumulate the time which individual workers (one or more) spend on a given job using the same rate programmed plugs provided for use with the aforementioned cost accumulator to control the time accumulator to start and stop the accumulation of time the worker spends on a job. By requiring the same worker-assigned actuator plug to start and stop the time accumulator as is required to set into the cost accumulator a worker's pay rate, the two machines can be made to complement each other.

It is another object of this invention to provide a time accumulator which is controlled by a worker assigned plug adapted to be plugged in and out of the time accumulator to start the accumulation of time when the worker assigned plug is withdrawn and to stop the accumulation of time when the plug is reinserted into the time accumulator.

It is another object of this invention to provide a system for substantially simultaneously counting labor cost on a job and accumulating individual worker's time on the same job, comprising an electrical cost accumulator, an electrical time accumulator and a rate programmed plug assigned to each worker on the job, each plug including an electrical resistance element set to a predetermined value corresponding to a worker's pay scale, the cost accumulator and the time accumulator both being controlled by the rate programmed plugs, in diverse ways, said time accumulator having plural means each actuated by the insertion of one of the worker's rate programmed plugs into a receptacle in said time accumulator for stopping the time accumulating function of said time accumulator for the particular worker, and actuated by the withdrawal of the rate programmed plug from said receptacle to start the time accumulating function of the time accumulator, said cost accumulator having plural receptacles for receiving at a given time one or more of said rate programmed plugs as the workers remove their assigned plugs from the time accumulator, said cost accumulator having means controlled by the rate programmed plugs to vary the accumulation of labor costs as a function of the composite rate of all the rate programmed plugs which are plugged into said cost accumulator at a given instant.

With the foregoing objects and features in view and such other objects and features as may become apparent as this specification proceeds the invention will be understood from the following description taken in conjunction with the accompanying drawings wherein like characters of reference are used to designate like parts, and wherein:

FIG. 1 is a perspective view of the time accumulator of this invention looking toward the display face thereof with one worker's plug in a jack and another plug about to be inserted into a jack, and with a cost accumulator mounted on top of the time accumulator;

FIG. 2 is a fragmentary front elevational view on an enlarged scale showing one display area of the display face of the invention;

FIG. 3 is an enlarged side elevational view of one of the plugs shown in FIG. 1;

FIG. 4 is a schematic wiring diagram of the invention showing two similar individual worker's time accumulator units with circuits for adding other similar individual workers' time accumulator units broken away; and

FIG. 5 is a schematic circuit diagram of one of the rate programmed plugs.

Referring now to the drawings in detail and particularly to FIG. 1 the time accumulator is designated by the reference number **10** and includes a box-like housing **11**, one wall of which is a display panel **12**. The display panel **12** has an exterior display face which includes a plurality of similar display areas A,B,C within the boundaries of the display face. One of the display areas is better shown by means of an enlarged view in FIG. 2. Within a display area are located a channel shaped receptacle **13** for receiving a worker's name tag, an indicator lamp **14** for indicating when energized that a worker is on the job, a viewing window **15** for viewing the numeral indicators **16** of an electrical counter, a counter reset dial **17**, a plug receiving jack **18**, and a time card receiving slot **19**. FIG. **1** shows one of the assigned worker's plugs **20** positioned in one of the jacks **18** in the display area B and a second worker's plug in line with, but removed from, the jack **18** in the display area A. While FIG. **1** shows only three display areas on the face of the cost accumulator it is to be understood that as many display areas and associated components may be provided as necessary to accommodate the anticipated number of workers on a job within, of course, practical limits of available space. The display areas are all similar and include similar components associated therewith. While the display areas are shown arranged in a single transverse row across the display panel in FIG. **1**, it should be recognized that the display areas can be variously arranged in multiple rows and columns to cover the face of the display panel depending on the number of display areas required to accommodate the workers on the job.

FIG. **4** is an electrical schematic diagram showing the components of the invention required to accumulate and indicate the time accumulated by two workers on a job. While only the components necessary for two workers are shown in FIG. **4**, similar components for any desired number of workers within practical limits can be readily added as will be subsequently explained.

The time accumulator includes a synchronous timing motor **28** which is energized continuously via power leads **25** and **26** from an A-C power source connected to the terminal strip **27** as shown in the lower left of FIG. **4**. The synchronous motor speed is preferably chosen to be 100 revolutions per hour, or one revolution every 36 seconds. A rotary cam **29** attached to the shaft **29'** of the motor actuates a normally open switch **31** momentarily during each revolution by engaging the pivoted lever arm **30** and forcing the lever arm clockwise to depress the outwardly biased switch actuator button **32**. The normally open switch **31** and associated synchronous motor driven cam **29** provide a means for producing a periodic timing pulse representative of a predetermined increment of time. The periodic switch **31** is connected on one side to power lead **26** via conductor **36** and power branch conductor **37** and is con-

nected on its other side to circuit conductor **38**. The circuit conductor **38**, the power branch conductor **37** and another power branch conductor **39** connected to power line **25** serve as trunk lines to which multiple time accumulator units are connected. Each time accumulator unit includes an electrical counter **33**, and a normally closed telephone jack type switch **34** connected in series across the circuit conductor **38** and the power line branch conductor **39**. Each time accumulator unit also includes an electrical indicator means **35** which preferably includes a panel lamp **14**, and a series resistor **43**, connected on one side through conductor **36** to the power branch line **37** and on the opposite side through conductor **41**, the normally closed switch **34**, and conductor **42** to the power branch line **39**.

The telephone jack type switch **34** preferably includes a single-throw set of contacts *d,e* and a double-throw set of contacts *a,b,c*. The movable contacts *b* and *d* of the two sets of contacts are interconnected by an insulated rod **44** so as to be actuated simultaneously when a worker assigned separable actuating device such as the rate programmed plug **20** is inserted in the jack receptacle ring **18'**. A V-shaped bend projecting downwardly from the free end of the movable contact *d* is positioned with respect to the axis of the receptacle ring **18'** so as to be engaged by the end **21** of the plug **20** and displaced outwardly from the axis of the receptacle ring **18'**. As shown in FIG. **4** the switch **34** in unit A is closed, while the switch **34** in unit B is held open by a plug **20** inserted in the jack **18**. The contacts *a* and *c* of the switch **34** are fixed contacts, alternately engaged by the movable contact *b* in the closed and open positions of the switch respectively. The contact *b* is connected through conductor **41** to one side of the counter solenoid coil **33'** and through conductor **40** connecting the other side of the counter coil **31'** to the circuit conductor **38**. Normally when no plug **20** is inserted in the jack **18** the movable contacts *b* and *d* are resiliently biased to engage the fixed contacts *c* and *e* respectively. The V-shaped bend (which will be referred to as a detent) on the contact *d* will engage the annular groove **23** on the plug shank **22** when the plug is fully inserted in the receptacle **18** and frictionally hold the plug in place. Contact *c* is connected through conductor **42** to the power line branch conductor **39**. Movable contact d and the metal jack ring **18'** are both connected to ground, and the fixed contact *e* is connected via conductor **46** to a terminal on the bus bar **27** which may be connected through appropriate wiring to a remote lamp not shown.

If the rate plug **20** is not inserted in the jack **18**, the condition of switch **34** will be as shown in unit A (FIG. **4**) and the panel lamp **14** will be continuously energized from the A-C source through the normally closed contacts *b,c* of the switch **34**. Through these same contacts *b,c* the counter coil **33'** will be momentarily energized each time the periodic switch **31** is actuated by the cam **29** attached to the shaft of the synchronous motor **28**. An optional remote lamp terminal **47** will be grounded through the contacts *d* and *e* of the switch **34**. The remote lamp may serve to show which employees are working.

If the rate plug **20** is inserted in the jack **18** (the condition shown in unit B, FIG. **4**) both sets *b,c* and *d,e* of normally closed contacts in switch **34** will open and no power will be delivered to the panel lamp **14** and the counter coil **33'**. Since the metal jack ring **18'** and the movable contact d are grounded at all times both the body **22** and tip **21** of the rate plug are grounded while in the jack **18** thereby eliminating any electrical hazzard.

The operation of the time accumulator will be apparent from the foregoing description. As long as the time accumulator is connected to A-C power through leads **25** and **26** the synchronous motor **28** will be energized, and will rotate cam **29** at a uniform speed to repeatedly open and close switch **31**. Since circuit conductor **38** is connected through the periodic switch **31** to power branch conductor **37** electrical pulses will be available to any number of accumulator units connected in closed circuit from the circuit conductor **38** to the other power branch conductor **39**. Each accumulator unit including a counter coil **33'** in circuit with normally closed contacts *b,c* of the switch **34**, will be energized to count the pulses appearing on the circuit conductor **38** as long as a rate plug **34** is not inserted in the jack **18**, and the panel lamps **14** being connected directly from the power branch conductor **37** through the closed contacts *b,c* of the switch **34** to the other power branch conductor **39** will be energized. As previously explained the normally closed condition of switch **34** is the condition when the rate plug is not inserted in the jack **18** and is the condition when the worker is on the job, the rate plug **20** having been removed from the jack **18**. When the worker goes off the job he reinserts the plug **20** in the jack **18**, the switch **34** is opened, the panel light **14** goes off and the counter **33** ceases to count.

Whenever a job is completed or at the end of a payroll period a job supervisor can reset the time accumulator units to zero by means of the counter reset dials **17**. The counters **33** should be reset only with the plugs **20** for each worker plugged in. The counters **33** indicate hours to the one-hundredth of an hour.

The time accumulator panel **12** may optionally be furnished with slots **19** to hold time cards on which the daily ascending balance of time worked can be entered.

The separable actuator **20** sometimes referred to as a plug, rate plug, or rate programmed plug, is shown in detail in FIGS. **3** and **5**. It may be the same plug **24** as is disclosed and described in co-pending application Ser. No. 2,693 previously referred to, and must be similar to the rate programmed plug **24** disclosed in the aforesaid pending application if it is to be used in conjunction with the cost accumulator disclosed in the aforesaid application. FIG. **5** shows schematically the electrical circuit arrangement of one of the plugs **20** which includes a calibrated resistance means connected in circuit between the conductive shank body **22** of the plug **20** on one side and the conductive tip **21** on the other side. The calibrated resistance means includes a potentiometer **50** and fixed resistor **51** connected in series. The resistance means is selected and calibrated to be a function of the pay rate of the worker to whom the plug is assigned. The tip **21** and the body portion **22** of the plug shank are electrically separated by an insulator portion which may be in the groove **23**.

Again referring to FIG. **1**, a cost accumulator which is described in detail in the aforesaid application Ser. No. 2,693 is shown positioned on top of the time accumulator housing. While the cost accumulator does not have to be mounted on top of the time accumulator the two devices should be located in close proximity if they are to be used in conjunction with one another so that when a worker pulls his plug **20** from the time accumulator he can immediately insert his plug in one of the jacks J of the cost accumulator. Or, when the worker pulls his plug from the cost accumulator he can immediately insert his plug in his assigned time accumulator unit in the time accumulator. The rate programmed plug **20** when inserted in one of the cost accumulator jacks J provides an input of the worker's pay rate into the cost accumulator.

While the time accumulator particularly described in this specification has been described as part of a system including a cost accumulator and a rate programmed plug which serves both the time accumulator and the cost accumulator, it is not intended that the use of the time accumulator be limited to such a system. The time accumulator may readily be used as a separate time accumulating device, requiring only a separable actuator for controlling the switch **34**.

What is claimed is:

1. Apparatus for accumulating the time a worker is on a job comprising (a) an electric power source, (b) means for producing a periodic electric timing pulse representative of a predetermined increment of time, (c) an electrical counter means in circuit with said periodic pulse producing means for counting said periodic pulses, (d) normally closed switch means in circuit with said periodic pulse producing means and said counter means for connecting and disconnecting said

periodic pulse producing means and said counter to said electric power source, said normally closed switch means requiring a separable actuating device to open said switch and (e) a worker assigned separable actuating device which is normally applied by the worker to open said normally closed switch means when the worker stops working, and is withdrawn by the worker from said normally closed switch means when the worker goes on a job to permit said normally closed switch means to close and said counter to count the periodic pulses produced by said periodic pulse producing means during the time said separable actuating device is withdrawn.

2. The apparatus set forth in claim 1 together with an electric indicator means connected in circuit with said power source and said normally closed switch to be energized when said normally closed switch is closed and said counter is counting for indicating when a worker is on the job.

3. The apparatus set forth in claim 1 wherein said periodic timing pulse producing means comprises a periodic switch, and motor actuated means for opening and closing said periodic switch in a continuous manner.

4. The apparatus set forth in claim 1 wherein there are plural electrically actuated counters and plural normally closed switch means, there being one counter and one normally closed switch means in multiple parallel branches and each of said branches being serially connected with said periodic timing pulse producing means and said electric power source.

5. The apparatus set forth in claim 4 wherein there are plural electric indicator means for indicating which workers are on the job there being at least one indicator means for each normally closed switch means.

6. The apparatus set forth in claim 4 together with a box-like housing having one wall which is a display panel with front and rear faces, the front face of said display panel comprising a plurality of similar display areas within the confines of said display face, and there being mounted behind each display area within said housing, one of said plurality of counters, and one of said normally closed switches, each display area having means for viewing the counter mounted behind said display area and access means within the display area extending through said display panel for receiving said separable actuating device for opening said normally closed switch.

7. The apparatus set forth in claim 6 wherein there are plural electric indicator means corresponding in number to the number of said display areas, there being one electric-indicator means mounted within each of said display areas, each of said indicator means being connected in circuit with said power source and with the normally closed switch behind a corresponding display area to be energized when the normally closed switch behind a corresponding display area is closed for indicating when a worker assigned separable actuator for said corresponding normally closed switch is withdrawn and said worker is presumed to be on the job.

8. The apparatus set forth in claim 7 together with a plurality of remote electrical indicator means which are located remotely from said housing there being at least one remote indicator for each of the electrical indicator means mounted in said housing, for presenting a remote indication corresponding with the indication of a particular indicator means in said housing.

9. The apparatus set forth in claim 1 wherein said normally closed switch means includes a receptacle for receiving said worker assigned separable actuating device, and means positioned within the receptacle for engaging said separable actuating device for opening said normally closed switch when said separable actuating device is inserted into said receptacle.

10. The apparatus set forth in claim 9 wherein the receptacle of said normally closed switch includes means for grounding said separable actuating device.

11. Apparatus for accumulating the time a worker is on a job comprising (a) an electric power source, (b) means for producing a periodic electric timing pulse representative of a predetermined increment of time, (c) an electrical counter means in circuit with said periodic pulse producing means for counting said periodic pulses, (d) normally closed switch means in circuit with said periodic pulse producing means and said counter means for connecting and disconnecting said periodic pulse producing means and said counter to said electric power source, said normally closed switch means requiring a separable actuating device to open said switch and (e) a worker assigned separable actuating device which is normally applied by the worker to open said normally closed switch means when the worker stops working, and is withdrawn by the worker from said normally closed switch means when the worker goes on a job to permit said normally closed switch means to close and said counter to count the periodic pulses produced by said periodic pulse producing means during the time said separable actuating device is withdrawn, said normally closed switch means including a receptacle for receiving said worker assigned separable actuating device, and means positioned within the receptacle for engaging said separable actuating device for opening said normally closed switch when said separable actuating device is inserted into said receptacle, said separable actuating device being a phone-type plug including a handle portion and a shank projecting from said handle portion, and said receptacle having a complementally shaped opening for receiving said shank, said shank having a body portion and a tip end portion and an annular groove adjacent said tip end portion, and means positioned within said receptacle for engaging said separable actuating device having a resiliently biased projection for engaging said groove and frictionally holding said separable actuating device in said receptacle.

12. Apparatus for accumulating the time a worker is on a job comprising (a) an electric power source, (b) means for producing a periodic electric timing pulse representative of a predetermined increment of time, (c) an electrical counter means in circuit with said periodic pulse producing means for counting said periodic pulses, (d) normally closed switch means in circuit with said periodic pulse producing means and said counter means for connecting and disconnecting said periodic pulse producing means and said counter to said electric power source, said normally closed switch means requiring a separable actuating device to open said switch and (e) a worker assigned separable actuating device which is normally applied by the worker to open said normally closed switch means when the worker stops working, and is withdrawn by the worker from said normally closed switch means when the worker goes on a job to permit said normally closed switch means to close and said counter to count the periodic pulses produced by said periodic pulse producing means during the time said separable actuating device is withdrawn, said normally closed switch means including a receptacle for receiving said worker assigned separable actuating device, and means positioned within the receptacle for engaging said separable actuating device for opening said normally closed switch when said separable actuating device is inserted into said receptacle, said separable actuating device being a phone-type plug including a handle portion and a shank projecting from said handle portion, said receptacle having a complementally shaped opening for receiving said shank, said shank having a body portion and a tip end portion and an annular groove adjacent said tip end portion, and said means positioned within said receptacle for engaging said separable actuating device having a resiliently biased projection for engaging said groove and frictionally holding said separable actuating device in said receptacle, said body portion of said shank and said tip being of electrically conductive material and being separated by an insulated portion, the handle portion of said plug being hollow and enclosing a calibrated electrical resistance means, and means connecting one side of said resistance means to said tip portion and means connecting the other side of said resistance means to said body portion.

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