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(54) RECORDING APPARATUS IN WHICH RECORDING IS EFFECTED BY BURNING OUT A METALLIC RECORDING LAYER

(71) We, KIENZLE APPARATE GMBH, a German Body Corporate of Villingen-Schwenningen, Germany do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:-

The invention relates to a recording apparatus in which the recording is effected by burning out a metallic recording layer. A carrier means is provided in which the recording electrodes are mounted to be lifted off and to be let down to the record carrier in suitable manner. The record carriers are diagram disks driven by a clockwork in dependence on time and adapted to the recording method. The apparatus is provided with a tiltable lid serving substantially to exchange the diagram disks; a device for lifting and letting down the recording electrodes is arranged to automatically move such electrodes into recording position with the diagram disk when the lid is closed.

Such recording apparatus or similar instruments are for instance used to record data of industrial production, that means the working times of machines, pieces produced and so on. It is advantageous that the recording apparatus is provided with a big window in the lid closing the apparatus on the front side so that the proper functioning of the recording means can be supervised in a most simple manner and the recorded data are immediately visible for short time decision.

With known recording apparatus used for this purpose the recording is generally effected in the form of bar diagrams for the machine working times or in the form of stroke diagrams for the number of pieces the recording being effected on diagram disks coated with wax or a wax like layer. It is a certain disadvantage that the recording

layer of such diagram disks may be easily damaged by finger prints and scratches.

This disadvantage for instance can be avoided with an electrical recording method, for instance by using diagram disks having a metallic recording layer. However, as against the wax paper recording method in this case it has to be made sure that when the diagram disks are inserted in the recording apparatus they do not touch and thereby damage or at least displace the recording electrodes, which have to be produced with a high degree of precision and which are very finely adjusted. Also it must certainly be avoided that the recording electrodes rest on the recording support when no diagram disk is inserted, thereby producing a short circuit. In cases where the recording support is made of an insulating material or where other measures have been taken against short circuiting but where the electrode carrier is arranged to make radial movements with respect to the diagram disks to produce the recordings it should be made sure that the recording electrodes can not stick to the recording support, thereby being also damaged.

In connection with a wax paper recording method it is already known to lift the recording device manually or by electromagnetic means off the diagram disk before they can be exchanged and to let down the recording elements onto the diagram disks only for the time of the recording signal. Suitable guide means for the record carrier have already been proposed by means of which mechanical damages to the recording means are to be avoided when inserting the diagram disks. However, this does not exclude the possibility that the recording means come into contact the recording support in those cases where it has been forgotten to put in a diagram disk. Additionally there is the disadvantage that the diagram disk is inserted in a complicated

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handling process and that a technical expensive device is required for lifting and letting down the recording means.

5 Apart from that it is already known in connection with a recording means to be lifted and let down electromagnetically as already mentioned above to attribute a sensing means to the diagram disks which is in operative connection with a first electrical switch. The second electrical switch which is in series with the first one is arranged in the lid of the recording apparatus so that the apparatus is only ready to record when a recording signal is delivered to the electro- magnet actuating the recording means after a diagram disk has been inserted into the recording apparatus and the lid is closed.

10 This arrangement entails relatively high technical expenses and a functional uncertainty due to the switches provided that not very expensive parts are used. A lot of adjustment must be put up with for such a lifting off and letting down of one or several recording means.

25 An object of the invention therefore is to provide a technically simple device for lifting off and letting down a recording means, especially an electrode carrier, which is suited to carry several recording electrodes, and which device is automatically put into function when the diagram disks are exchanged and when the lid is closed so that it functions safely and affords a minimum of adjustment.

30 According to the invention we provide a recording apparatus having an electrode carrier to record on a diagram disk rotated by driving means in dependence on time, the apparatus having a housing and a tiltable lid to allow for an exchange of the diagram disk, wherein the electrode carrier cooperates with a lifting off and letting-down device comprising a first lever connected to the electrode carrier, a second sensing lever mounted on the first lever to be rotatable in a plane essentially parallel to the recording plane and bearing a first sensing pin to sense the presence of the diagram disk, a second sensing pin as a part of the lifting-off and letting-down device being elastically mounted in the housing so as to be operated by the lid and so as to be within the actuating range of the second sensing lever when the lid is closed whereby the electrodes are moved to their operative positions when the lid is closed only when the diagram disk is mounted in position in the apparatus.

60 In a preferred embodiment of the invention the first lever carrying the second sensing lever is arranged on a first bracket which is independent of the electrode carrier, said electrode carrier being in the shape of a second bracket, the first bracket being mounted rotatably on the same shaft

as the second bracket, the electrode carrier having a third lever and connecting means allowing to adjust the position of the first and third levers with respect to each other but rigid with respect to the rotational movement. 70

Preferably the sensing lever is elastically deformable in the direction of movement of the second sensing pin, and the lever which carries the sensing lever is movable between two fixed stops and is in contact with one stop when the lid is closed and the second sensing pin rests against this top with an excess movement so that the sensing lever is bent in the direction of movement of the second sensing pin when the lid is closed. 75 80

In an embodiment the electrode carrier means is radially movable with respect to the diagram disk and is rotatably mounted on a shaft the second lever arm provided on a bracket being mounted independently of the electrode carrier means, there being a pin and slot connection, rigid in the direction of rotation between the cross-piece of the bracket of the lever arm and the electrode carrier means. 85 90

In the following the invention shall be explained more in details with reference to the enclosed drawings. In these drawings-

95 *Figure 1* shows the essential parts of the recording apparatus in which the device according to the invention for lifting off and letting down the recording means is shown in a perspective representation.

100 *Figure 2* is a partial cross-section through the recording device with a lateral view of the device for lifting off and letting down of the recording electrodes.

105 *Figure 3* is a functional representation of the sensing lever.

110 *Figure 4* is another representation of the bearing of the electrode carrier means and of the levers of the lifting off and letting down device attributed thereto.

The recording apparatus as shown in *Figure 1* essentially consists of a housing 1 with a lid 2 which is pivotally connected to the housing by means of pivot pins 3. The lid has a viewing window 4 and may be locked to the housing 1 by means of a locking part 5 to be operated by a key (not shown). The housing 1 is provided with an intermediate cover plate 6 separating that part of the housing 1 in which a driving device for driving the recording means, the control counters and the electrical control circuitry and such like as well as essential parts of the device for lifting off and letting down the recording means from that part of the housing 1 which must be accessible in order to exchange the diagram disks and in order to observe the recordings. A centering and driving part 7 to take up the record carrier in the form of a diagram disk 8 projects through the intermediate plate 6 which 120 125 130

driving part 7 is fastened to a support driven by a clockwork in dependence on time. This support has not been shown in detail as it is not essential for the invention. The diagram disk 8 is fixed by means of a cup-shaped part 9 which is axially elastic and rotatable on the shaft 10 fastened to lid 2 respectively to the window 4. For a complete understanding it should be mentioned that in the recording apparatus shown as recording means several pin-shaped leaf springs 12 are used which serve as recording electrodes and which are fastened to bars 45 in a support 11 in a side by side relationship. At the bars 45 there are projections 46 which are the contact pins for conducting current to the recording electrodes 12. Naturally another design of the support for these electrodes would be possible. In each case, however, the support 11 may be fastened - by means of a cross-piece 47 and a screw 13 - on an electrode carrier means 15 which on its part is rotatably mounted on a shaft 14 and which is also axially displaceable so that it may be adjusted in radial direction with respect to the diagram disk 8 (setting screw 16 and slot 17). A transparent hood 18 which has been shown in Figure 1 as largely cut away is connected in suitable manner to the housing and covers the recording electrodes and a certain range of the record carrier 8 to protect it against tampering and dirt. There is a slot only within the front wall of the hood 18 and the intermediary wall 6 serving as a recording support through which slot the diagram disk 8 may be introduced. A cross piece 19 at the hood 18 which extends radially with respect to the diagram disk 8 serves as a retaining element to the diagram disk 8. The pins 20 and 21 which have also been shown in Figure 1 are parts of the lifting off and letting down device according to the invention. In the following the pin 20 shall be the first sensing pin which is in contact with the diagram disk whilst the second sensing pin, the pin 21, is in operative connection with the lid.

As may be seen from Figure 2 a bearing bracket 22 which is fastened in the housing 1 (screws 23) bears the shaft 14 which carries the electrode carrier 15. The bearing part 22 projects through a cut-out 24 in the intermediate plate 6 into the space between the lid 2 and the intermediate plate 6. The electrode carrier 15 has an arm 25 which is in operative engagement with a cam driven by a clock (not shown) to achieve an axial movement thereof. A lever 27 is also rotatably mounted on shaft 14 by means of a suitable bracket 26. The lever 27 bears a shaft 28 on which a sensing lever 30 is mounted which is under the effect of a spring 29. The sensing lever 30 which carries the first sensing pin 20 and which has a stop 31 to cooperate with the lever 27 has a

projection 32 (Figure 3). This projection 32 comes into operative engagement with the second sensing pin 21 which is under the influence of a pressure spring 33 when a diagram disk has been properly inserted into the recording apparatus. Another lever arm 34 is rotatably mounted on shaft 14 by means of a suitable bracket 35. In the cross piece of this bracket 35 as may be seen from Figure 4 a slot 36 is provided running in the direction of shaft 14, and electrode carrier 15 is provided with a guide pin 37 engaging in slot 36. A spiral spring 38 serves to retrack the electrode carrier 15 after having been axially moved and keeps the arm 25 in operative engagement with the driving cam disk. An axial displacement of this kind and the necessary driving means are naturally only required when for recording the desired stroke markings as shown in the drawings an individual recording electrode is attributed to each recording track. Of course, it is also possible to use chisel shaped electrodes having a width corresponding to the length of the stroke or else several electrode points attributed to one recording track producing the recording stroke in the form of a number of dots. In these cases in which no relative motion between the recording electrodes and the diagram disks is required the electrode carrier 15, the lever 34 and its bracket 35 can be made as one part. Another spiral spring 39 which is attached to lever 27 and also to lever 34 serves for an elastic connection between the electrode carrier 15 and the lever 27 a projection 40 on lever 34 and a screw 41 being attributed to spring 39 as an adjustable stop. A spring 42 serves to lift off the recording electrodes when the lid 2 is opened and presses the lever 27 against the stop 43. An arm 48 on bracket 22 is provided with a stop 44 defining the other end position of the lifting off and letting down device that moves the recording electrodes. A switch 49 also provided on arm 48 serves to switch off any additional loads, such as for instance control bulbs and other lighting means when no diagram disks are inserted in the recording apparatus.

The function of the lifting off and letting down device according to the invention will be explained in the following: When a diagram 8 is inserted into the recording apparatus whilst the lid 2 is opened, that means when it is pushed below the cross piece 19 on hood 18 and centered on the centering and driving part 7 sensing lever 30 is simultaneously rotated so that the projection 32 comes into the range of motion of the sensing pin 21. When thereafter the lid 2 is closed and thereby the sensing pin 21 axially displaced it gets in touch with projection 32 rotating lever 27 to stop 44 via the sensing lever 30 against the action of spring

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42. When the disk is in position the pin 21 presses down the levers 30, 27 which swing about 14 and lever 27 presses on 41 and swings parts 41, 34, 15, 11 anticlockwise to bring the electrodes down on to the disk. The spring 33 is stronger than the spring 42. When the lid is closed but no disk is present the pin 21 does not contact the lever 30 and the spring 42 pulls 27 to the left and swings it clockwise to press 41, 34, 15, 11 clockwise and thus holds the electrodes off the disk support. The pressure of the recording electrodes is adjusted by means of the setting screw 41. The sensing pin 21 has so much excess movement as compared with the rest position of lever 27 that any tolerances of production and mounting are ineffective within a very wide range. In order to allow for this excess movement the sensing lever 30 is elastically deformable in the direction of movement of sensing pin 21 so that it is slightly bent when the lid is closed.

It is the essential advantage of the lifting off and letting down device according to the invention that only a few parts, and parts to be simply produced are used. Also for automatically rotating the recording electrodes by means of the lid no adjustment has to be made. Differing measurements of the lid and other tolerances are made up for by the elastically deformable sensing lever 30. Functional disturbances due to electrical switches are impossible. It is also of a special advantage as compared with the already mentioned known actuating device for lifting off and letting down that the recording pressure of the recording electrodes 12 may be adjusted whilst the lid is closed in that the sensing pin 21 may be pressed down manually whilst the setting screw 41 is operated.

WHAT WE CLAIM IS:-

1. A recording apparatus having an electrode carrier to record on a diagram disk rotated by driving means in dependence on time, the apparatus having a housing and a tiltable lid to allow for an exchange of the diagram disk, wherein the electrode carrier cooperates with a lifting off and letting-down device comprising a first lever connected to the electrode carrier, a second sensing lever mounted on the first lever to be rotatable in a plane essentially parallel to the recording plane and bearing a first sensing pin to sense the presence of the diagram disk, a second sensing pin as a part of the lifting-off and letting-down device being elastically mounted in the housing so as to be operated by the lid and so as to be within the actuating range of the second sensing lever when the lid is closed whereby the electrodes are moved to their operative positions when the lid is closed only when the diagram disk is mounted in position in the apparatus.

2. A recording apparatus according to claim 1, wherein the sensing lever is elastically deformable in the direction of movement of the second sensing pin.

3. A recording apparatus according to claims 1 and 2, wherein the first lever carrying the second sensing lever is arranged on a first bracket which is independent of the electrode carrier, said electrode carrier being in the shape of a second bracket, the first bracket being mounted rotatably on the same shaft as the second bracket, the electrode carrier having a third lever and connecting means allowing to adjust the position of the first and third levers with respect to each other but rigid with respect to the rotational movement.

4. A recording apparatus according to claims 1 to 3, wherein the electrode carrier is mounted on a shaft to be rotatably and axially movable and wherein the third lever is fixed to a third bracket independent of the electrode carrier and wherein between the cross piece of the third bracket of the third lever and the electrode carrier there is a pin and slot connection rigid in rotational direction.

5. A recording apparatus according to claims 1 to 4, wherein the first lever is rotatable between two stops and rests at one stop when the lid is closed and the second sensing pin applying an excess movement so that the sensing lever is bent in the direction of movement of the sensing pin when it is applied to stop.

6. A recording apparatus substantially as described herein with reference to and as illustrated by the accompanying drawings.

7. A recording apparatus as claimed in Claim 1, substantially as hereinbefore described.

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COMPLETE SPECIFICATION

2 SHEETS

*This drawing is a reproduction of
the Original on a reduced scale
Sheet 1*

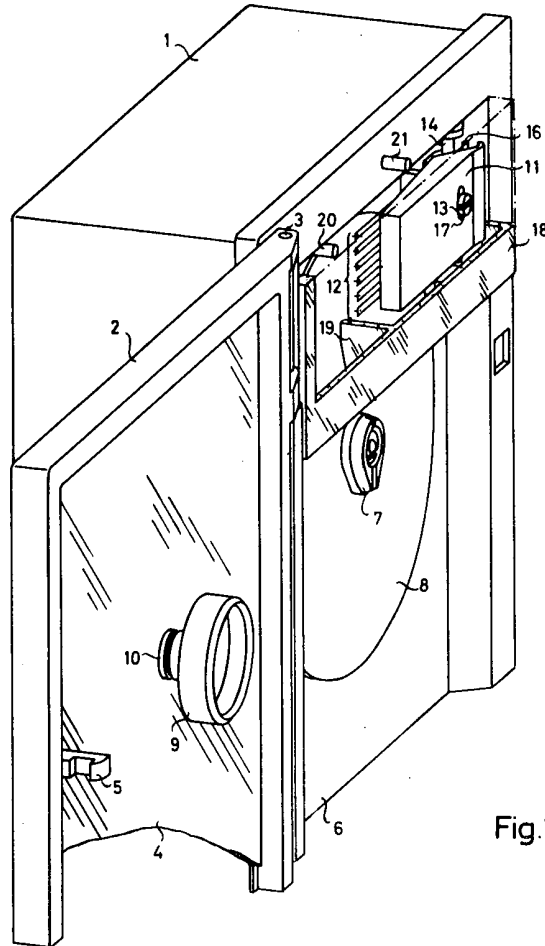


Fig.1

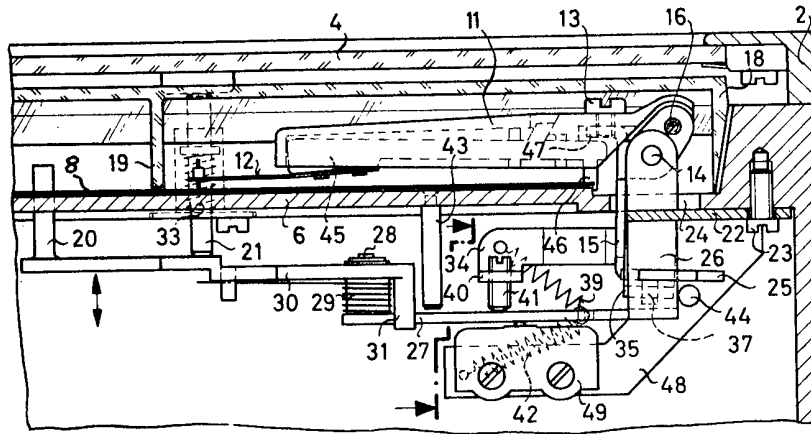
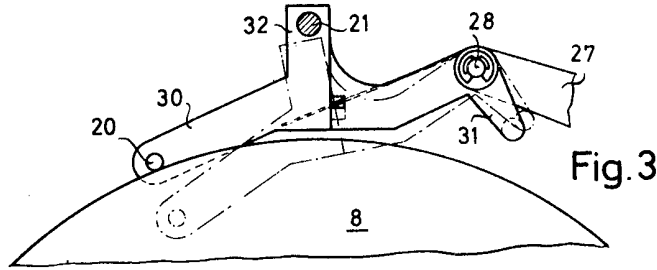


Fig. 2

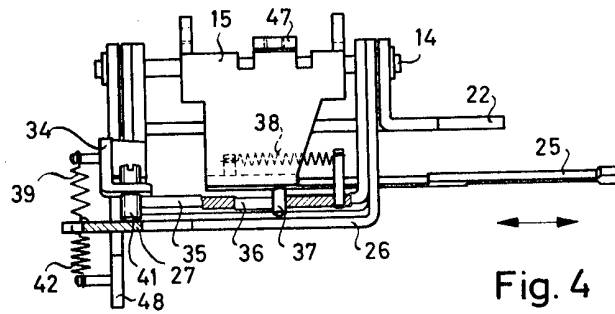


Fig. 4