June 30, 1964 K. R. JOHNSON 3,139,320

RECORDER

Filed Jan. 15, 1962

4 Sheets-Sheet 1

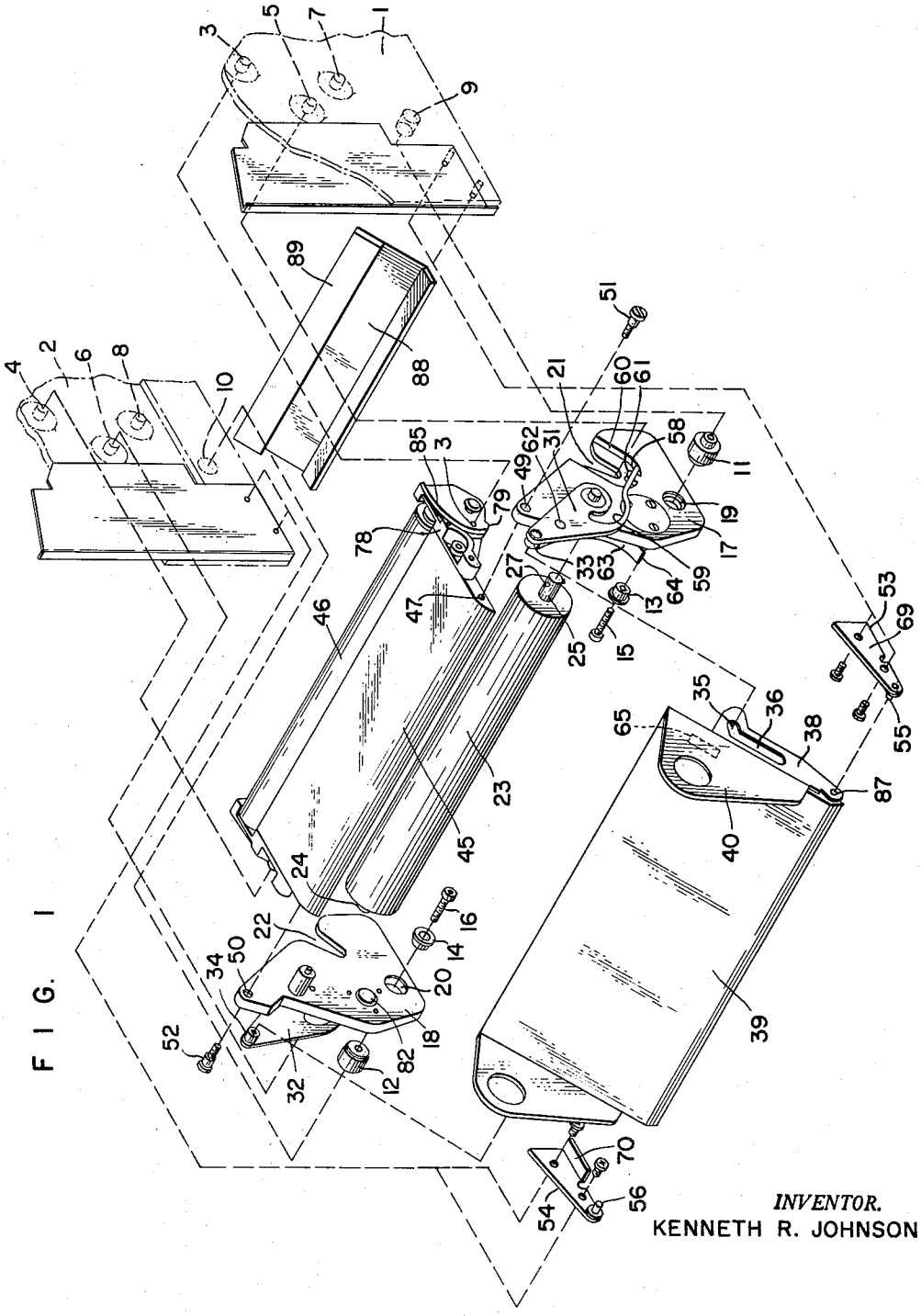


FIG. 1

INVENTOR.
KENNETH R. JOHNSON

June 30, 1964 K. R. JOHNSON 3,139,320

RECORDER

Filed Jan. 15, 1962 4 Sheets-Sheet 2

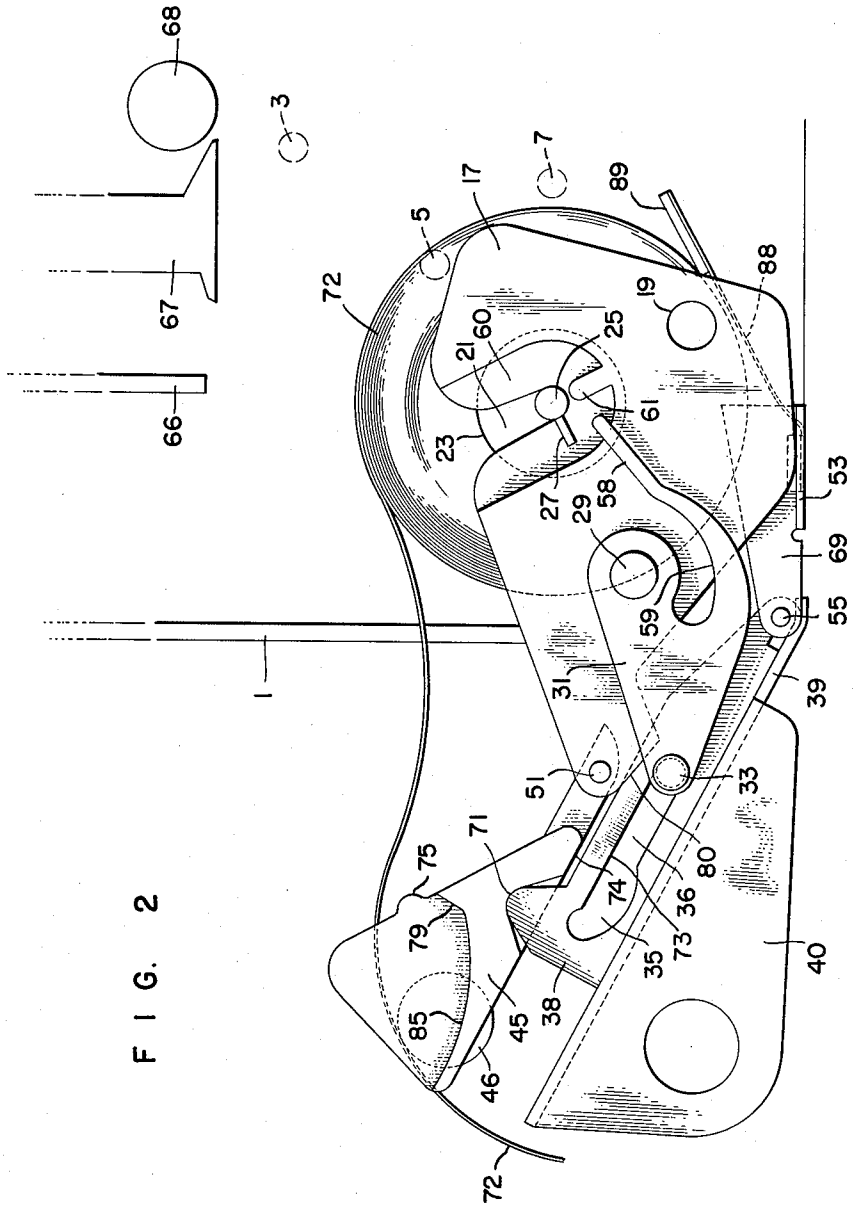


FIG. 2

INVENTOR.
KENNETH R. JOHNSON

BY

ATTORNEY.

June 30, 1964 K. R. JOHNSON 3,139,320

RECORDER

Filed Jan. 15, 1962

4 Sheets-Sheet 3

FIG. 3

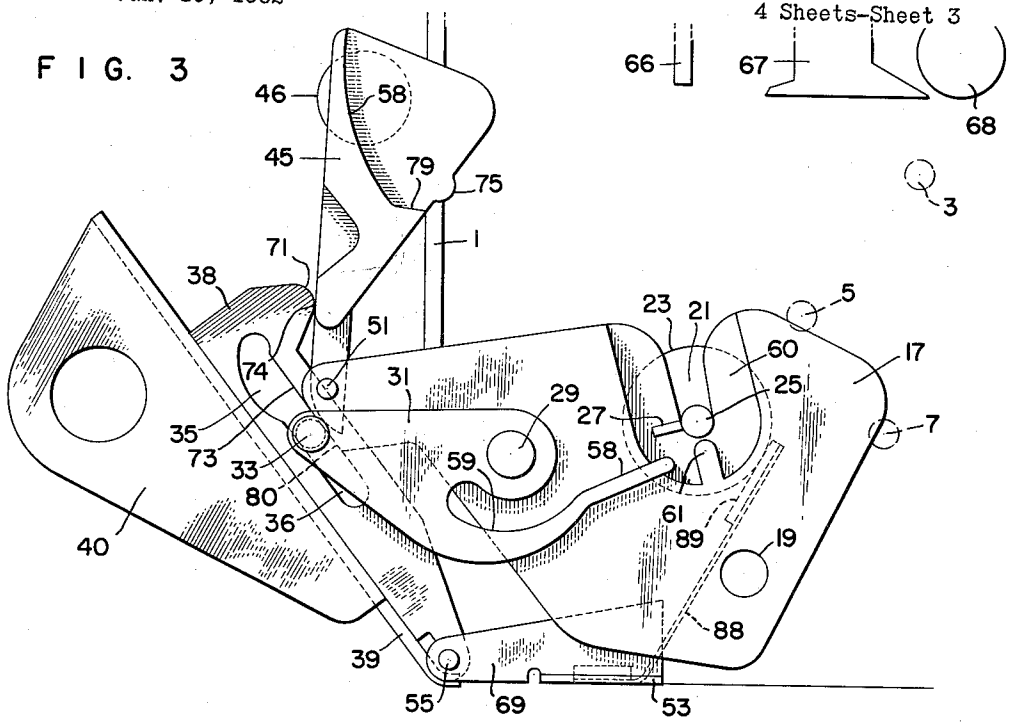
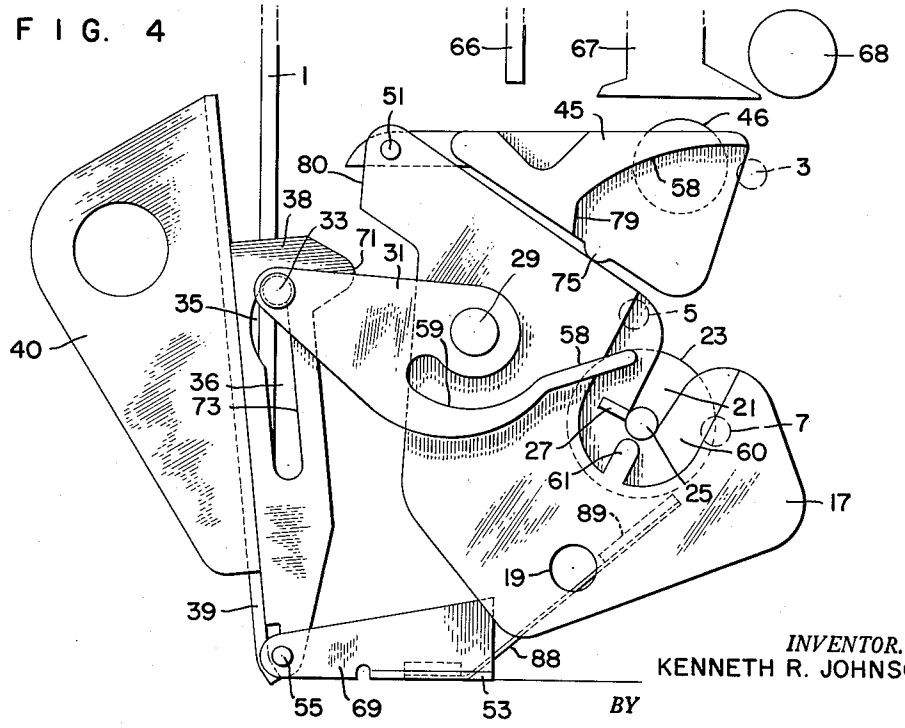


FIG. 4



INVENTOR.
KENNETH R. JOHNSON

BY

ATTORNEY.

June 30, 1964 K. R. JOHNSON 3,139,320

RECORDER

Filed Jan. 15, 1962 4 Sheets-Sheet 4

FIG. 5

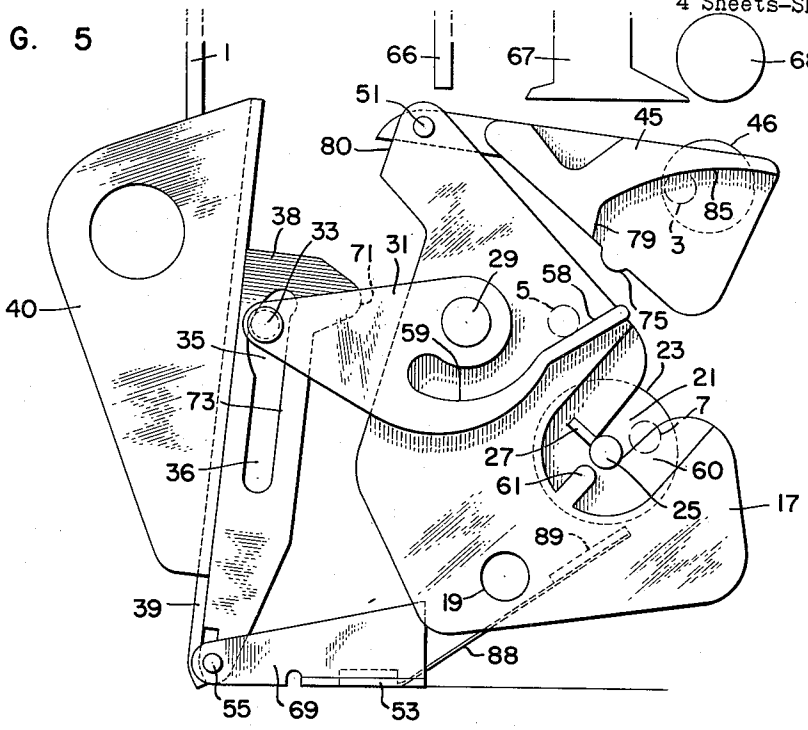
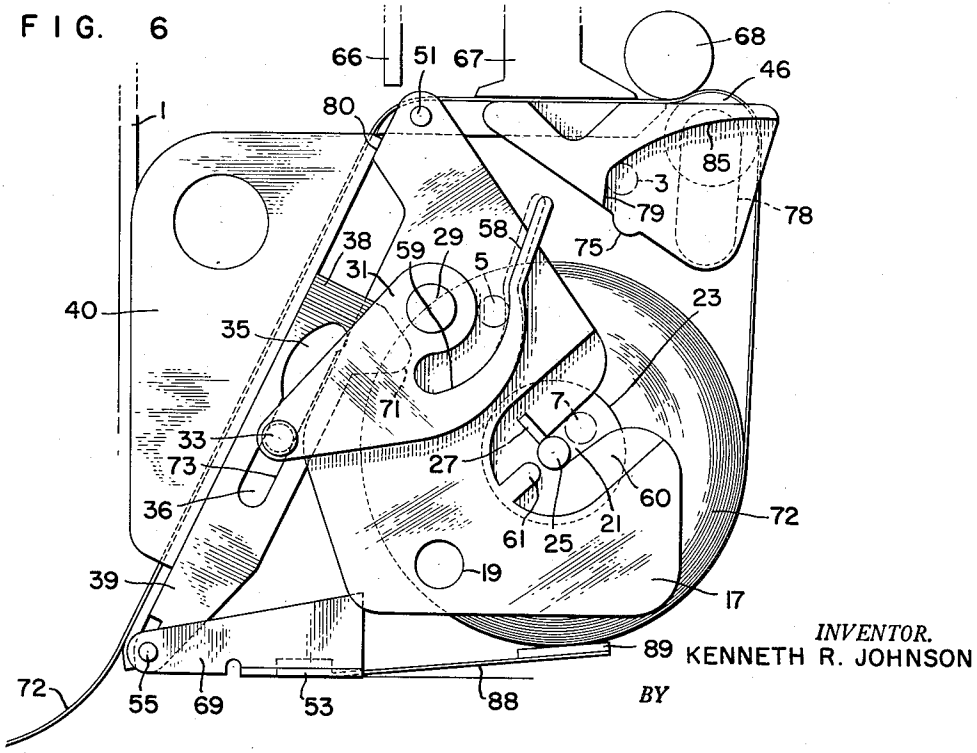


FIG. 6



INVENTOR.
KENNETH R. JOHNSON

BY

ATTORNEY.

United States Patent Office 3,139,320 Patented June 30, 1964

3,139,320

RECORDER

Kenneth R. Johnson, Denver, Colo., assignor to Minneapolis-Honeywell Regulator Company, Minneapolis, Minn., a corporation of Delaware

Filed Jan. 15, 1962, Ser. No. 166,062
6 Claims. (Cl. 346—145)

This invention relates to a paper transport system useful in connection with a direct-recording oscillograph which includes: a high-energy, mercury-vapor, light source; mirror galvanometers; and an optical system, which transmits the light from the source to the mirrors and thence to the paper on which a trace or record is made.

An object of this invention is to provide means whereby a roll of paper can be readily and easily loaded into the oscillograph.

More specifically, it is an object of this invention to provide in a recording oscillograph, a paper transport system including, a case, a writing platen pivotally mounted in said case, a cradle pivotally mounted in said case, a pivotal connection between said writing platen and said cradle whereby said platen and said cradle may be rocked from recording position to paper-receiving position, a spindle adapted to be passed through the roll of paper and to be pivotally mounted in said cradle, a recording platen mounted on said cradle for movement therewith, an idler roller pivotally mounted on said recording platen, and a drive roller mounted in said case adapted to engage a surface of said paper, by pressure of said idler roller, so as to drive said paper.

A further object of this invention is to provide, in a recording oscillograph having a paper transport system, means for indicating the amount of paper remaining in said system and available for recording.

A better understanding of the present invention may be had from the following detailed description when read in connection with the accompanying drawings, in which:

FIG. 1 is an isometric view with the parts separated and their relative location indicated by dashed lines; and

FIGS. 2 through 6 are simplified diagrams in right side elevation showing the paper transport system in the various positions it assumes as it moves from open to closed position.

The paper transport system of this invention comprises a case having side plates 1 and 2 on which are located pins 3, 4, 5, 6, 7 and 8. These pins are mounted perpendicular to the plane of the side plates 1 and 2 and are adapted to frictionally engage and thereby retain in adjusted position various parts of the paper transport system hereinafter mentioned.

Side plates 1 and 2 each has therein a hole 9 and 10 which is mounted on a cradle pivot 11 and 12. Cradle pivots 11 and 12 each supports a cradle bearing 13 and 14 secured thereto by a screw 15 and 16. The cradle side plates 17 and 18 each has a hole 19 and 20 therein adapted to receive a cradle pivot 11 and 12 therein so that the side plates and the parts supported thereby are mounted for pivotation about the axis of the cradle pivots 11 and 12. Cradle side plates 17 and 18 each has a notch 21 and 22 in it adapted to receive the studs 25 and 24 of a cylindrical spindle 23. Spindle 23 is mounted in the cradle by the engagement of the studs 25 and 24 in the notches 21 and 22, respectively. Pin 27 engages projection 61 and prevents rotation of the spindle 23. Therefore in operation the paper roll rotates but the spindle does not, thus inertia is kept at a minimum.

The cradle assembly is retained in the closed position by means of a latch comprising a pair of latch plates 31

and 32 each having a connecting pin 33 or 34 mounted thereon. Pins 33 and 34 are each slidingly located in an L-shaped slot 35–36 in a platen bracket 38 (only one of the platen brackets 38 is seen in the drawings). Platen brackets 38 are mounted on the rear of a writing platen 39 which has ears 40 projecting forwardly therefrom.

Recording platen 45 has a pair of holes 47 (of which but one is shown in the drawing). Cradle side plates 17 and 18 have a pair of holes 49 and 50 through them. A pair of platen shoulder screws 51 and 52 project through the holes 49, 47 and 50, 47, respectively. Screws 51 and 52 thus provide a pivotal connection, by means of the side plates 17 and 18, between the cradle and recording platen 45.

The case, by means of the side plates 1 and 2, carries a pair of hinge brackets 53 and 54 on it. Hinge brackets 53 and 54 each has a pivot 55 and 56 adapted to enter into one of a pair of holes 87 (only one hole 87 is shown in the drawings) in cover 39. Pivots 55 and 56 thus provide a stationary axis about which the writing platen 39 can rotate.

The latch plates 31 and 32 have latch faces 58 and 59 (only one of the latch faces 58 and 59 is shown in the drawing). These latch plates 31 and 32 and these latch faces 58 and 59 retain the cradle side plates 17 and 18 and associated parts in the closed position by means of engagement with pins 5 and 6.

The cradle side plates 17 and 18 have recesses 60 in them. Support 61 projects radially into recesses 60.

A paper supply indicator is mounted on the cradle by means of a pivot 62 on which is pivotally mounted an indicator lever having a curved face 63 adapted to engage the roll of paper on the spindle 23 and an indicator 64 aligned with a slot 65 in the cover 39 to indicate the amount of paper remaining on the spindle. The geometry of the pivot 62 and of the curved portion 63 is so arranged that the scale of the footage indicator is approximately linear from full roll to empty roll even though the quantity of paper is not linear with the change in diameter of the paper roll.

FIG. 2 shows the paper transport system in the open position.

The amber viewing glass 66, the paper hold-down bar 67, and the drive roller 68 are permanently mounted between the side plates 1 and 2. Projecting inward from side plate 1, are pins 3, 5 and 7. A right cradle side plate 17 is mounted on pivot bearing 11, which, in turn, is mounted on the side plate 1. Likewise pins 4, 6 and 8 project inward from side plate 2 and cradle side plate 18 is mounted on pivot bearing 12.

As shown in FIG. 2, the cradle side plates 17 and 18 are rotated counterclockwise and rests on the flanges 69 and 70 of the hinge brackets 53 and 54. The writing platen 39, which pivots at pivot 55 and 56 is restrained from further rotation counterclockwise by nylon pins 33 and 34 which have reached the end of slot 35, 36 in the platen brackets 38. Platen brackets 38 are permanently attached to writing platen 39. Pins 33 and 34 are mounted on latch plates 31 and 32, which are pivotly mounted on the cradle side plates 17 and 18 by bearings 29. The recording platen assembly 45 is shown pivoted counterclockwise about pivot points 51 and 52 and is resting against the writing platen brackets 38 at point 71. A roll of recording paper 72 is shown in place prior to closing the cradle. The recording paper is supported on spindle 23, which has extending from each end, studs 24 and 25 which rest in the slots 21 and 22 in the cradle side plates. A pin 27 is installed on one side of the spindle only, and prevents rotation of the spindle by coming to rest against projection 61 in the cradle side plate 17.

FIG. 3 shows the paper transport system as it is starting to be closed. Closing is accomplished by applying

pressure to the writing platen at a point spaced from the pivot. As this motion is begun, nylon pins **33** and **34** move upward until they contact the cradle side plates at points indicated **73**. Continuing this motion then causes the cradle side plates **17** and **18** to start rotating clockwise about their pivot bearings **11** and **12**. While this is happening, nylon pins **33** and **34** move upward in slots **35, 36**. The recording platen assembly **45** is forced to rotate clockwise by pressure of the ears of the platen brackets at points indicated **74**. By the time motion has continued to the point shown in FIG. 3 gravity takes over and causes the recording platen assembly **45** to continue rotating clockwise until it comes to rest on the cradle side plates against projections **75**.

As motion continues, pins **33** and **34** reach the ends **35** of slots **36** as shown in FIG. 4. At this point, latches **31** and **32** are caused to rotate counterclockwise as cradle side plates continue their rotation clockwise. Because recording platen assembly **45** is resting on projections **75** against the cradle side plates, it is in a position low enough to clear the amber glass **66** and hold-down bar **67**. At the position shown in FIG. 4 the cam surfaces **85** on the cam plates which are a part of the recording platen assembly are approaching pins **3** and **4**, and will shortly contact the cam surfaces **85**. The straight portions **58** of latches **31** and **32** are also approaching pins **5** and **6** and will shortly contact them.

FIG. 5 shows that pins **33** and **34** have started moving downward in slots **35, 36** and straight portions **58** of latches **31** and **32** have contacted pins **5** and **6**. Also, cam surfaces **85** have contacted pins **3** and **4**, and are causing recording platen assembly **45** to move upward toward the paper hold-down bar **67** and the drive roller **68**. The studs **24** and **25** on the ends of the spindle **23** are moving underneath pins **7** and **8** which project inward from the side plates **1** and **2**.

FIG. 6 shows the cradle completely closed and ready for operation. The idler roller **46** has now moved up to contact the drive roller **68**. The idler roller **46** is spring loaded against the drive roller **68** and is pivotly mounted on links **78**. The recording platen assembly is accurately positioned, both vertically and horizontally by pins **3** and **4**. The junction of the cam surface **85** and a vertical surface **79** on the cam plates has come to rest against pins **3** and **4**. This positioning accurately controls the narrow gap between the recording platen and the hold-down bar through which the paper travels. This action holds the paper accurately so that it will remain in focus as recording takes place.

The cradle side plates **17** and **18**, and thus, the entire assembly is firmly locked in place by the latches **31** and **32** as they contact pins **5** and **6**. During the final bit of motion of the writing platen **39**, a force is exerted on pins **33** and **34** by slots **35, 36**. This causes counterclockwise rotation of the latches and a wedging action around pins **5** and **6**. The latches are flexible and deflect slightly in the locked position as indicated by the dotted line which shows their free position, and the solid line their deflected position.

The writing platen, when closing, comes to rest against the cradle side plates at points **80**.

When the paper drive is started, the drive roller rotates clockwise and the pressure of the idler roller grips the paper and causes the paper roll to rotate counterclockwise. The spindle can only rotate part of the turn until pin **27** comes to rest against projection **61**. The spindle is held stationary to reduce the rotating inertia. This is necessary because sudden stopping would otherwise cause excessive overspooling of the paper.

Drag buttons **82** (only one of which appears in the drawings) are also installed in the cradle side plates **1** and **2**. These drag buttons **82** are spring-loaded against the edge of the roll **72** of paper, and cause additional friction to prevent overspooling when stopping from high-speed operation. As the diameter of the paper roll **72** goes down, eventually contact is lost with the drag buttons **82**, because of the reduced diameter. By this time, however, the paper roll is small enough that the drag buttons **82** are no longer required.

Another method of providing friction to prevent overspooling is provided by part **88**. This may be used in addition to, or in place of, the drag buttons. Part **88** consists of a light spring made of thin spring material to which is attached a felt or velvet pod **89**. This pod drags on the outside of the roll of paper. As the roll diameter becomes smaller the pressure of this drag brake becomes less.

Opening the cradle is almost the reverse operation to closing it. The writing platen is pulled outward by the unnumbered fingerholes in writing platen **39**. This outward rotation of the writing platen pulls on pins **33** and **34** by slots **35, 36** causing clockwise rotation of latches **31** and **32**. Thus, the latches release from pins **5** and **6**. When the writing platen **39** is pulled all the way forward and comes to stop, the recording platen **45**, however, will still be resting on the cradle side plates on projections **75**. In order to remove the paper roll or spindle, the recording platen **45** must then be rotated counterclockwise by hand until it comes to rest at points **71** in FIG. 2.

The operation of the paper transport system of this invention is as folows:

Device is shown in its normal or operating position in FIG. 1.

The user of the paper transport system can insert one or more fingers into one or more of the holes in ears **40** and turn cover **39** from the position in which it is shown in FIG. 1 counter-clockwise into a substantially horizontal position. The initial portion of the movement of the cover **39** also rocks the cradle counter-clockwise by engagement of the connecting pins **33** and **34** in the radial portion **36** of the slots in ears **38**. The initial movement of the cover **39** also rotates the latch plates **31** and **32** so that latch surfaces **58** and **59** move away free from pins **5** and **6** (FIG. 5).

The platen **45** may be then grasped by the fingers of the operator and turned counter-clockwise about its pivot **51** and **52** because of the pivotal connections provided by tthe platen shown by screws **51** and **52** between platen **45** and the cradle. The spindle **23** can then be lifted out of the cradle. The tube of paper on which the roll of recording paper is mounted can then be removed from the spindle **23** and a new tube containing a fresh roll of recording paper is slid over the spindle **23**. The spindle **23** and the roll of supply paper thereon is then returned to the cradle by placing the studs **24** and **25** in the slots **22** and **21**, respectively. The engagement of the outer surface of the roll of paper on the spindle **23** with the curved face **63** of the indicator causes the indicator **64** to move from one end of slot **65**, which indicates the exhausted position of the paper, to the other end of the slot **65**, which indicates the full or 100% position of the paper.

The writing platen **39** is then turned clockwise into its closed or normal position. The initial movement of platen **39** causes recording platen **45** to rotate clockwise and come to rest with projections **75** on cradle side plates **17** and **18**. The initial clockwise movement of writing platen **39** does not cause any movement of the cradle because the connecting pins **33** and **34** are not yet contacting the cradle side plates. When the connecting pins **33** and **34** reach the end of slots at **35**, the latch is moved counter-clockwise. Shortly thereafter the curved latch faces **59** engage the stationary pins **5** and **6**. The latter portion of the movement of the latch allows the pins **5** and **6** to bend the latches in the **58, 59** area slightly as is seen in FIG. 6 in solid and dotted lines.

What is claimed is:

1. In a recording oscillograph, a paper transport system, including, a case having a pair of flat side plates

and a flat front plate with an opening therethrough, a cradle pivotally mounted in said case and having a pair of side plates each having a notch therein, a spindle adapted to be inserted at its ends into the notches in said cradle side plates and adapted to support a roll of paper thereon, a writing platen pivotally mounted on said case, and a pivotal connection between said writing platen and said cradle whereby said writing platen may be moved by hand about its pivot and cause said cradle to move about its pivot.

2. In a recording oscillograph, a paper transport system, including, a case having a pair of flat side plates and a flat front plate having an opening therethrough, a cradle having a pair of flat side plates each having a notch therein, a pivotal connection mounting said cradle in said case, a spindle adapted to be inserted in said notches adjacent the ends of said spindle and to support a roll of paper thereon, a writing platen pivotally mounted in said case, a pivotal connection between said writing platen and said cradle whereby said writing platen may be turned by hand about its pivot and cause said cradle to turn about its pivot, and a recording platen pivotally mounted on said cradle and adapted to underlie a portion of the paper leaving the roll of paper on said spindle.

3. A paper transport system according to claim 2, including, at least one pin mounted on one of the side plates of said case and projecting into the interior of said case, and a cam surface on said recording platen cooperating with said pin to locate said recording platen with relation to said case.

4. In a recording oscillograph, a paper transport system, including, a case having a pair of side plates and a front plate having an opening therethrough, a cradle having a pair of side plates each having a notch therein, a pivotal connection between said cradle and said case, a spindle adapted to be received in the notches in said side plates and to support a roll of chart paper thereon, a writing platen, a pivotal connection between said writing platen and said case whereby said writing platen may be turned by hand about its pivot, a pivotal connection between said writing platen and said cradle whereby turning movement of said writing platen causes turning movement of said cradle, at least one pin on one of the side plates of said case projecting toward the interior of said case, and at least one latch mounted on one of the side plates of said cradle and movable into and out of engagement with said pin to latch said cradle in its normal operating position.

5. In a recording oscillograph, a paper transport system, including, a case having a pair of flat side plates and a front plate having an opening therethrough, a cradle having a pair of side plates each having a notch therein, a pivotal connection between said cradle and said case, a spindle adapted to be located adjacent its ends in the notches in said side plates and to support a roll of paper thereon, a writing platen, a pivotal connection between said writing platen in said case whereby said writing platen may be turned about its pivot by hand, a pivotal connection between said writing platen and said cradle whereby turning movement of said writing platen causes corresponding turning movement of said cradle, a recording platen, a pivotal connection between said cradle and said recording platen whereby said recording platen may turn about its pivot relative to said cradle, a driving roller mounted in said case, and an idler roller mounted for rotation on said recording platen adapted to engage a portion of said paper and to force it into engagement with said driving roller.

6. In a recording oscillograph, a paper transport system, including, the case having a pair of flat side plates and a flat front plate with an opening therethrough, a cradle pivotally mounted in said case and having a pair of flat plates each having a notch therein, a spindle adapted to be inserted at its ends into the notches in said cradle side plates and adapted to support the roll of paper thereon, a writing platen pivotally mounted on said case adjacent the opening in said flat front plate and having an opening therethrough, a pivotal connection between said writing platen and said cradle whereby said writing platen may be moved by hand about its pivot and cause said cradle to move about its pivot, and a paper supply indicator, including, a lever pivotally mounted in said case and having a portion adapted to engage the roll of paper on said spindle and a portion visible through the opening in said writing platen and serving as an indicator of the diameter of said roll of paper.

References Cited in the file of this patent

UNITED STATES PATENTS

2,080,086	Mihalyi	May 11, 1937
2,902,332	Bauer	Sept. 1, 1959
3,082,970	Rasmussen	Mar. 26, 1963

FOREIGN PATENTS

302,656	Germany	Dec. 15, 1917