

April 23, 1940.

E. B. D. MACKENZIE

2,198,171

RECORDING DEVICE

Filed Nov. 29, 1935

3 Sheets-Sheet 1

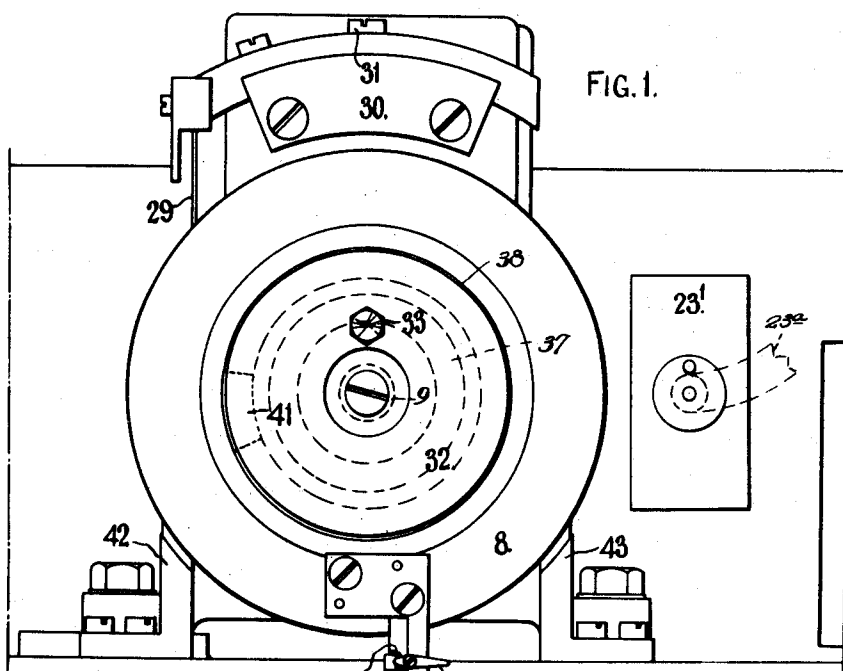


FIG. 1.

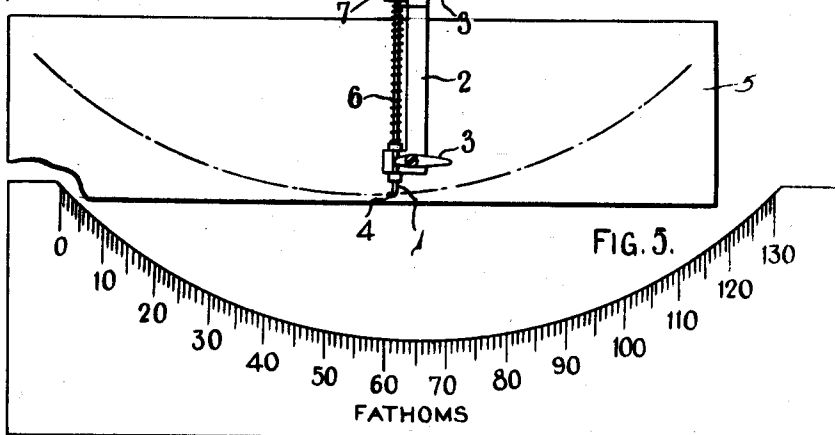


FIG. 5.

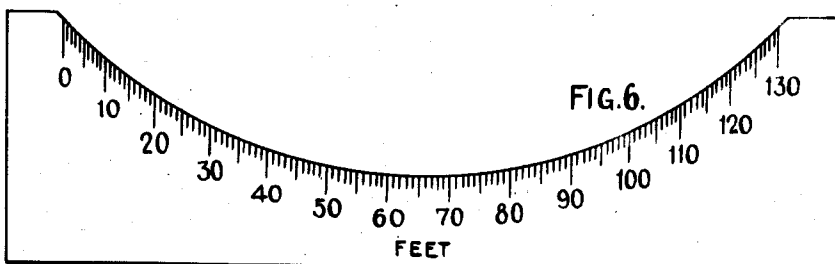


FIG. 6.

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3 Sheets-Sheet 2

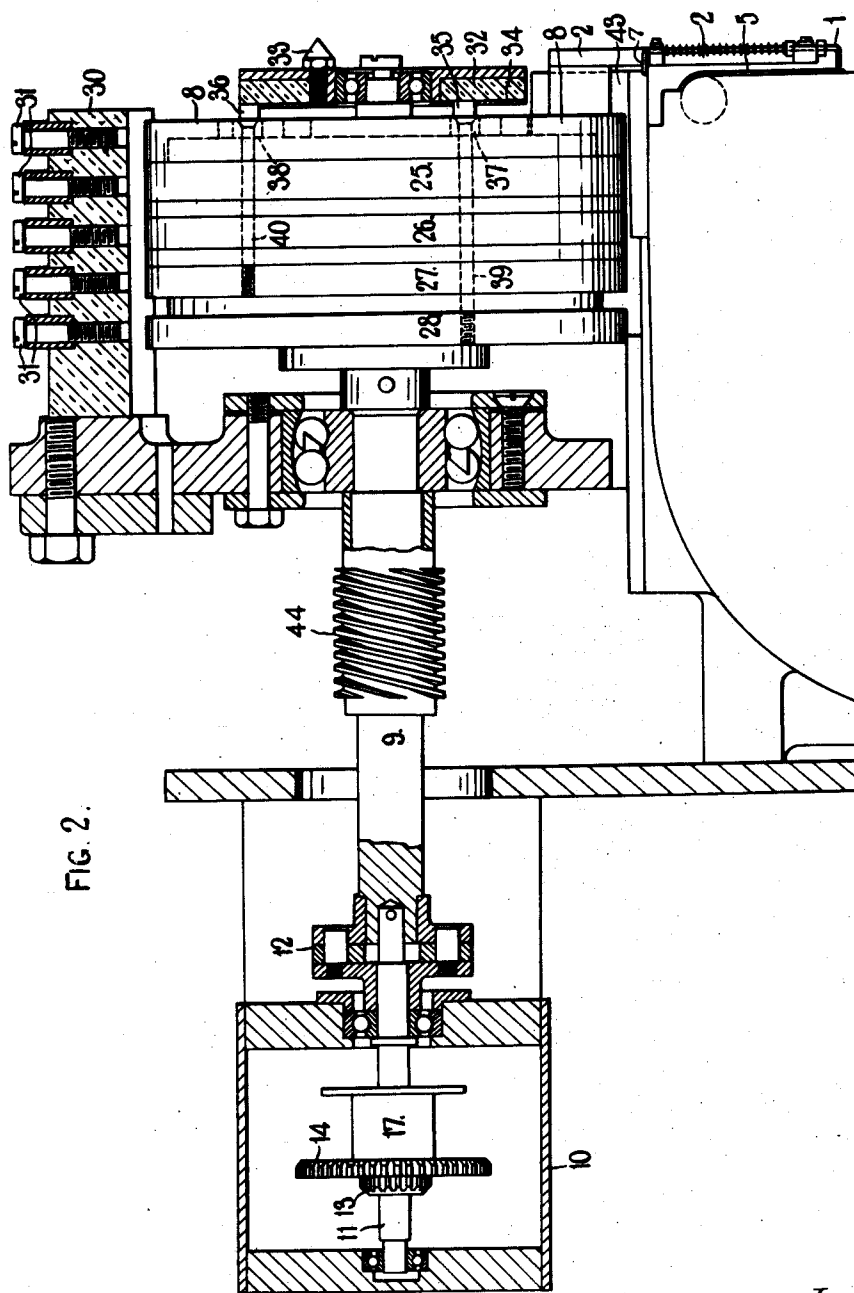


FIG. 2.

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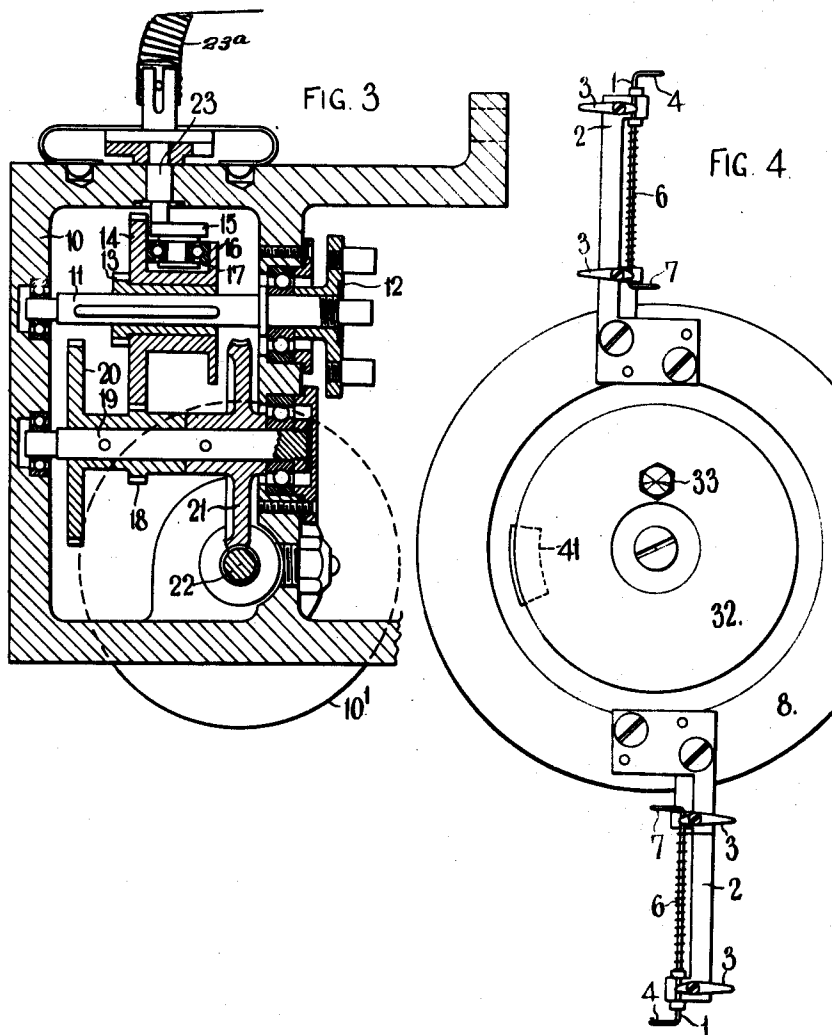
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3 Sheets-Sheet 3



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UNITED STATES PATENT OFFICE

2,198,171

RECORDING DEVICE

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Application November 29, 1935, Serial No. 52,263
In Great Britain December 3, 1934

2 Claims. (Cl. 234—72)

This invention relates to recording devices in which a stylus is caused to traverse a recording strip or sheet on which the record is to be produced, and more particularly to electro-chemical recorders in which the strip or sheet is suitably sensitized so that the passage of an electric current through the stylus and sensitized material produces a permanent record.

In previous constructions of electro-chemical recorders of this kind, the stylus has been made to traverse the recording strip in a straight line such as by causing it to move backwards and forwards along longitudinal guides, while in recorders using other systems of marking the record the stylus has been moved in a circular path. Certain constructional and operating difficulties arise in connection with these recorders and the main object of the present invention is to provide an improved construction of recorder in which the disadvantages of the known constructions of recorders are avoided and a further object of the invention is to provide a construction in which the stylus can be raised and lowered out of and into the plane of the record strip. This arrangement prevents the breaking of the edge of the paper strip as the stylus passes on and off the strip. These and other objects are achieved by the apparatus described in the following description and set out in the claims appended at the end of such description.

A construction of recording device is illustrated in the accompanying drawings in which:
Fig. 1 is a front elevation of the device.

Fig. 2 is a sectional side elevation thereof;

Fig. 3 is a detail view (a sectional plan view) showing a suitable construction of gear box;

Fig. 4 is a detail view of a modified stylus carrier with which more than one stylus is used; while

Figs. 5 and 6 are illustrations on a slightly larger scale than Figs. 1 to 4 of the scales to which the record produced by the stylus is related according to whichever of the gears are in use at the time the record is produced.

The recording device illustrated is particularly applicable for the recording of depth measurements obtained by means of an echo-sounding gear and will be mainly described in connection with such use, although the invention is not restricted to the use of the recording device in connection with echo-sounding gear.

The apparatus consists of a recording stylus 1 which is attached to an arm 2 by clips 3 and the writing point 4 of the stylus is pressed against the recording strip 5, when the stylus is travers-

ing it, by a spring 6 surrounding the stylus, while the end of the stylus remote from the writing point 4 is provided with a projection or tail 7 for the purpose hereinafter mentioned. The arm 2 carrying the stylus is secured to a carrier or disc 8 which is secured on a shaft 9 driven through a gear box 10 by a suitable constant speed electric or other motor indicated at 10¹ in Fig. 3. This motor must be carefully governed to run at constant speed.

As the shaft is rotated the writing point 4 of the stylus is made to travel in a circular path, part of which crosses the record strip 5 so that if an impulse is applied to the stylus while it is traversing the record strip a mark is made on the strip to form a permanent record. If the recording strip is suitably sensitized the impulse applied to the stylus may be an electrical impulse so that the record is produced by electro-chemical action. In this case the record strip may conveniently be in a pre-sensitized and moist condition and issuing from an air-tight container as described in my co-pending application, Serial No. 52,264 filed November 29, 1935, Patent No. 2,129,776, the record strip being drawn past the stylus track by feed rollers (not shown).

The gear box through which the shaft 9 is driven is shown in sectional plan view in Fig. 3 and consists of the box or casing 10 in which is supported in suitable bearings a shaft 11 connected by a coupling 12 to the shaft 9. Splined on the shaft 11 are a pair of gear wheels 13, 14 of different diameters which can be slid along the shaft 11 by rotation of a crank 15 carrying a roller 16 engaging with an annular recess 17 in a sleeve formed at one side of the large gear wheel 14. In the position shown the larger gear wheel 14 meshes with a small gear wheel 18 secured to a second shaft 19 supported in bearings in the box 10 and this small gear 18 is integral with a larger wheel 20 with which the smaller gear wheel 13 on the shaft 11 can mesh. The shaft 19 also has attached to it a worm wheel 21 engaging with a worm 22 coupled to the shaft of the driving motor. By rotating the spindle 23 of the crank 15 to move one or the other co-operating pairs of gears into mesh the speed at which the shaft 9 is driven can be instantly altered while the machine is running so that the speed at which the stylus traverses the strip 5 can be changed and the record produced by the stylus related to one of the two scales illustrated in Figs. 5 and 6. The record strip is of the same extent as the distance between the zero and the extreme right hand mark of the scales shown in

Figures 5 and 6 of the drawings, and the record strip is read by placing the appropriate scale of Figure 5 or 6 with the curved edge coinciding with the curved path of the stylus and with the zero mark of the scale coinciding with the left hand edge of the record strip.

The spindle 23 is coupled by a flexible shaft 23a or other means to a switch 23' (Fig. 1) which momentarily switches off the motor while the gears are moved. The switch 23' is a double-throw switch which switches on the motor in each of its two extreme positions so that as the spindle 23 is given a half-turn to make the gear change the switch 23' is thrown over from one position to the other and the motor is switched off while the switch is moving over (i. e., while the gear change is being made). When the stylus shaft is being driven at its slowest speed the record conforms to the scale shown in Fig. 5 and when the stylus is rotating at the higher speed the record conforms to the scale shown in Fig. 6. By this means it is possible to work at shorter intervals to give a more accurate scale when working at high speed, such as where an accurate record of the depth of shallow water is required when producing a record of echo soundings, or it is possible to work at long intervals at low speeds when charting deep water by an echo sounding gear. Also the recorder can normally be kept running at its low speed and the record of any important phenomena can be noted for accurate observation later.

The shaft 9 also has secured on it, behind the stylus carrier 8, a number of contact discs or drums 25, 26, 27, 28 with which are associated blade contacts or contact springs 29 projecting from a holder 30 of insulated material and connected to their respective terminals 31. The first of these contact discs 25, is electrically connected with the stylus 1 so that through the contact spring 29 bearing on this disc 25 the stylus can be connected to an electrical recording circuit so that an electric current can be passed through the stylus and strip 5 to produce the record by electro-chemical action. The next contact disc 26 is a line marking disc by which an electric current can be applied to the stylus at regular intervals so that the latter produces on the record a series of marks at spaced intervals which form a scale which is an indication of the distance travelled by the stylus between subsequent contacts made by this contact drum. The remaining contact drums 27, 28 control an electrical circuit which, when the device is used for recording depths by means of echo-sounding, causes the emission of a signal whose echo is made to mark the record strip to give an indication of the depth from which the echo is received.

These discs 27 and 28 are combined with an arrangement for varying the instant of emission of a signal relative to the position of the stylus during its movement in its circular path which amounts, in effect, to a shifting of the datum line from which the record is measured by providing for the transmission of a signal at some predetermined interval before the stylus commences to traverse the recording strip. This "phasing" arrangement consists of an insulated disc 32 which does not rotate with the shaft 9 but is held stationary. A pin 33 projecting from the disc 32 makes it possible to rotate the disc in steps corresponding with the shifting of the datum line of the record. This pin 33 may be engaged in any desired manner for rotating the discs. The back of this stationary disc is pro-

vided with a brass facing 34 formed with two projections 35, 36 which press against contact rings 37, 38 let into the face of the stylus carrier 8. The inner of these rings, 37, is connected by a metallic connection 39 with the contact disc 28 while the outer of the contact rings, 38, is connected by a connection 40 to the contact drum 27. The inner contact ring 37 is broken at one point by the insertion of an insulating segment 41 so that as the stylus carrier 8 rotates relative to the stationary disc 32 the circuit through the discs 27, 28 and their brushes and the stationary disc 32 is broken periodically. By altering the position of the stationary disc 32, the point at which this interruption in the circuit occurs can be adjusted relatively to the movement of the stylus so that when this interruption of the circuit controls the emission of a signal, the signal transmission can be made to occur at some predetermined time before the stylus commences to traverse the recording strip, or it can be arranged so that the signal is emitted at the instant the stylus crosses a datum line at the edge of the recording strip. The emission of the signal before the stylus reaches the recording strip corresponds to a shifting of the datum line from which the record is measured, thus, in connection with echo sounding work, if the signal is emitted at the instant the stylus crosses the edge of the recording strip, a certain distance traversed by the stylus across the strip before the echo is received to mark the recording strip, may correspond to a certain depth, whereas if the signal is emitted before the stylus crosses the edge of the strip by the time necessary for the signal to travel a predetermined depth then a mark on the record in the same position as the previous mark would then indicate a depth greater than that previously indicated by the amount of the predetermined depth. The stylus is lifted on to the recording strip and off the strip after it has traversed it by providing a pair of ramps 42, 43 in the path of the projecting tail 7 of the stylus so that as the stylus comes round towards the recording strip the tail piece 7 rides up on the ramp 42 and the writing point 4 of the stylus is thereby lifted clear of the record strip against the action of the spring 6 and as the tail 7 passes off the ramp the writing point 4 is lowered on to the record strip. A similar action occurs when the tail of the stylus crosses the other ramp 43 as the stylus leaves the record strip. The arrangement for lifting the stylus on to and off the paper record strip is to prevent tearing of the edges of the paper.

Instead of providing only one stylus and arm attached to the carrier 8, two styluses can be provided, as shown in Fig. 4, or more than two styluses may be used, and by this means it is possible to run the shaft 9 with two styluses at one half the speeds necessary when only a single stylus is used or if the shaft is run at the same speeds as with a single stylus a much more closely spaced record is obtained.

The shaft 9 carrying the stylus and contact drums also has secured on it a helical gear 44 which engages with a similar gear (not shown) for driving feed rollers for drawing the recording strip across the stylus track.

In echo-sounding the recorder is used in conjunction with a signal transmitter which is controlled through the contact discs 27 and 28 and the phasing disc 32 (Fig. 2) and the received echo is caused to complete an electric circuit through the stylus and the record strip so that

a mark is produced on the strip by electro-chemical action.

The phasing disc 32 can be set so that the emission of a signal occurs at the instant the stylus crosses a datum line near the edge of the record strip and the distance travelled by the stylus across the strip before the echo is received is, therefore, a measure of the time taken by the signal to reach the sea bottom and travel back therefrom and hence is a measure of the depth.

The phasing disc 32 can, however, be set so that the signal is emitted at some predetermined time before the stylus crosses the datum line so that this datum instead of representing zero depth as before, now represents a depth corresponding to the time interval between the instant of signal transmission and the instant the stylus crosses the datum line. The adjustment of the disc 32 thus amounts, in effect, to a shifting of the datum line from which the depth is measured.

What I claim as my invention and desire to secure by Letters Patent:

1. A recording device comprising a stylus movable across the path of a record strip and having a motion greater than the width of the strip, said stylus having a contact portion and a stem portion angularly connected to the contact portion, a stylus supporting member including a supporting arm for the stylus, means pivotally securing the stem portion of said stylus to said arm whereby the contact portion of the stylus may be swung into and out of the plane of the

record strip, a spring engaging said stylus to bias it to a position with the contact portion in the plane of the record strip, a stationary ramp disposed in the path of said stylus, and means carried by said stylus engageable with said ramp to turn the stem portion of the stylus against the action of said spring to lift the contact portion of the stylus away from the plane of the record strip, said ramp being positioned to lift said contact portion as it crosses an edge of the record strip.

2. A recording device comprising a stylus movable across the path of a record strip and having a motion greater than the width of the strip, said stylus having a contact portion and a stem portion angularly connected to the contact portion, a stylus supporting member including a supporting arm for the stylus, means pivotally securing the stem portion of said stylus to said arm whereby the contact portion of the stylus may be swung into and out of the plane of the record strip, a spring engaging said stylus to bias it to a position with the contact portion in the plane of the record strip, a stationary ramp disposed in the path of said stylus, and an outstanding arm carried by said stem portion of the stylus at an angle and positioned to engage said ramp to turn said stylus to lift the contact portion away from the plane of the strip, said ramp being positioned to lift the contact point away from the strip as the stylus passes an edge of the strip.

EDWARD BRIGGS DRAKE MACKENZIE.