

Aug. 22, 1950

W. OKUNIEW
APPARATUS FOR RECORDING THE SUCCESSIVE
OPERATIONS OF MACHINES

2,519,925

Filed Aug. 30, 1947

3 Sheets-Sheet 1

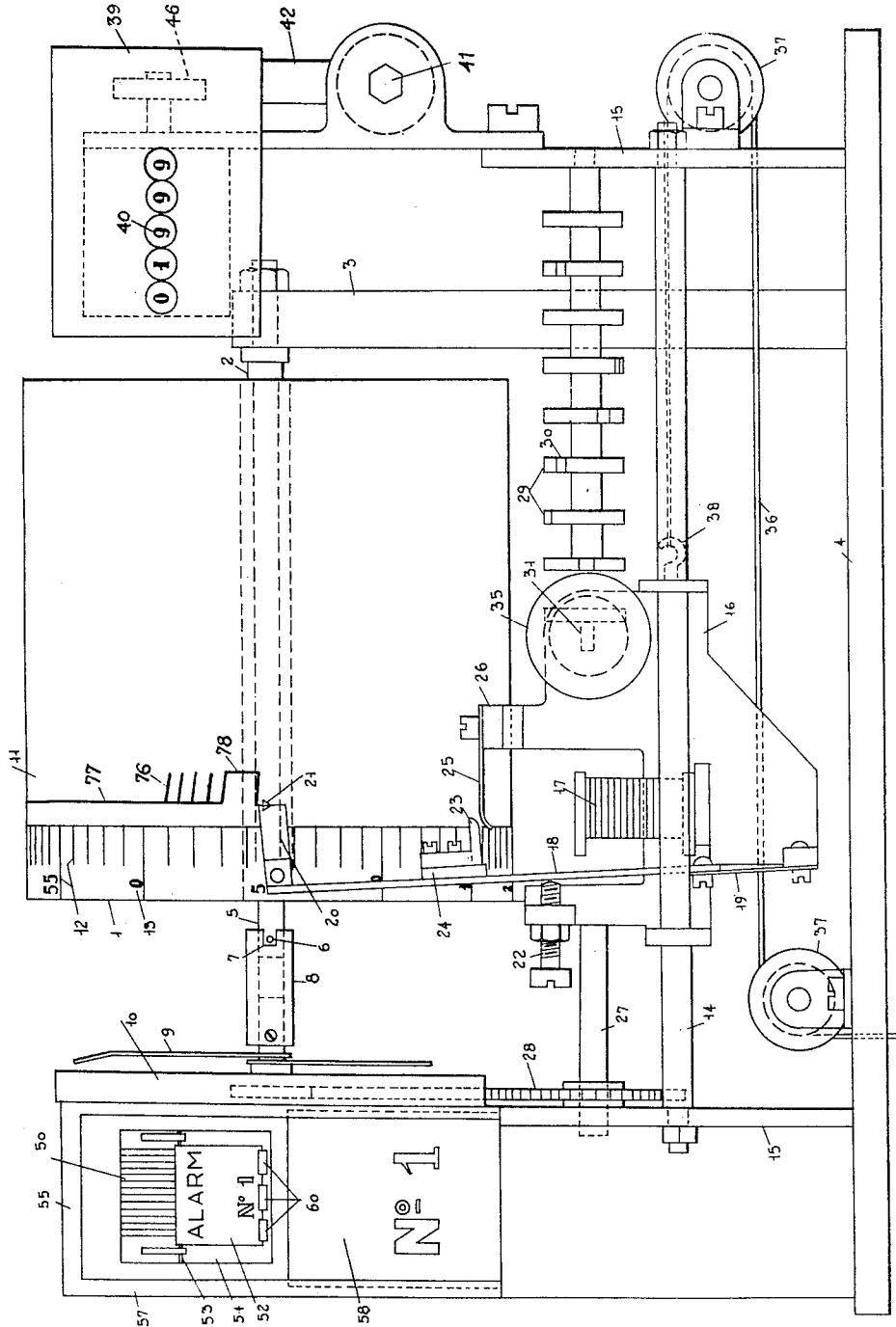


FIG 1

INVENTOR:
WOLF OKUNIEW
BY *heer M. Strauss* PAT.

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3 Sheets—Sheet 2

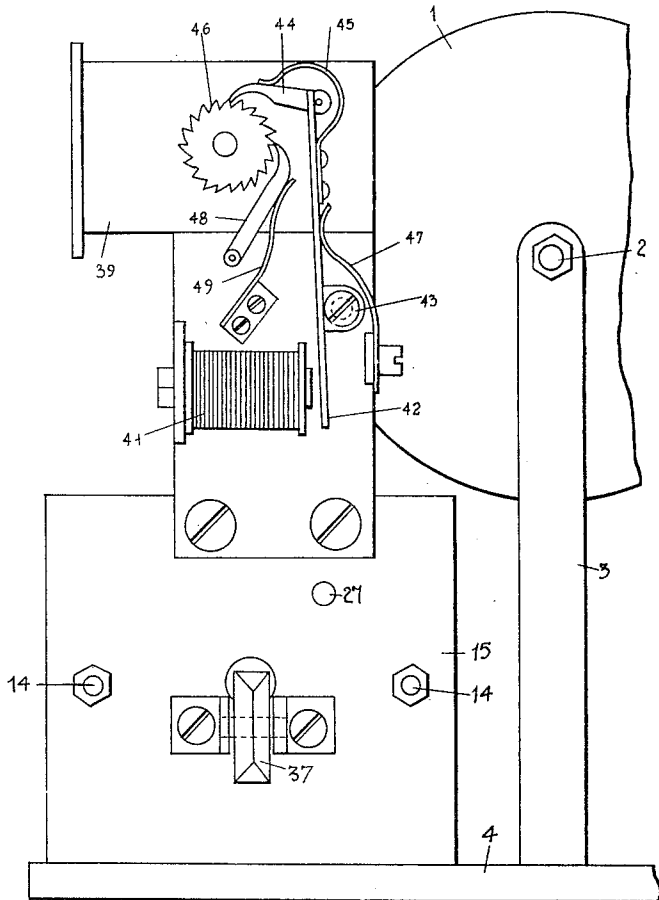


FIG. 2

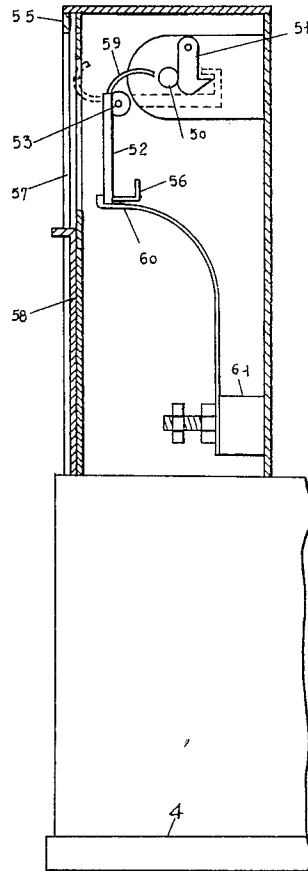


FIG. 4

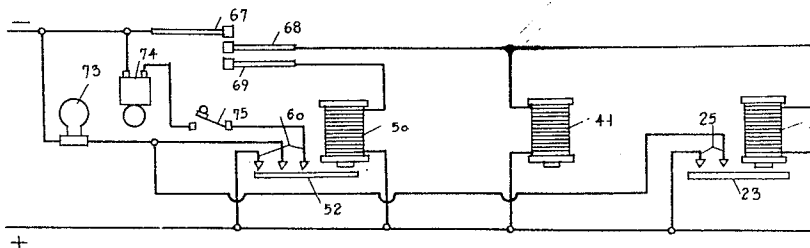


FIG. 6

INVENTOR.
WOLF OKUNIEW

by *Leon M. Strauss*
PAT

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3 Sheets-Sheet 3

FIG. 3

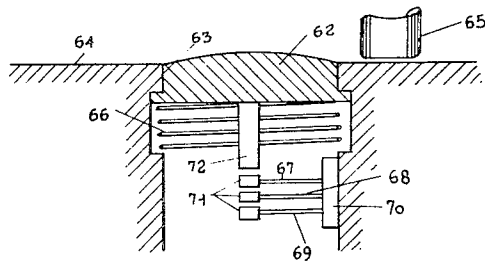
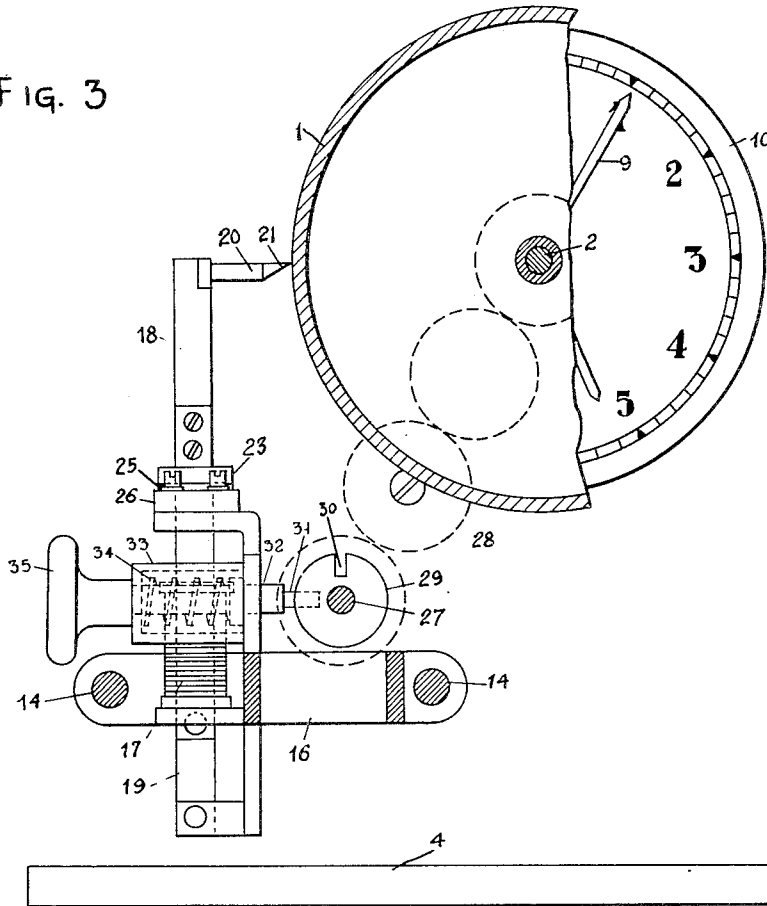


FIG. 5

INVENTOR:
WOLF OKUNIEW

by

Leon M. Strauss
PAT.

UNITED STATES PATENT OFFICE

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APPARATUS FOR RECORDING THE SUCCESSIVE OPERATIONS OF A MACHINE

Wolf Okuniew, Buenos Aires, Argentina

Application August 30, 1947, Serial No. 771,522

3 Claims. (Cl. 346-17)

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The present invention relates to apparatus for recording the successive operations of a machine, and more particularly to machines of the kind effecting a reciprocating or rhythmic motion, such as for instance, self-acting, embossing presses and similarly operating machines.

It is a purpose of the invention to provide an apparatus which permits of controlling by means of a graph traced on a recording sheet the number of operations carried out by the machine, the time elapsed between two successive operations, the time during which the machine has been inoperative and the abnormal conditions that may have taken place during the action of the recording apparatus.

The apparatus in accordance with the invention is essentially characterized by a carrying member for the recording sheet, capable of keeping the latter in uniform motion, a stylographic writing member mounted on the armature of an electromagnet in such manner that energizing of said electromagnet causes the writing member to trace a line upon said recording sheet, said electromagnet being mounted upon a carriage guided to travel in a transverse direction with regard to said recording sheet and moved by a source of power synchronized with said recording sheet; the apparatus furthermore includes electrical contacting means mounted between a stationary portion and a movable portion of the machine to be controlled to send an impulse to said electromagnet in synchronized relation to the rhythm of successive operations of said machine.

The present invention will be fully described hereinafter by way of example in a preferred embodiment thereof which is disclosed in the accompanying drawings, in which:

Figure 1 is a front view of the apparatus according to the invention.

Figure 2 is a partial view in elevation of the right hand end of the apparatus.

Figure 3 is a cross sectional view on the line 3-3 of Figure 1.

Figure 4 is a cross section taken on the line 4-4 of Figure 1.

Figure 5 is a longitudinal section of the contacting device.

Figure 6 is a wiring diagram of the apparatus.

The apparatus as illustrated, comprises a horizontal cylinder 1 rotatably journaled on a stationary shaft 2 supported by a standard 3 disposed on a base plate 4. The end of the cylinder 1 opposite the standard 3 carries an axial pivot 5 integral with the cylinder and provided with a pin 6 engaging co-operating notches 7 of a sleeve

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8 coaxial with said pivot 5 which latter penetrates into said sleeve. The sleeve 8 is secured upon the bushing of the minute hand 9 of a clock 10 in such manner that the cylinder 1 will rotate jointly with said minute hand, that is to say, that it will complete a full turn in one hour. Around the cylinder 1 is wrapped a paper sheet 11 having printed thereon at its left hand side a number of divisions 12 which stand for minutes, the marks corresponding to five minutes' intervals being preferably longer than the intermediate ones, and digits 13 beside said marks indicating the corresponding minutes.

In front of said cylinder 1 two horizontal and parallel bars 14 are supported at their ends by a pair of brackets 15 secured upon the base plate 4. Said bars 14 are intended to serve as guiding means for a carriage 16 permitting the latter to travel in a parallel direction to the cylinder 1. The carriage 16 has mounted thereon a stylographic device including an electromagnet 17 secured on said carriage and having an armature 18 in a substantially vertical position placed in front of the poles of said electromagnet and mounted on the end of a flexible metal sheet 19 secured in turn on said carriage. This resilient mounting permits the armature 18 to be attracted by the electromagnet each time the latter is energized and to separate therefrom when the magnetic attraction becomes inoperative. Said armature carries at its upper end a flexible metal sheet 20 disposed parallel to the cylinder 1 and carrying at its end the stylographic member 21 arranged to bear perpendicularly against the sheet of paper 11 at the level of the horizontal diameter of the cylinder 1. The carriage 16 carries a regulating screw 22 against the end whereof the armature is made to bear in its inoperative position, thus permitting said screw to regulate the exact position of said armature. The latter carries a metal contacting member in the shape of an angular bracket 23 and insulated from the armature by means of an insulating pad 24. In front of said contacting member 23 two flexible metal tongues 25 are fastened in horizontal position upon an insulating pad 26 carried by the carriage 16. In the inoperative position of the armature the contacting member 23 is separated from the tongues 25; however, when the armature 18 is attracted by the electromagnet 17, said member 23 will bear upon the pair of tongues 25 bridging them to a purpose which will be explained hereinafter. A device is also provided by which the carriage 16 may be shifted to the right on its guides when the cylinder 1 completes a

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full turn. Said device comprises a shaft 27 parallel to the cylinder 1 and rotatably journaled in bearings carried in the brackets 15. The shaft 27 rotates in synchronized relation to the clock 10 by a transmission of gears 28 transmitting to said shaft the motion of a convenient part of the clockwork mechanism. The shaft 27 carries secured thereto a number of discs 29 spaced at even intervals, each disc being provided with a radial notch 30. The carriage 16 has in front of said shaft 27 a stop 31 of such section that it may freely pass through the notches 30; said stop forming the end of a rod 32 guided as to move at right angles to said shaft 27, by means of a guide 33 forming part of the carriage 16 and having a compression spring 34 keeping normally said rod in its end position in which the stop 31 projects in the way of the discs 29. At its other end opposite the one carrying the stop, said rod has a head 35 serving as a handle for pulling it backwards by hand at the end of the travel of the carriage to withdraw the stop out of the reach of the discs and to permit return of the carriage to its starting position. The position of the notches of two adjacent discs is such that they do not face each other, the stop 31, after passing through one of the notches facing the full portion of the following disc. Said position of the notches is also such that the stop 31 will face the notch of the disc against which it bears, in the precise moment when the cylinder 1 has completed a full turn. The number of discs 29 is equal to the number of turns to be completed by the cylinder to fill a record sheet 11. In the case illustrated by way of example, there are nine discs 29 corresponding to nine successive shiftings of the carriage 16, to fill out nine columns on the record sheet 11, each column corresponding to one turn of the cylinder 1, carried out in an hour, which means that the record on the sheet is completed by a total working time of nine hours.

The power required to effect the travel of the carriage to the right is, in the case illustrated, a weight, not visible in the drawings, suspended from a cable 36 which, passing over guide pulleys 37, is at its other end tied to a hook 38 of the carriage 16.

The apparatus in accordance with the invention, in the illustrated embodiment, also comprises a counter mechanism, shown at 39, of the type indicating by a visible number the number of operations graphically recorded on the record sheet 11. This counting mechanism is actuated by an electromagnet 41 conveniently mounted on the apparatus and having an armature 42 mounted to swing on a fixed pivot 43. Said armature carries at its end a pawl 44 kept by means of a spring 45 in contact with a ratchet wheel 46 forming part of the counting mechanism. A spring 47 constantly bears against the armature 42 in opposite direction to the attraction of the electromagnet. Said ratchet wheel 46 is held against backward rotation by a further pawl 48 subjected to pressure by a spring 49.

The invention also provides in the apparatus illustrated, an alarm device for indicating deficient functioning of, or tampering with the contacting device mounted upon the machine subject to control with the purpose of producing the impulses sent to the recording apparatus. Said alarm device includes an electromagnet 50 which, on being energized, attracts a small pawl 51 in oscillating arrangement, normally keeping lifted an oscillating plate 52 mounted on a horizontal shaft 53 in front of a window 54 of a

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fixed front wall 55. Said plate 52 is backwardly provided with a hook 56 engaging said pawl 51 for the purpose of normally keeping said plate in a lifted position, the pawl 51, on being attracted, leaves said plate 52 to fall into a vertical position through said window. The plate is provided with an inscription reading "Alarm" and also bearing the number of the machine subject to control. In front of said window a small plate 58 is slidably arranged in vertical guides 57, normally closing said window and resting in said position due to the pressure exerted thereagainst by a shoe 59 forming integral part of the plate 52. In the alarm position the shoe 59 leaves the plate 58 which consequently falls down leaving freely visible the plate 52. Said plate 58 also bears the indication of the number of the machine to which the recording apparatus is coordinated. Furthermore, the oscillating plate 52, on arriving at the vertical alarm position, contacts by its lower margin with three metal tongues of flexible construction 60, fastened upon an insulating pad 61.

The contacting device mounted upon the machine subject to control includes in the illustrated case (Figure 5) a piece 62 the upper surface whereof is slightly arcuate, and which is mounted to move within an opening 63 of a piece 64 fastened on the machine to be controlled and having a flat upper surface. Said machine has on one of its moving parts a stop 65 arranged to slidably move over the surface of said piece 64. The piece 62 is vertically slidable and normally kept in its projecting position by means of a spring 66. Beneath said piece 62 three flexible metal strips 67, 68 and 69 parallel to each other and in superposed relation are fixed on an insulating block 70, each of said strips having a contacting head 71, the heads 71 being normally separated from each other by a very small distance which is just sufficient to displace said piece 62, due to the passage of the stop 65 by the amount necessary to obtain by means of an internal extension 72 of piece 62 the pressing together of the strips 67 and 68, and also by a slight additional pressure abnormally exerted on said piece 62, to bring about contact between the strips 68 and 69.

Figure 6 shows the electrical connections between the various electrically acting parts of the apparatus according to the illustrations. The contact 67 of the contacting device mounted on the machine subjected to control is connected with the negative pole of a source of current; contact 68 of the same device, is connected with the electromagnets 17 and 41 of the recording apparatus and of the operation counting device, respectively; and contact 69 of the contacting device is connected with the electromagnet 50 of the alarm device. The returns of all of these electromagnets are connected with the other pole of the source of current. The two flexible contacting strips 25 mounted on the carriage 16 and which may be bridged by the piece 23 of the armature are connected, respectively, with the positive pole of the line and with a lamp 73 connected in turn with the other pole of the line. The three flexible contact strips 60 of the alarm device which may be bridged by the small plate 52, are connected, respectively, with one of the poles of the line, with said lamp 73 and with an alarm bell 74 connected in turn with the other pole of the line. A switch 75 is provided in the bell circuit to put the bell out of use if desired. In Figures 1 to 4 the electrical connections have

not been shown in order to avoid complications and inasmuch as they are not indispensable for understanding the invention.

The illustrated apparatus works as follows:

Upon the passing of the stop 65 integral with the movable part of the machine subject to control, over the piece 62 of the contacting device (see Figure 5), said piece 62 is pressed into its recess by a distance sufficient to establish a contact between the flexible strips 67 and 68, thereby closing the circuits of the electromagnets 17 and 41. The energizing of the electromagnet 17 attracts the armature 18 to the right and the stylographic writer 21 mounted on said armature traces a substantially horizontal line 76 on the recording sheet 11. The passage of the stop 65 being almost instantaneous, the energizing of the electromagnet will cease also instantaneously and therefore the armature will return to inoperative position under the pull of the spring 19, the stylograph writer 21 also returning to its initial position along the line traced during its forward stroke. Inasmuch as the cylinder 1 is continually rotating, the stylograph traces between two operations, a vertical line 77 on the recording sheet, to the left of the horizontal traces 76. While the electromagnet 17 is energized, the armature 18 connects the two flexible strips 25 by means of the angle bracket 23. This action will complete the circuit of the lamp 73 which will light up for an instant only, i. e. while the passage of the stop 65 over the piece 62 proceeds. The electromagnet 41 attracts the armature 42 the pawl 44 whereof slides back by one tooth on the ratchet wheel 46 of the operations counting device 39; the attraction being stopped, said armature, under the pressure of its actuating spring 47, returns to its original position rotating said wheel 46 which actuates the counting mechanism, causing a new digit 40 to appear on the face of said counting device.

When the cylinder 1 has completed a full turn, the shaft 27 has been rotating also whereby the disc 29 against which the stop 31 is bearing places its notch 30 in front of said stop, permitting the carriage 16, under the traction of the cable 36, to travel to the right until the stop 31 abuts against the disc 29 in the following position, where a new column of traces is started on the recording sheet 11. Once the carriage has arrived at the end of its travel, the recording sheet is exchanged for a blank and the carriage is replaced by hand to its starting position by pulling the head 35 to permit of retraction of the stop 31 beyond the reach of the discs 29.

Upon an abnormal operation occurring in the device of contact mounted on the machine subject to control, either due to a faulty functioning of the latter or due to having been tampered with by a worker, upon excessive pressure being applied to the piece 62, contact will be established between the three flexible strips 67, 68 and 69, which, aside from the circuit of the electromagnets 17 and 41, completes another circuit through the alarm electromagnet 50 which upon being energized will drop the plate 52 the shoe 59 whereof will cease to hold the plate 58; the latter, on dropping, will uncover said first plate 52 which constitutes a telltale of the abnormality produced and of the machine where said abnormality has taken place. Simultaneously, the plate 52 will bridge the three flexible strips 60 thus closing the circuits of the lamp and of the alarm bell, 73 and 74, respectively. The lamp 73 will therefore stay lighted continually as long as the

abnormality is not eliminated, whereas during the normal functioning of the machine only momentary flashes are produced. During the persistence of the abnormal conditions, the electromagnet 17 will also keep the armature 18 constantly in its attracted position and therefore the stylographic writer 21 will trace a vertical line 78 to the right of the traces 76. In order to place the apparatus again in working condition after having dealt with the abnormality occurred in the contacting device mounted on the machine subject to control, it is sufficient to lift the plate 52 to its normal position and then lift the plate 58 thus closing the window through which the first plate 52 has become visible, its shoe being returned to its position of holding said second plate 58 in its lifted position. The telltale members being returned to this position, the circuits of both the lamp and the alarm bell are opened and thus, inoperative.

The record sheet 11 permits of accurate and ready control of the functioning of a determined machine. The traces 76 correspond each to one operation of the machine, the vertical trace 77 at the left hand side shows the intervals between two consecutive operations and the vertical trace 78 at the right hand side shows the time during which the contacting device mounted on the machine subject to control has been under abnormal operation. The indicating divisions 12 of the record sheet 11 show accurately the time elapsed during two consecutive operations, making it possible to appreciate whether the machine has been working at its normal rhythm or not and in the latter case, permitting of finding the cause of the deficient yield thereof.

Evidently the present invention is by no means limited to the example described and illustrated, its scope being clearly determined by the appended claims.

Having thus described the invention, what is claimed as new and desired to be secured by Letters Patent, is:

1. An apparatus for recording consecutive operations of a machine comprising: a record sheet carrier actuated at a uniform progressing motion, a stylographic writer mounted on the oscillating armature of an electromagnet in such manner that at each oscillation of said armature said stylographic writer will trace a line upon said record sheet, a carriage having said electromagnet and its armature mounted thereupon and suitably guided to travel in a transverse direction to the said record sheet, means acting upon the carriage to impell the same in the transverse direction, a shaft parallel to the travel of said carriage, and means for actuating the same in synchronized relation with the record sheet and provided with discs spaced at even intervals provided with radial notches, a stop on said carriage disposed to abut against said discs during the travel of said carriage and of such profile as to be able to pass through the notches of said discs in predetermined positions thereof, a lamp device for indicating the operation of the electromagnet and the stylograph writer, an alarm device for indicating the tampering of parts of the machine, and actuating means mounted on the machine to be controlled including a member adapted to be guided in a stationary portion of the machine and a member adapted to be mounted on a movable portion of said machine in such manner as to push the guided member during its passage over same, and circuit means including electrical contacting members adapted to be actuated to be closed by said guided mem-

ber upon being pushed in such way that one of the contacting members will form the circuit of the stylograph actuating electromagnet and of the lamp device, and the other contacting members will form the circuit of the alarm device in which said lamp is also included.

2. An apparatus for recording the consecutive operations of a machine comprising a base supporting structure, a recording sheet drum mounted on the base structure for rotation thereon, a clock mechanism mounted on the base structure and connected to the record sheet drum to cause the rotation of said drum in a time-controlled manner, a carrier device mounted on the base structure for movement longitudinally of the drum, a magnetically operated stylographic writer mounted on the carrier device and adapted to engage with a record sheet on the drum to make transverse and vertical lines thereon, a shaft extending parallel to the record sheet drum and rotatably journaled in the supporting structure, said shaft connected to the clock mechanism to be rotated in synchronized relation thereto, a series of discs on said shaft respectively spaced from one another, each of said discs having a radially extending notch therein, the notches of adjacent discs being angularly offset with respect to one another, means tending to move the carriage transversely of the drum and across the edges of the discs, a releasable stop on said carrier adapted to engage with the

sides of the discs one at a time to keep the recordation for a given rotation of the record sheet within successive registration columns, said stop adapted to pass through the radially extending notch of the disc upon the notch arriving into registry with the stop, and electric circuit means having contact members adapted to be closed by the relative movement of parts of the machine for effecting a transverse marking of the stylographic writer.

3. An apparatus for recording consecutive operations of a machine as defined in claim 2 and an alarm device for indicating the tampering with the parts of the machine, and said electric circuit means including a further contact adapted to be closed by the abnormal movement of the machine part when connected with the alarm device whereby to cause its operation.

WOLF OKUNIEW.

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