June 25, 1968 J. J. NEFF 3,390,398

OSCILLOGRAPH LOADING

Filed Feb. 28, 1966 2 Sheets-Sheet 1

FIG. 1

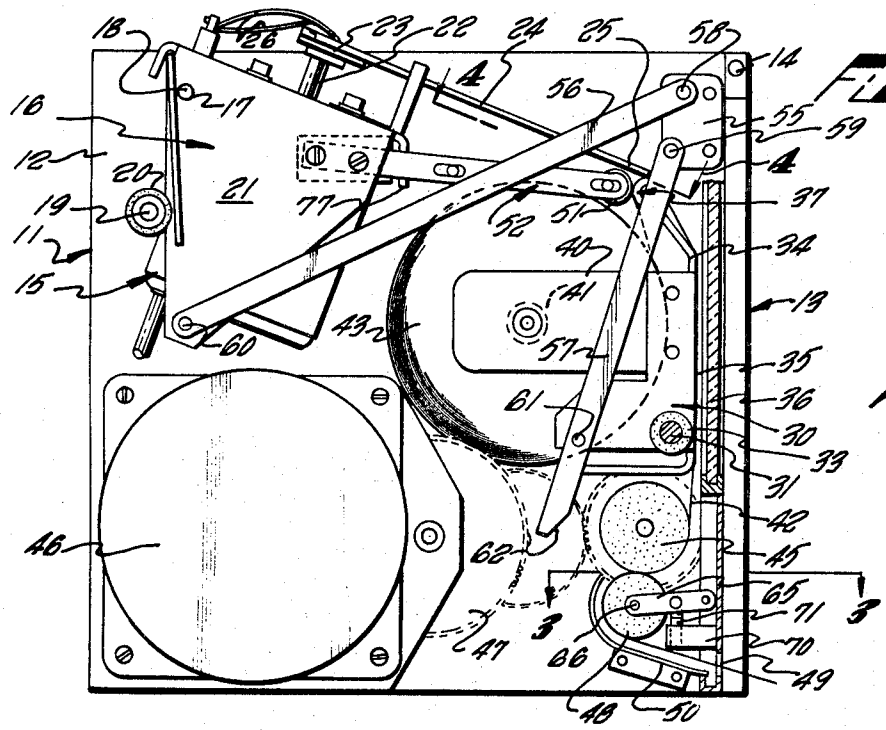
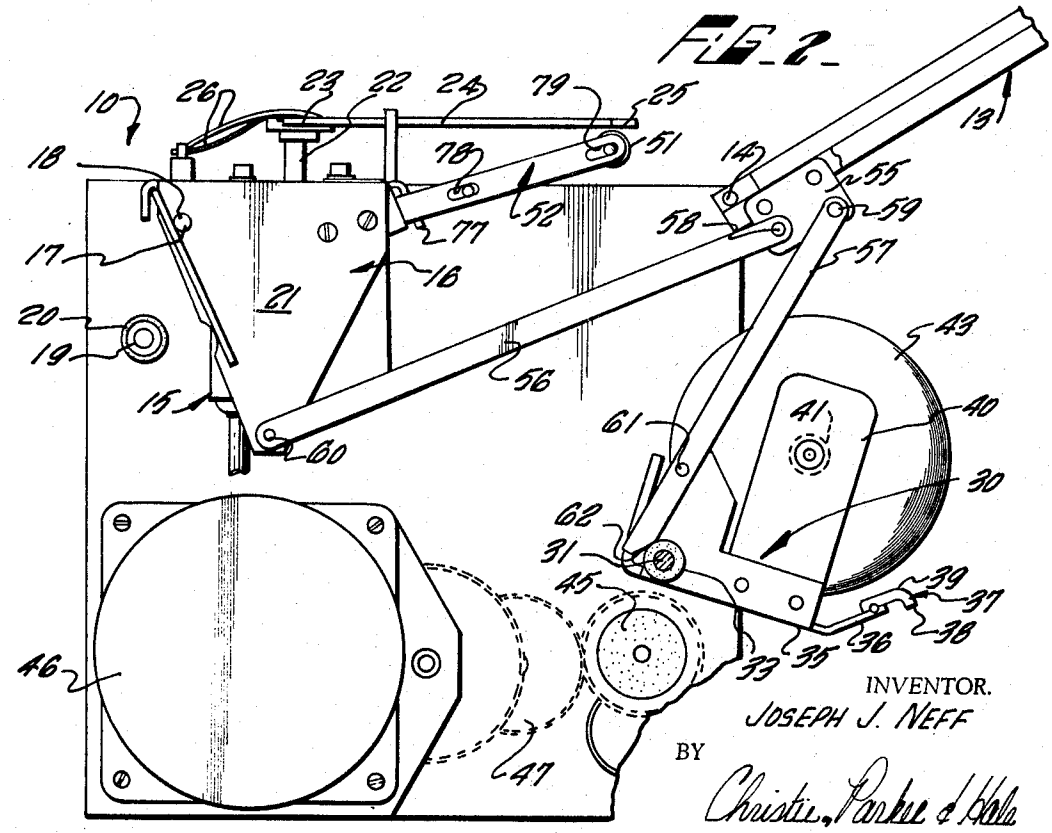


FIG. 2



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OSCILLOGRAPH LOADING

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FIG. 3

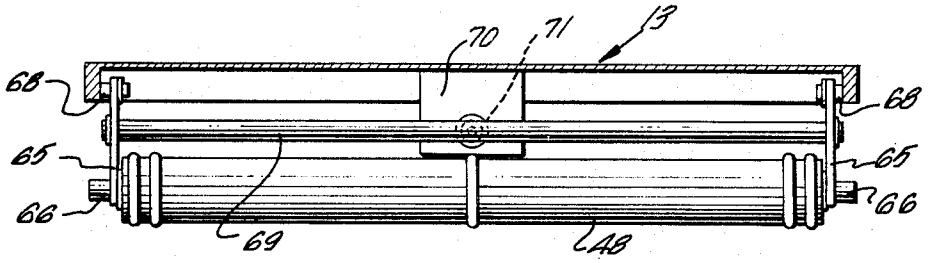
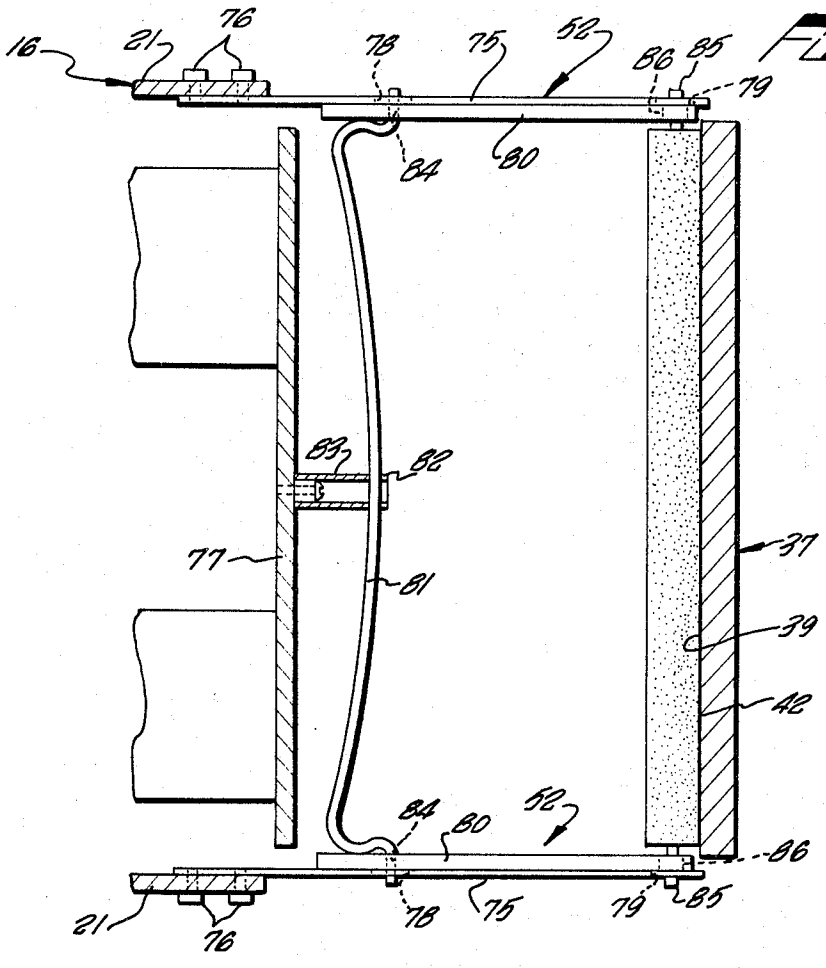


FIG. 4



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3,390,398

OSCILLOGRAPH LOADING

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ABSTRACT OF THE DISCLOSURE

A recording oscillograph in which a door and a platen are separately hinged to a frame, the platen carrying a supply roll of record medium on its reverse side. The door and platen are linked together so that as the door is moved from its closed position, in which the front side of the platen is disposed adjacent the door, to its open position, the platen moves about its hinge axis to expose the supply roll support to the exterior of the oscillograph for ready and easy loading of a fresh supply roll into the oscillograph. The medium is threaded into the oscillograph merely by unrolling a length of the medium from the roll and by closing the door.

This invention relates to recording oscillographs having the feature that opening a door to a housing moves a holder for a roll of record material to a position of ready access for rapid replacement of a spent roll with a fresh roll, and closing the door threads the record material in the oscillograph and moves selected components of the oscillograph into an operative recording interrelation.

A recording oscillograph is a device for producing upon a record medium a graphic representation, as a function of time, of the instantaneous values of one or more signals applied as inputs to the device. The record material usually is a strip of paper which may or may not be specially prepared, depending upon the nature of the mechanism used to produce the graphic representation. Basically, however, recording oscillographs are either optical devices, wherein each input signal is applied to a galvanometer for deflecting a light beam transversely of the path of movement of a photosensitive record medium, or they are mechanical devices wherein each input signal is applied to a motor which drives a stylus transversely of the path of movement of the record medium. The latter class of oscillographs may incorporate ink-writing styli, or they may incorporate heat-writing styli cooperating with a heat sensitive record medium. The present invention is described below with relation to a heat-writing mechanical oscillograph, although it has utility with ink-writing and optical oscillographs.

Recording oscillographs are frequently used in tests and the like wherein it is desired that records be obtained over a long period of time. Often the supply of record material in the oscillograph is exhausted one or more times during the test, and it becomes necessary to insert a new supply roll of record material into the instrument before further recordings can be made. The longer the time required to change a supply roll, the more data is lost by reason of nonrecordation, unless a stand-by oscillograph is available for use during the period required to change supply rolls in the principal instrument. Existing recording oscillographs are so constructed that the roll changing operation is a time consuming and relatively complicated process, and care must be taken that the new strip of record material is properly threaded in the oscillograph. If the record material is not properly threaded, the signal traces produced by the oscillograph may be illegible, and the record material may jam in the instrument.

This invention provides an improved recording oscillograph which may be loaded with a supply of record material easily and rapidly. The oscillograph also has the

feature that the record material is threaded into the instrument automatically upon closure of a door which must be opened before a new supply roll of record material may be inserted into the instrument. The invention also provides a novel and efficient mechanism for maintaining uniform tension in the record material across its width; such a mechanism is particularly useful in a heat-writing mechanical oscillograph, although it is also useful in ink-writing mechanical oscillographs and optical oscillographs.

In brief but general terms, this invention has utility in an oscillograph for producing upon a moving strip of record material a record of variations in the magnitude of a signal applied as an input to the oscillograph. The oscillograph includes a housing having a frame and roll support means for receiving and rotatably mounting a roll of the record material. Record material drive means are provided in the housing for moving the strip of record material along a selected path in the housing. The housing also contains writing means to which the signal is applied and which is operative upon the record material, at a selected point along the path of movement of the record material during operation of the oscillograph, to produce upon the record material a record of variations in the magnitude of the signal. A platen is disposed in the housing and has a surface over which the record material moves during operation of the oscillograph. The improvement provided by this invention includes a door hingeably mounted to the housing frame for movement relative to the frame between an open position and an operative closed position. In its closed position, the door is disposed adjacent to the platen surface; this is the position of the door during operation of the oscillograph. Bracket means are provided for mounting the roll support means adjacent the side of the platen which is opposite from the platen surface over which the record material moves during operation of the oscillograph. Further, the invention includes means hingeably mounting the platen to the housing frame for movement of the platen relative to the frame about an axis adjacent the closed position of the door. The door carries, for movement with the door, means which are operative to engage the record material with the record material drive means when the door is in its closed position. Also, the structure provided by the invention includes means coupled to the door, and operable as the door is moved from its closed to its open position, for moving the platen about its hinge axis from a first position of the platen relative to the writing means to a second position relative to the writing means. In its first position the platen is disposed in operative writing relation to the writing means and the drive means is operable to move the strip of record material along the above-mentioned path. In the second position of the platen, the record supply support means is exposed for rapid loading of a roll of record material into the support means, and the record material is threadable along the path by pulling a length of material from the roll and by closing the door to return the platen to its first position. Closure of the door automatically engages the record material with the drive means.

The above-mentioned and other features of the invention are more fully set forth in the following description presented with reference to the accompanying drawings, wherein:

FIG. 1 is a cross-sectional elevation view of a recording oscillograph of the mechanical heat-writing type, the oscillograph being shown in its recording condition;

FIG. 2 is a cross sectional elevation view of the oscillograph shown in FIG. 1 disposed in its supply roll reloading conditions;

FIG. 3 is a cross-section view taken along line 3—3 of FIG. 1; and

FIG. 4 is a cross-sectional elevation view taken along line 4—4 of FIG. 1.

As indicated above, the invention is described below in the context of a heat-writing mechanical oscillograph. The invention may also be incorporated into an ink-writing mechanical oscillograph or into an optical oscillograph.

A heat-writing mechanical oscillograph **10** includes a housing frame **11** having a pair of spaced end plates **12**, only one of which is shown. An access door **13** is hingeably mounted at its upper end to the frame by a hinge pin **14**. The door is movable through an arc of about 120° between a closed position (shown in FIG. 1), wherein the door closes the front of the housing, and an open position of the door (shown in FIG. 2). The door is disposed in its closed position when the oscillograph is operated for the purpose of recording graphic representations of the variations in an oscillograph input signal. The door is disposed in its open position when it is desired to insert a fresh supply roll of recording paper into the instrument.

A bank of aligned stylus drive motors **15** (only one of which is visible in FIGS. 1 and 2) is mounted in the upper rear portion of the housing. The stylus drive motors are mounted to a motor bracket **16**. The motor bracket is mounted to the frame end plates by coaxially aligned pins **17** so that the bracket is rotatable relative to the frame about an axis **18**. A stop pin **19**, having a circumferential rubber tire **20**, extends from each frame end plate at a location spaced from the adjacent motor bracket hinge pin into abutting engagement with a vertical flange **21** at each end of the bracket. The stop pins function to secure the bracket, and thereby the drive motors, in a predetermined postion when the door is in its closed position. A separate oscillograph input signal is applied to each drive motor.

Each stylus drive motor has a rotatable output shaft **22** which extends generally upwardly from the motor to a hub **23** of a stylus support arm **24**. The motor shafts are aligned parallel to each other. Each stylus arm extends normal to its motor drive shaft toward door **13**. At its end remote from its supporting drive motor shaft, each stylus support arm carries a stylus **25**. Each stylus is comprised of a tubular sleeve having a respective one of a pair of electrical conductors **26** connected to its opposite ends. When a potential is applied to the opposite ends of the sleeve, the sleeve heats and produces a mark on a heat sensitive strip of recording paper which moves past the sleeve. The engagement of the stylus with the recording paper is described below.

A platen assembly **30** is disposed in the housing adjacent the closed position of door **13**. The platen assembly is mounted to the frame end plates by a pair of coaxially aligned hinge pins **31** which are connected to the frame end plates adjacent the door in its closed position. Each pin **31** carries a circumferential rubber sleeve **33**. The platen assembly includes a platen **34** having a planar surface **35** which, when the oscillograph is operating and the door is closed, lies parallel to and adjacent to the inner surface of the door opposite a viewing window **36** carried by the door. At its end away from pins **31**, the platen is bent away from surface **35** and, as shown best in FIG. 2, terminates in a knife-edge member **37** having a sharp writing edge **38** spaced remote from the pins. The knife-edge member has a convexly contoured drag surface **39** adjacent the writing edge; this surface is disposed convex toward the stylus drive motors during operation of the oscillograph. If desired, the knife-edge member may be formed integral with the platen.

A pair of resilient brackets **40** are mounted to the platen at its opposite ends adjacent the frame end plates and extend away from platen surface **35**. Each bracket, at a location spaced from the platen, rotatably mounts a respective one of a pair of coaxially aligned record supply roll holder pins **41**. The pins are sized to fit snugly into a core (not shown) upon which a quantity of heat sensitive record paper **42** is coiled to form a record paper supply roll **43**. An empty core can be removed from the pins and a full roll mounted on the pins by deflecting the brackets against their resilient bias tomove the pins away from each other.

A record paper drive roller **45** is rotatably mounted between the frame end plates below the platen assembly adjacent the closed position of door **13**. The drive roller is driven by a motor **46** via a gear train **47** so that a length of record paper engaged with the roller is pulled from supply roll **43**, over surface **39** and writing edge **38**, and over platen surface **35** to the drive roller during operation of the oscillograph. In order that the record paper may be properly engaged with the drive roller during operation of the oscillograph, a pressure roller **48** is rotatably mounted to the inner surface of the door in such position that the pressure roller is moved into cooperative engagement with the drive roller when the door is closed. The pressure roller is resiliently biased toward the drive roller by a biasing mechanism described below. Record paper moved along the above-described path in the oscillograph passes from between the pressure and drive rollers through an exit slot **49**. The paper is guided from the drive roller to the slot by a guide **50** extending between the frame end plates adjacent the lower portion of the door in the closed position of the door.

A record paper drag roller **51** is rotatably mounted between a pair of arm assemblies **52** which extend forwardly of the housing from motor bracket end flanges **21**. The drag roller is disposed adjacent the knife-edge member during operation of the oscillograph and is resiliently biased to force paper passing between it and the knife-edge into engagement with convexly curved surface **39**. This cooperation between the drag roller and the knife-edge member causes the strip of record paper between the drag and drive rollers to be under a selected amount of tension and to break, i.e., bend, sharply as it is moved over writing edge **38**. The tension in the strip between the drag and drive rollers is essentially constant since the amount of platen assembly surface engaged by the strip is essentially constant regardless of the degree of fullness of the paper supply roll.

A lug bracket **55** is secured to door **13** adjacent each frame end plate and adjacent door hinge pin **14**. The lug brackets are positioned so that they extend toward the motor bracket when the door is closed. Two link members **56** and **57** are pivotally connected to each lug bracket by pins **58** and **59**, respectively. The ends of link members **56** are pivotally connected to the adjacent stylus motor end flanges by pins **60**. Pins **60** are coaxially aligned with each other and are spaced from motor bracket hinge pins **17** so that, when the door is closed, pins **14**, **58** and **60** lie in a straight line, and so that, when the door is opened, the motor bracket is hinged upwardly through an arc of about 25° about axis **18**. Link members **57**, at locations spaced from pins **59**, are pivotally connected to the platen assembly at coaxially aligned locations by pins **61**. Pins **61** are spaced from platen assembly hinge pins **31** such that, when the door is closed, pins **59** lie toward the stylus motor bracket from a line between pins **14** and **61**. Link arms **57** extend beyond pins **61** and, beyond pins **61**, define inclined surfaces **62** which engage tires **32** of the platen assembly hinge pins to prevent movement of these link members and of the door during opening of the door beyond a point which is selected so that pins **58**, **59** and **60** and pins **31**, **59** and **61** are neither in a straight line nor have they moved into and past a straight line during such movement of the door. In other words, surfaces **62** engage tires **32** in time to limit the opening movement of the door so that as the door is moved from its fully open to its closed position no toggle effects are encountered relative to link members **56** or **57**. Accordingly, the door cannot jam open.

As shown in FIG. 1, the link members are arranged relative to the platen assembly and the stylus motor bracket so that, when the door is closed, the motor bracket is engaged against stop pins **19** and the surface **35** of the platen is adjacent to and parallel to door window **36**. Also, pressure roller **48** is resiliently engaged with drive roll **45** on the side of the drive roll opposite from the platen assembly. The heated stylus carried by each stylus arm engages record paper **42** at knife edge **38** with essentially point contact. As a result, as the stylus moves transversely of the path of movement of the record paper in response to an input signal applied to the corresponding stylus drive motor, a sharply defined line or graphic representation of the variations in the signal is produced on the record paper. This record is visible through window **36** as the record paper moves over platen surface **35**.

Because link member pivot pins **59** lie toward the stylus motors from a line through pin **14** and pins **61**, whereas pins **14**, **58** and **60** lie in a line when the door is closed, the first stages of movement of the door from its closed toward its open position cause the platen assembly to move a slight amount counter-clockwise (as seen in FIG. 1) before moving clockwise through an arc of about 110°; the stylus motor bracket moves only counter-clockwise during such movement of the door. As a result, the platen knife-edge member moves against resiliently biased drag roller **51** at the same time the drag roller and the several styli move upwardly relative to the knife-edge member. The link members are arranged so that the styli have been moved out of the path of the knife-edge member before this member begins to move out of the housing in response to opening movement of the door. This sequence of movements is reversed when the door is closed.

As shown in FIG. 2, when the door is fully open, the platen assembly is so positioned that supply roll supporting brackets **40** are readily accessible from the exterior of the housing. A spent roll of record paper may be extracted from the oscillograph and a full roll inserted in its place in a matter of seconds merely by deflecting brackets **40** against their inherent resilient bias which urges pins **41** toward each other. After a new roll of record paper has been mounted in the platen assembly, a quantity of paper is unrolled from the roll and draped over the knife-edge member. As the door is closed and the movable components of the oscillograph move from the relation shown in FIG. 2 to the relation shown in FIG. 1, this length of record paper moves into engagement with platen surface **35** and extends past the drive roller. The portion of the record paper which extends below the drive roller is engaged by pressure roller **48** as the door is closed and is moved by the pressure roller into engagement with the drive roller. After the door is closed, it is only necessary to operate motor **46** sufficiently to rotate the drive roller three or four times to cause the record paper to be properly aligned and tensioned along its path of movement through the oscillograph.

It will be understood that the structure described above may be used to advantage in an ink-writing mechanical oscillograph. The only basic structural difference between the structure described and the structure of an ink-writing oscillograph is in the nature of the stylus carried by each stylus arm. Such a structural difference, however, is not material to the present invention. In an optical oscillograph, the stylus and stylus arm combinations are replaced by light beams. In an optical oscillograph, therefore, use of the invention may result in only the platen assembly, over which a light-sensitive record paper moves, being moved in response to movement of a door so that a roll of record paper carried by the platen assembly may be changed easily and rapidly.

As shown in FIGS. 1 and 3, pressure roller **48** is mounted to door **13** by a pair of arms **65**, each of which journals a corresponding one of a pair of roller axles **66** at the end of the arm spaced away from the door. Adjacent its other end, each arm is journalled on a corresponding one of a pair of pins **68** carried by the door. An elongate spring rod **69** extends parallel to the pressure roller between the roller and the door and has its opposite ends secured to arms **65**, as seen best in FIG. 3. Below the pressure roller and centrally of its length, a lug **70** extends rearwardly from door **13**. A post **71**, preferably provided by an adjustable set screw, extends upwardly from the lug into essentially point contact with the spring rod at essentially the midpoint of the distance along the rod between arms **65**. The post has a length such that, when the pressure roller is engaged with the drive roller, the ends of the spring rod are deflected away from the drive roller relative to the portion of the spring rod engaged with the post, and arms **65** are biased toward the drive roller about pins **68**. The amount of this bias is determined by the stiffness of the spring rod and the amount of deflection of the spring rod. Because the spring rod is not constrained at its midpoint, equal forces are imposed upon arms **65** by the rod and the force of engagement of the pressure roller with the drive roller is equal at each end of the pressure roller. Also, the pressure roller is thus so mounted that any non-parallelism between it and the drive roller is eliminated. If the door hinge axis is skew to the axis of the drive roller, the pressure roller is still parallel to the drive roller when the drive and pressure rollers are engaged. As a result, the record paper at all points acoss its width is wrapped around the drive roller to the same extent and the drive roller functions properly to pull the record paper over the writing edge in such a manner that the tension in the paper across its width at the writing edge is uniform. Uniform tension in the record paper at the writing edge means that the lines produced by the action of the styli upon the paper are of uniform density.

To further assist in maintaining the tension in the record paper uniform across the length of writing edge **38**, drag roller **51** is mounted to the stylus motor bracket by a mechanism similar in principle to the mechanism which mounts the pressure roller to the door. As shown in FIG. 4, each drag roller mounting arm assembly **52** includes a guide arm **75** which is rigidly mounted to a corresponding one of bracket flanges **21** by screws **76**. A flange **77** extends downwardly from the motor bracket between arms **75** adjacent the front edges of flanges **21**. Forwardly of flange **77**, each arm **75** defines an elongate slot **78** (see FIG. 2); a similar slot **79** is formed in each arm adjacent its end remote from the stylus motor bracket. A movable arm member **80** is slidably engaged with each of the opposing surfaces of arms **75** forward of flange **77**. A spring rod **81** is supported at its midlength between arm members **80** in a diametral slot **82** formed in the forward end of a spring support sleeve **83** mounted at its rear end to bracket flange **77**. Each end of the spring rod extends through a circular aperture **84** formed in the rear portion of a corresponding arm member **80** into sliding engagement with adjacent slot **78**. The drag roller has coaxially aligned axles **85** which are rotatably mounted in bearings **86** carried by arm members **80** at their forward ends. Each drag roller axle extends beyond its bearing into engagement with an adjacent slot **79**. Accordingly, the drag roller is mounted for limited sliding movement toward and away from bracket flange **77**, but is urged into engagement with surface **39** of the knife-edge member by spring **81**.

Because only a single spring is used and because the spring is supported at essentially a single point at its midlength, equal forces are imposed on axles **85** and the pressure of the roller against a strip of record paper disposed between it and surface **39** is equal across the width of the paper. As a result, the friction produced between the roller and writing edge **38** along surface **39** is uniform across the width of the strip and the angle with which the paper breaks over the writing edge is sharp and uniform across the width of the strip. Thus, each stylus engages the record paper at only a single sharply defined

point along the writing edge and the trace provided by the stylus is uniform regardless of the position of the stylus transversely of the path of paper movement.

Also, because of the manner in which the drag roller is mounted and biased toward surface **39**, the advantages described above are obtained even though the operational position of the platen assembly relative to the stylus motor bracket may change slightly during the life of the oscillograph because of wear in the joints of the linkage assembly interconnecting the bracket and the platen assembly with the door.

I claim:

1. In a recording oscillograph including a housing having a frame, means for receiving a supply of strip record material, drive means for moving a strip of said record material along a selected path in the housing, writing means in the housing for producing upon the record material a record of variations in an oscillograph input signal, and a platen having a surface over which the record material moves during operation of the oscillograph, the improvement comprising, in combination, a door hingeably mounted to the housing frame for movement relative to the frame between an open position and an operative closed position adjacent the platen surface during operation of the oscillograph, means mounting the record material supply receiving means to the side of the platen opposite from said surface, means hingeably mounting the platen to the frame separate from the door for hingable movement relative to the frame and the door about an axis fixed relative to the frame adjacent the door in its closed position, means carried by the door for movement therewith operative to engage the record material with the record material drive means in the closed position of the door, and means coupled to the door and operable in response to movement of the door from its closed to its open position for moving the platen about its hinge axis from:

(a) an operative recording relation of the platen relative to the writing means wherein the drive means is operable to move said record material along said path, to

(b) a position of the platen wherein the record material supply receiving means is exposed for loading a supply of record material thereinto and the record material is threadable along said path by pulling a length of said material from the supply and closing the door to return the platen to said operative recording relation and to engage the record material with the drive means.

2. An oscillograph according to claim **1** including record material tensioning means mounted for operative engagement with the record material when the door is in its closed position.

3. An oscillograph according to claim **2** wherein the record material tensioning means is mounted to engage the record material between the roll support means and the platen surface.

4. An oscillograph according to claim **3** wherein the record material tensioning means includes a drag roller disposed transversely of the path of said strip of record material, and means resiliently biasing the drag roller into the strip moving therepast.

5. An oscillograph according to claim **1** wherein the writing means includes a stylus, a stylus drive motor coupled to the stylus for moving the stylus transversely of the selected path, and means mounting the stylus relative to the platen so that the stylus engages record material passing the platen only when the platen is in said operative recording relation to the writing means.

6. An oscillograph according to claim **5** including stylus motor mounting means mounting the stylus drive motor to the frame for rotation relative to the frame about a hinge axis, and the means coupled to the door includes means operable in response to movement of the door from its open to its closed position for moving the motor mounting means and the motor from a first position wherein the stylus is located relative to the platen for engaging record material passing the platen to a second position in which the stylus is spaced from the position occupied in its first position.

7. An oscillograph according to claim **6** wherein the means coupled to the door includes a rigid link member pivotally connected at one end thereof to the door and at its other end to the stylus motor mounting means.

8. An oscillograph according to claim **7** wherein the locations of pivotal connection of said link member to the door and to the stylus motor mounting means lie in a substantially straight line with the door hinge axis when the door is in its closed position.

9. An oscillograph according to claim **6** including resilient stop means abutting the stylus motor mounting means when the door is closed for defining the first position of the stylus motor mounting means.

10. An oscillograph according to claim **5** wherein the platen defines a convexly contoured drag surface extending transversely of said selected path between said platen surface adjacent the door and the location of a roll of said record material, a rotatable drag roller disposed adjacent said drag surface so that record material passes between the drag roller and the drag surface, and means resiliently biasing the drag roller into engagement with the drag surface.

11. An oscillograph according to claim **10** including stylus motor support means hingeably mounting the stylus motor to the frame, means coupling the stylus motor support means to the door for movement of said support means relative to the frame in response to hinging movement of the door, and wherein the drag roller is carried by the stylus motor support means for movement therewith and the means resiliently biasing the drag roller cooperates between the roller and the stylus motor support means.

12. An oscillograph according to claim **1** wherein the means coupled to the door comprises an elongate substantially rigid link member pivotally connected at one end to the door adjacent the hinge axis of the door and pivotally coupled at its other end to the platen at a location opposite the platen hinge axis from the closed position of the door.

13. An oscillograph according to claim **12** wherein the door and platen hinge axes and the link member pivot axes are substantially parallel, and the link member is arranged between the door and the platen so that the connection of the link member to the door lies opposite the door from a line between the connection of the link member to the platen and the door hinge axis when the door is in its closed position.

14. An oscillograph according to claim **13** including stop means for defining the open position of the door such that the pivot axes of the link member and the platen hinge axis are neither in a straight line relation in the open position of the door nor have they moved into and out of such relation during movement of the door from its closed to its open position.

15. In a recording oscillograph including: a housing having a frame; means for receiving a supply of strip record material; drive means for moving a strip of said record material along a selected path in the housing; writing means in the housing, including a stylus engageable with the record material, a drive motor for the stylus, and support means for the stylus motor, for producing upon the record material a record of variations in an oscillograph input signal; and a platen having a surface over which the record material moves during operation of the oscillograph; the improvement comprising, in combination: a door hingeably mounted to the housing frame for movement relative to the frame between an open position and a closed position; means mounting the record material

supply receiving means to the side of the platen opposite from said surface, means hingeably mounting the platen to the frame for movement relative to the frame and to the door; means carried by the door for movement therewith operative to engage the record material with the record material drive means in the closed position of the door, means hingeably mounting the stylus motor support means to the frame for movement relative to the frame, to the door, and to the platen; and means coupled to the door and operable in response to movement of the door from its closed to its open position:

(a) for moving the platen from

(1) a position in which the supply of record material is located behind the platen relative to the door and wherein the drive means is operable to move said record material along the selected path, to

(2) a position of the platen wherein the record material supply receiving means is exposed for loading a supply of record material thereinto and the record material is threadable along the selected path by pulling a length of the record material from the supply and closing the door to return the platen to its former position and to engage the record material with the drive means, and

(b) for moving the stylus motor support means from

(1) a position in which the stylus engages record material moving over the platen along the selected path, to

(2) a position in which the stylus is spaced from the platen and the platen may move between its positions as aforesaid without engaging the stylus.

References Cited

UNITED STATES PATENTS

3,051,408	8/1962	Finch	346—136
3,154,368	10/1964	Daigler et al.	346—68
3,283,335	11/1966	Sachleben	346—68

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