July 24, 1934. W. M. PERRY ET AL 1,967,900

PEN UNIT CONSTRUCTION

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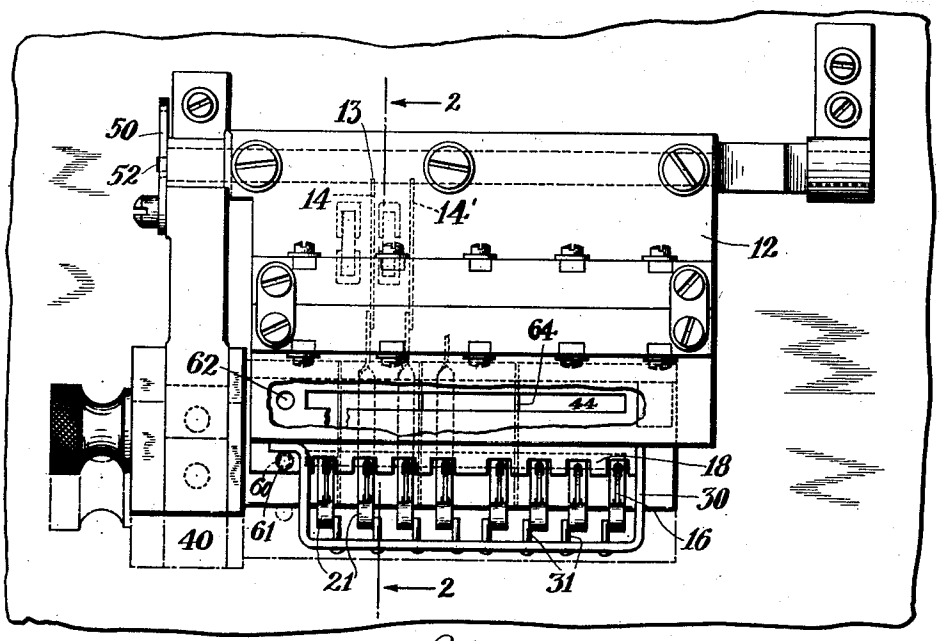


Fig. 1.

Fig. 2.

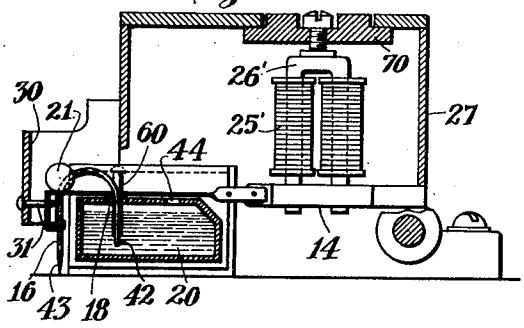


Fig. 3.

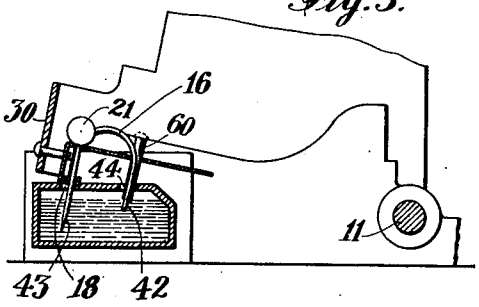
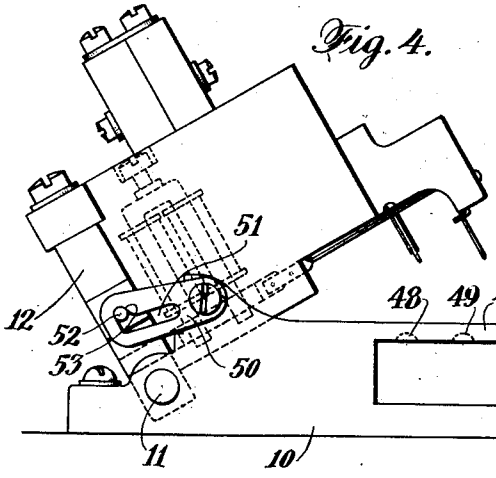


Fig. 4.



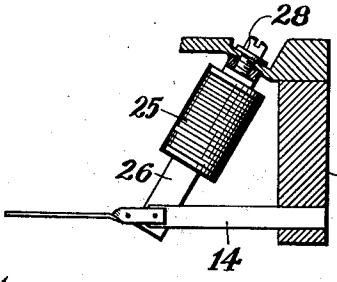


Fig. 5.

INVENTORS
WALTER MERTON PERRY
LOREN J. DeLANTY

BY Joseph N. Lipschutz
ATTORNEY

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PEN UNIT CONSTRUCTION

Walter Merton Perry, Brooklyn, and Loren J. De Lanty, Spring Valley, N. Y., assignors to Sperry Products, Inc., Brooklyn, N. Y., a corporation of New York

Application August 1, 1931, Serial No. 554,420

6 Claims. (Cl. 234—1)

This invention relates to pen units of the type wherein a plurality of pens are employed to operate in conjunction with a chart upon which they make a record. The invention relates particularly to such pen units employed in connection with rail flaw detectors wherein the number of pens operated give an indication of the degree of rail flaw encountered, and also in track recorders. Such pen units comprise, usually, a plurality of pens carrying spring levers which are designed to be attracted by electro-magnets to cause the pen to be moved in a transverse direction with respect to a moving chart.

In a pen unit of the type described above, certain difficulties arise. It has been found, for example, that the electro-magnetic circuit established through the pen carrying the spring arm caused the adjacent spring arm to be attracted also and thus resulted in an incorrect operation of the said adjacent pen. It is one of the objects of our invention, therefore, to provide a construction involving an electro-magnetic circuit such that it will be impossible for adjacent pen-carrying arms to be attracted unless their own particular magnets are energized.

In constructions heretofore employed, the pens were all mounted in a swinging or swivel carriage so that they could be swung up out of engagement with the ink-well when not in use. We have provided automatic means for holding the carriage in raised position so that the ink bath may be replaced or refilled conveniently and access had to the pens and the pen-operating magnets without interference from the pens or their support and without the necessity of an operator holding the support in raised position.

Heretofore, it has been the custom to allow the pens to remain in their normal position even when the device was not in use. As a result, it was found that when the device was to be used it frequently occurred that ink had dried and caked on the recording points of the pens and had to be cleaned before they could again be used. We provide a special construction whereby the recording points of the pen will be protected against such drying and caking of ink when not in use.

The form of pen unit heretofore employed consisted of long spring arms fixed at their rear ends to the casing or carriage, the forward ends of said arms carrying the pens. The resiliency of these arms enabled the magnets to attract them for the purpose of making an indication on the record. When the magnets were deenergized the spring arms were released and tended to overrun their original position to give an incorrect indication in the opposite direction. We provide suitable means for preventing such overrunning and incorrect indication.

As explained in the preceding paragraph, the long spring fingers carrying the pens at their forward ends are very delicate and easily disturbed. We provide a suitable guard which will obviate accidental operation of these spring arms, and hence of the pens, and will also protect the pens against injury.

Further objects and advantages of this invention will become apparent in the following detailed description thereof.

In the accompanying drawing,

Fig. 1 is a plan view of a pen unit embodying the features of our invention.

Fig. 2 is a vertical section taken on the line 2—2 of Fig. 1.

Fig. 3 is a view similar to Fig. 2 but showing the ink-well in its retracted position.

Fig. 4 is a side elevation of the Fig. 1 device but showing the ink-well completely removed.

Fig. 5 is a detailed view of a portion of the mechanism corresponding to Fig. 2, but showing a form heretofore employed.

Referring to the drawing, we have shown the pen unit as comprising a base 10 to the rear of which is swivelly connected at 11 a carriage 12. At the rear of said carriage at 13 is supported a plurality of spring fingers 14 which extend forwardly and carry in their front ends marking means in the form of substantially inverted U-shaped siphon pens 16 which are in effect small tubes with a thin capillary bore extending therethrough. One end of each pen extends through an opening or slot 18 within an ink-well or bath 20 supported in the base 10 in a manner hereinafter to be described. The longer end of the pen 16 extends outside the ink-well and into engagement with the record chart, which is usually a moving tape, to mark a record thereon. A small weight 21 is mounted on the upper end of each pen 16 so that while said pens may move vertically in response to the irregularities in the surface of the chart, the said weight will cause said pens to remain at all times in engagement with the chart.

The pens are adapted to be actuated by electro-magnetic means which attract the respective spring arms 14 to cause lateral movement of the pens 16. Heretofore, there was employed the

electro-magnetic circuit shown in Fig. 5 consisting of a single electro-magnet 25, energized from a suitable source of E. M. F. such as a battery (not shown) having a core 26 which extended downwardly adjacent the spring arm 14. The electro-magnetic circuit through the spring arm 14 extended through the rear supporting plate 27 which was also of magnetic material and to which the core 26 was fixed at 28. From plate 27 the magnetic circuit extended into adjacent pen arms, such as 14'. The result of this was that the field set up by the electro-magnetic circuit designed to actuate arm 14 also tended to actuate an adjacent spring arm, as, for instance, spring arm 14' in Fig. 1. This caused the pen carried by spring arm 14' to make an indication, which was, of course, a false indication.

By our invention we obviate the above difficulty by reducing the magnetic reluctance of the circuit including a given pen arm relative to the reluctance of the circuit through an adjoining pen arm. For this purpose, only a very small portion of spring arm 14 of low reluctance is included in the electro-magnetic circuit. We accomplish this by the structure shown in Fig. 2, wherein a U-shaped core 26' is employed with a winding 25' on each leg and the spring arm 14 forming the closure between the open ends of the U-shaped core. Hence, only that portion of spring arm 14 between the open ends of the U-shaped core 26' need be of magnetic material, or of material of much lesser reluctance than the rest of the arm, and hence only a correspondingly small portion of arm 14 is in the electro-magnetic circuit. The result of this construction is that the low reluctance of the magnetic circuit thus established prevents energization of a by-pass circuit through an adjacent arm, and hence, actuation of the latter is prevented. Preferably, the magnet is insulated from the support 27 by means of a non-magnetic washer or plate 70 which may be of brass, or the support 27 may be made of such material.

In order to protect the free ends of the spring arms which carry the pens, we provide a guard 30 fixed to the front of the carriage 12. Said guard 30 may also carry a plurality of stops 31, each normally contacting with the respective spring arm on the side opposite to that of the respective electro-magnet, so that when the magnet attracts the spring arm and then releases the same, the stops 31 will be effective to prevent overrunning of the spring arms on the return movement.

It can be seen that if the device were left in the Fig. 2 position for a number of hours as, for instance, overnight, during this time the ink would have dried and caked on the recording point and in the bore of the siphon tube 16. This would necessitate cleaning the fine bore of each of these pens and also removing the caked ink from the pen points. This is a delicate and tedious operation, and in order to obviate this condition we provide means for preventing such drying and caking of ink during the periods of non-use by the following construction. The ink-well 20 may be provided with a tenon 40 which is designed to fit into a tongue 41 formed at the forward end of the base 10 so that the entire ink-well may be slipped out of the said tongue. In this sliding movement there is an intermediate stage, shown in Fig. 3, wherein the ink-well has been moved sufficiently far forward so that the rear ends 42 and the forward ends 43 of the pens may both be positioned within the ink-well. An additional slot 44 may be provided so that when the bath is moved forward to the intermediate position the rear points 42 of the pens may extend through the said slot 44, while the forward points 43 of the pens may extend through the slot 18. Thus, there are three positions possible for the bath. In the first position shown in Fig. 2, it is fully within the tongue 41 and only the rear ends 42 of the pens dip into the well by engaging in slot 18. When it is desired to place the pen unit out of commission for a considerable period. the ink-well is moved forward to the intermediate position shown in Fig. 3 when the read ends 42 of the pens will also dip into the well through rear slot 44, while the slot 18 cooperates with the forward points 43 of the pens. Thus both ends of the pens dip into the ink-well and drying and caking of ink on the marking points of the pens is prevented. The ink-well may be still further withdrawn from tongue 41 to the position shown in Fig. 4, that is, to the position where it is completely withdrawn from the base 10. The tenon 40 may be provided with a spring-pressed detent 47 cooperating with grooves 48 and 49 in the tenon to fix the rearmost and intermediate positions of the bath within the tenon 41.

To prevent movement of the ink-well when the support is lowered to effective position, we may provide a finger 60 engageable in holes 61 and 62 in the ink-well corresponding to the rearmost and intermediate positions of the well.

For facilitating access to the pens and to the ink bath for repair, cleaning, or filling, without the necessity of an operator holding the pen-support or carriage 12 in raised position, we may provide lock detent 50 having a cam slot 51 therein cooperating with the pin 52 on the carriage 12, the said cam slot being formed with an offset portion 53 so that said pin during the raising movement of carriage 12 may ride down the slot 51, and upon reaching offset slot 53 the detent 50 will drop by gravity and pin 53, and hence carriage 12, will be locked in said offset slot automatically when the carriage 12 has been raised to the predetermined degree.

As shown in Fig. 1, we may provide a plurality of partitions 64 within the ink-well so that ink of different colors may be employed in the various sub-divisions thereof and so that certain pens may make indications characteristically different from those of certain other pens. These partitions act also as baffles and prevent splashing of the ink when the ink-well is mounted on a moving vehicle.

Having described our invention, what we claim and desire to secure by Letters Patent is:

1. In a recording unit, a marking means in conductive relation to a plurality of similar marking means, an arm for carrying said marking means, means including an electromagnet for actuating said arm, and means for short-circuiting the electromagnetic path through said arm to prevent establishment of a by-pass circuit through an adjacent arm.

2. In a recording unit, a marking means in conductive relation to a plurality of similar marking means, an arm for carrying said marking means, means including an electromagnet for actuating said arm, a support for said arm, and means for limiting the electromagnetic circuit through said arm to a predetermined por-

tion thereof to prevent establishment of a by-pass circuit through an adjacent arm.

3. In a recording unit, a marking means in conductive relation to a plurality of similar marking means, an arm for carrying said marking means, means including an electromagnet for actuating said arm, a support for said arm, and means for limiting the electromagnetic circuit through said arm to a predetermined portion thereof to prevent establishment of a by-pass circuit through an adjacent arm, said last-named means consisting in forming said portion of a material having lesser magnetic reluctance than the remaining portion of said arm.

4. A recording unit comprising a base, marking means, a support for said marking means, an inkwell, and means whereby said marking means and well are relatively movable so that one or both ends of said marking means may engage in said well.

5. A recording unit comprising a base, marking means, a support for said marking means, and an inkwell movably mounted in said base for movement to a plurality of positions, one of the ends of said marking means being engageable in said well in one position thereof and both ends of said marking means being engageable in said well in another position thereof.

6. A recording unit comprising a base, a support pivoted thereon for movement to effective and ineffective positions, marking means carried by said support, an inkwell slidably mounted in said base for movement to a plurailty of positions, one of the ends of said marking means being engageable in said well in one position thereof and both ends of said marking means being engageable in said well in another position thereof, and means for locking said well against movement when said support is in effective position.

WALTER MERTON PERRY.
LOREN J. DE LANTY.