

Aug. 10, 1954

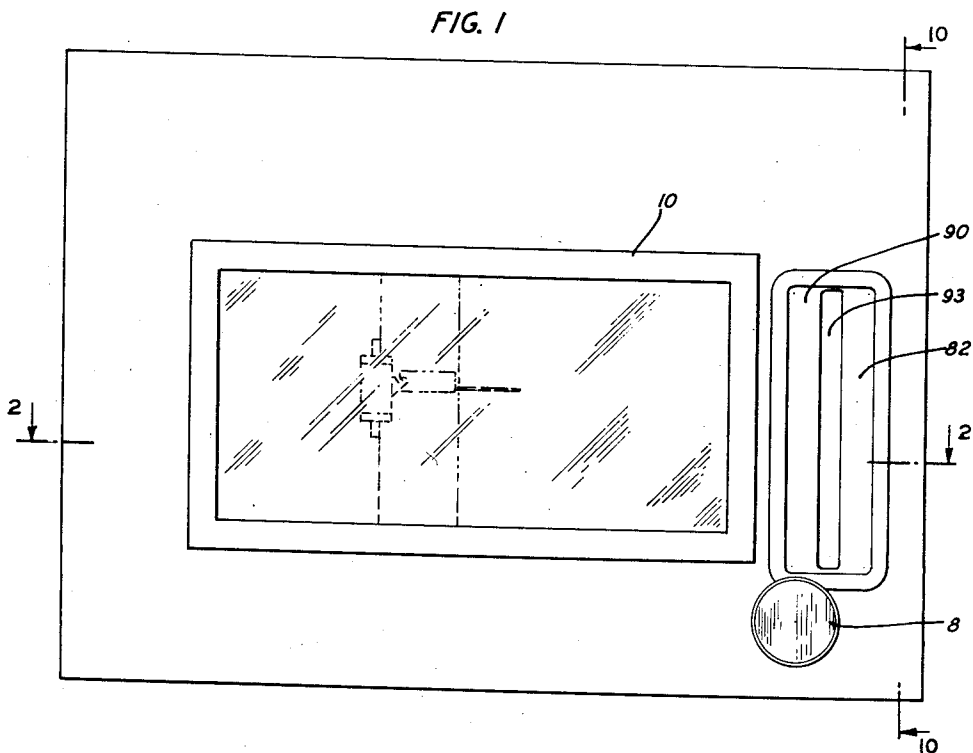
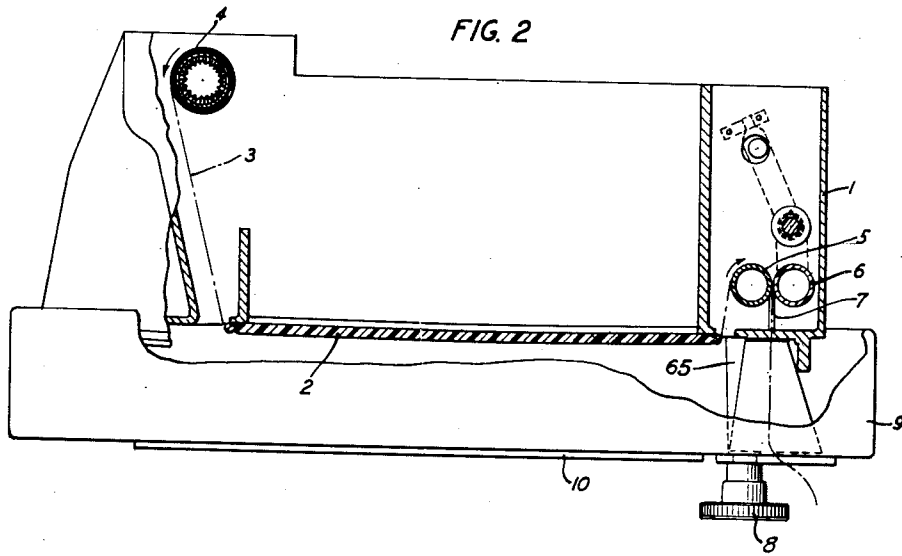
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2,686,012

PAPER SHEET FEED AND TENSIONING SYSTEM

Filed Nov. 6, 1951

5 Sheets-Sheet 1



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5 Sheets-Sheet 2

FIG. 3

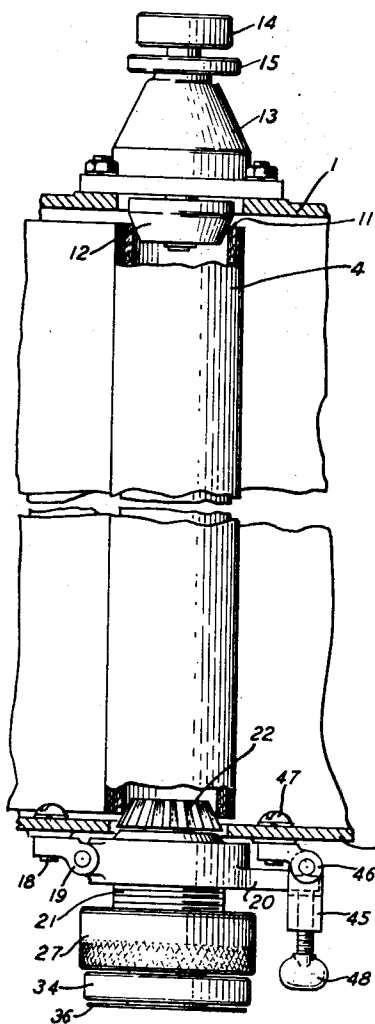


FIG. 4

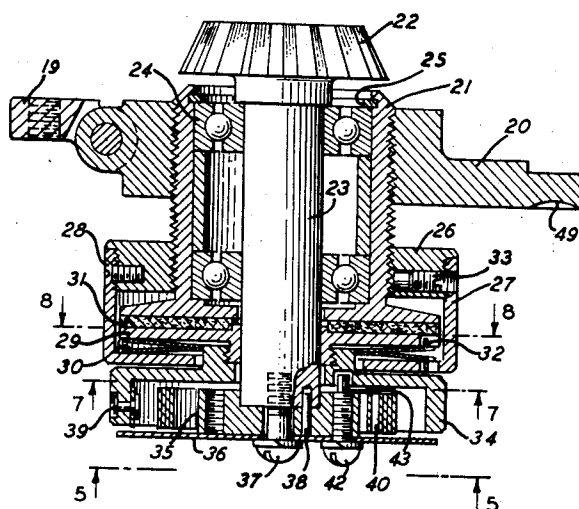


FIG. 9

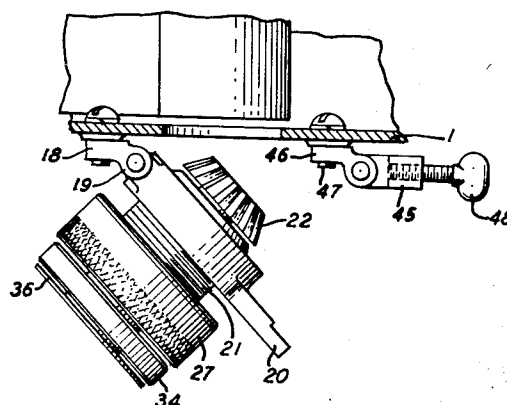
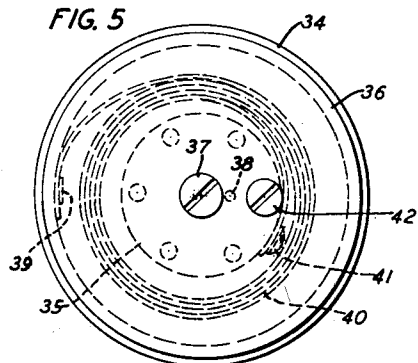


FIG. 5



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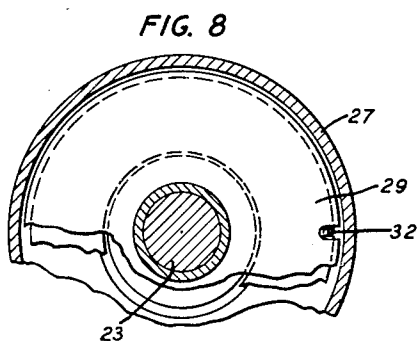
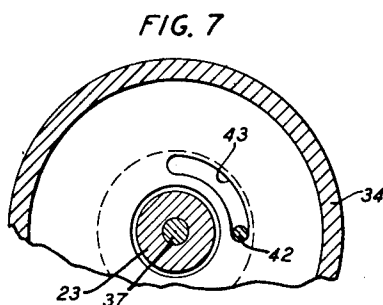
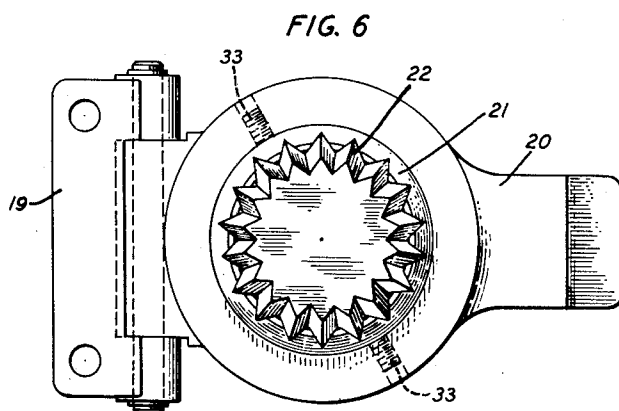
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FIG. 10

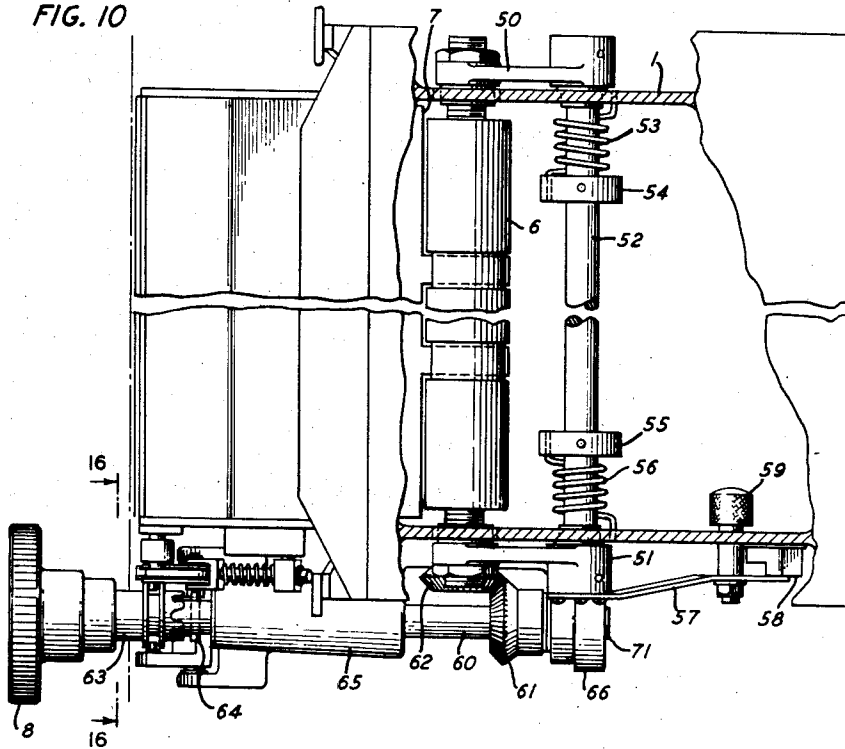


FIG. 11

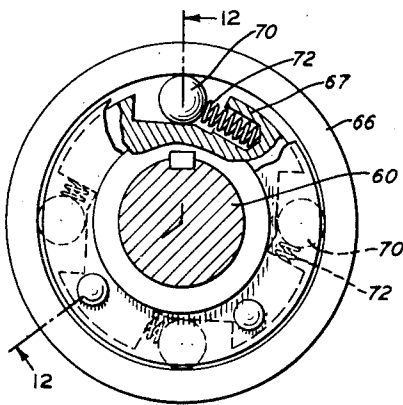
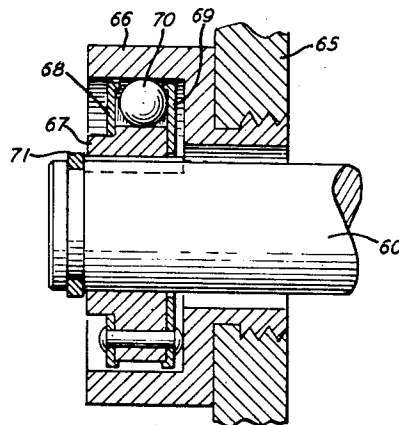


FIG. 12



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FIG. 13

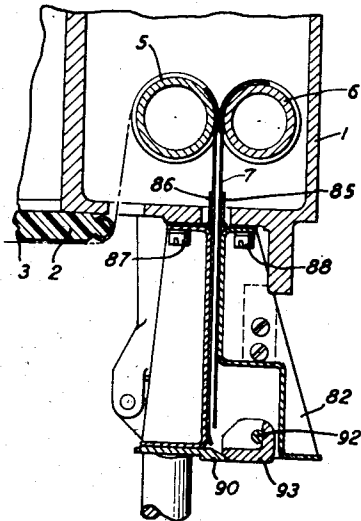


FIG. 14

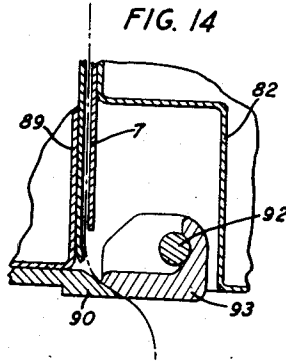


FIG. 15

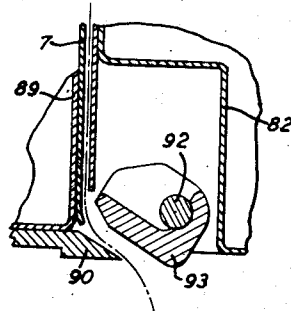


FIG. 16

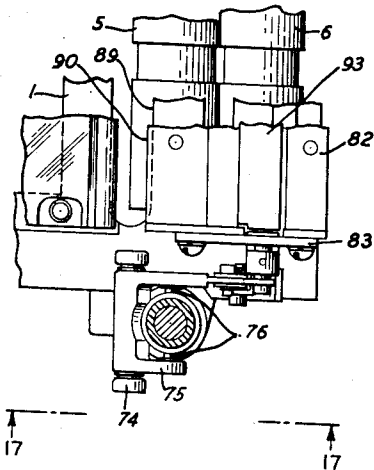


FIG. 18

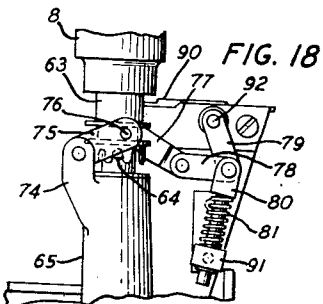
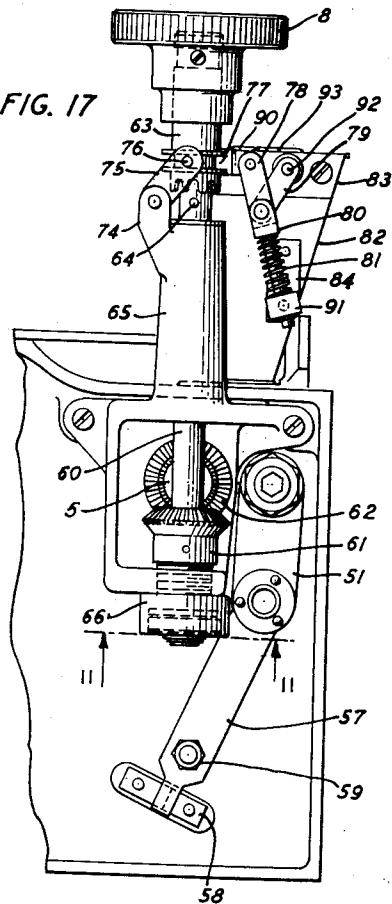


FIG. 17



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SYSTEM

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Application November 6, 1951, Serial No. 255,052

8 Claims. (Cl. 242—55)

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This invention relates to plotting boards, and particularly to plotting boards of relatively large size, having a renewable plotting surface, which are used, for example, to plot the outputs of electronic analogue computers, that is, to plot the solutions of the equations solved by the computers.

The object of the invention is mechanism for easily renewing the plotting surface, which may be in the form of a roll of thin paper, and for retaining the plotting surface under tension.

A feature of the invention is a spring loaded friction brake, supporting the paper roll, and exerting a tension on the paper.

Another feature of the invention is a gear driven paper advancing roller having a one-way overriding clutch.

A further feature of the invention is a manually operated clutch for driving the paper advancing roller, and actuating a toggle operated paper tear-off gate.

Other features and advantages of the invention will be evident from the following description, taken in combination with the drawings, in which:

Fig. 1 is an elevation of a plotting board embodying the invention;

Fig. 2 is a top view, in part section on line 2—2, of the board shown in Fig. 1;

Fig. 3 is an elevation of the paper roll and brake;

Fig. 4 is a sectional view of the paper roll brake;

Fig. 5 is an end view in direction 5—5, Fig. 4, of the paper roll brake;

Fig. 6 is a top view of the paper roll brake;

Figs. 7 and 8 are sectional views of the paper roll brake on lines 7—7, 8—8, Fig. 4;

Fig. 9 shows the paper roll brake in detached position;

Fig. 10 is a side view of the paper advance mechanism and pressure roller;

Fig. 11 is a detail view, in part section on line 11—11, Fig. 17, of the one-way overriding clutch;

Fig. 12 is a sectional view on line 12—12, Fig. 11;

Fig. 13 is a sectional view of the paper duct;

Figs. 14 and 15 are sectional views of the paper gate;

Fig. 16 is a front view, in part section on line 16—16, Fig. 10, of the paper gate toggle;

Fig. 17 is a bottom view in direction 17—17, Fig. 16, of the paper drive, with the toggle in closed position; and

Fig. 18 is a detail bottom view of the paper gate toggle in open position.

The invention is shown embodied in a plotting

board having a vertical plotting surface, but the invention evidently may be embodied in plotting boards having the plotting surface in some other plane, such as the horizontal plane.

The plotting board framework is a box-like casting 1, supporting a plotting surface 2. The plotting surface 2 may be made of any suitable material, such as the plastic substance known under the trade name "Lucite," and preferably is slightly curved so that the plotting paper will be stretched smooth on the surface 2. The plotting paper, indicated by the dash-dotted line 3, is threaded from the paper roll 4, through a suitable aperture in the casting 1 across the surface 2, through another aperture in the casting 1, around the drive roller 5, between the drive roller 5 and the pressure roller 6, and through the paper duct 7. As explained herein, the paper may be advanced by the handwheel 8, driving the roller 5. The front of the board is enclosed in a cover 9, attached in any suitable manner (not shown) to the casting 1, which protects the plotting pens and other apparatus from dust or injury. A rectangular opening in the cover 9, covered by some transparent material 10, permits inspection of the plotted trace.

The plotting paper, as commercially available, is wound on a cardboard tube 11, Fig. 3. One end of the tube 11 is supported by a smooth cone 12, mounted on a shaft journaled in bearings slidably mounted in the support 13. The cone 12 may be advanced or retracted by rotation of the knurled wheel 14, to center the paper on the plotting surface, and secured by the lock nut 15.

A threaded arm 20 is pivoted to a hinge 19, secured to the framework 1, in any suitable manner, as by the screw 18. The hub 21 is screwed in the arm 20. A shaft 23, affixed to the serrated cone 22, is journaled in ball bearings 24 retained in hub 21 by the retaining ring 25. The hub 21 may be rotated to advance, or retract, the cone 22, to center the paper roll 11. A collar 26 is threaded on the outside of the hub 21, and a housing 27 is threaded on the outside of the collar 26, and secured by screw 28. A brake disc 29 is rotatably mounted on the shaft 23, inside the housing 27. The brake lining 31 is interposed between the flat end surface of the hub 21 and the brake disc 29. Two flat disc springs 30, 32, are interposed between the in-turned end of housing 27, and brake disc 29, and are retained by upturned ears projecting into holes cut in the housing 27 and disc 29. By rotating the housing 27 and collar 26 on hub 21, the pressure on springs 30, 32, may be adjusted to a suitable

value, and the housing 27 may then be secured by screw 33. The housing 34 is screwed on the brake disc 29. A collar 35 and cover plate 36 are attached to the end of shaft 23 by a screw 37; the collar 35 being rotatably connected to the shaft 23 by a pin 38 inserted in the matching holes drilled in the collar 35 and the end of the shaft 23. A flat spring 40 is secured to the housing 34 by a rivet 39, spirally coiled around the collar 35, and attached to the collar 35 by a weld, rivet, or screw 41. A pilot screw 42 is threaded in the collar 35, and projects into a 90-degree arcuate slot 43, cut in the housing 34. Several holes may be drilled and tapped in the collar 35, so that, by rotation of the collar 35 before insertion of screw 42, the initial tension of spring 40 may be adjusted.

Rotation of the cone 22 and shaft 23 will initially rotate collar 35, tensioning spring 40, till the pilot screw 42 reaches the end of the arcuate slot 43. Further rotation of the cone 22 and shaft 23 will rotate the collar 35, housing 34, and brake disc 29 against the retardation of the friction material 31. When the rotation of cone 22 ceases, the tension of spring 40 continues to exert a torque, in a direction opposite to the original rotation, on the shaft 23 and cone 22.

A latch 45, carrying a thumbscrew 48, is pivoted to a hinge 46, attached to the framework 1.

The cone 22 is swung clear of the framework 1, as shown in Fig. 9, the paper roll 11 is placed over the cone 12, then the cone 22 is swung back into contact with the other end of the roll 11, the latch 45 is turned over the end of the arm 20 and the thumbscrew 48 turned into the depression 49 in arm 20, forcing the serrations on cone 22 into the roll 11.

The shaft of the pressure roller 6 passes through clearance holes in the framework 1, and is bolted to lever arms 50, 51, Fig. 10, pinned to the shaft 52. Collars 54, 55, are pinned to the shaft 52, and helical springs 53, 56, are secured in holes drilled in the framework 1 and collars 54, 55. A flat lever 57 is secured to lever 51, and normally rests on an abutment 58. A push-button 59 is secured to the lever 57, and passes through a clearance hole in the framework 1. The button 59 may be pushed to raise the lever 57 from the abutment 58, then moved to cause lever 57 to rotate shaft 52 to move the pressure roller 6 away from the drive roller 5. After the paper has been threaded, the roller 6 is moved back into contact with roller 5 and is retained in position by the springs 52, 56.

The shaft of the drive roller 5 is journaled in the framework 1 and secured to a gear 62 meshing with the gear 61 pinned to the shaft 60, journaled in the casting 65 secured to the framework 1. The handwheel 8 is mounted on a sleeve 63, formed as one element of a clutch adapted to engage the pin 64, secured to the shaft 60, so that rotation of the handwheel 8 will rotate shaft 60 and the drive roller 5.

A housing 66 is threaded in an extension of the casting 65. A collar 67 is keyed to the end of shaft 60, inside the housing 66, and is retained in place by a spring ring 71 snapped into a groove in shaft 60. The collar 67 is shaped to accommodate a plurality of balls 70, 70, inside the housing 66. The balls 70, 70, are retained in place by the cover plates 68, 69, riveted to the collar 67, and are impelled forward by helical springs 72, set in pockets formed in the collar 67. As shown in Fig. 11, when the shaft 60 is rotated counter-clockwise to advance the paper, the balls

70, 70, are rotated backward against the springs 72, 72, and the shaft 60 is free to rotate; when the shaft 60 is rotated clockwise, the balls 70, 70, are impelled backward by the springs 72, 72, along the surface formed in collar 67 and will jam between the housing 66 and the collar 67, preventing further rotation of the shaft 60.

After the paper has been threaded through the board, and the pressure roller 6 restored to position, the handwheel 8 may be pressed in to engage the clutch 63, 64, and rotated to turn shaft 60 and the drive roller 5 to advance the paper 3. Initially, the movement of the paper 3 tensions spring 40, Fig. 4, and is then retarded by the friction brake 21, 31, 29. When the paper 3 has been advanced to any desired extent, the handwheel 8 is released. The spring 40 continues to exert a tension on the paper 3, which jams the clutch 66, 67, 70, Fig. 11, and retains the paper 3 under tension, to remove any tendency of the paper to slack off due to atmospheric conditions.

The paper duct 7 is formed of thin sheet material riveted or welded to light angles 85, 86, secured to the casting 1 by screws 87, 88. The rollers 5, 6, are faced with soft material divided into several sections. The end of the duct 7 is formed into several finger-like projections which are wrapped partially around the rollers 5, 6, between the sections of soft material, to lead the paper smoothly off the rollers.

A sheet metal duct 82 is also attached by screws 87, 88, to the casting 1. A strap 83 is used to mount the lower bearing for gate 93. A knife plate 90 is secured to one side of the support 82.

A yoke 75 is pivoted in ears 74, formed on the casting 65, and carries pins 76, 76, engaging shoulders on the sleeve 63. One arm of the yoke 75 extends outward at an angle to form the lever arm 77, which is pivoted to the link 78. The link 78 is pivoted to the toggle arms 79, 80. The arm 80 is slidably supported in a hole bored in the block 91, pivotally mounted on the plate 84 secured to the support 82. The arm 79 is secured to a shaft 92, journaled in support 83, and carrying a gate 93 secured thereto.

When the handwheel 8 and sleeve 63 are in the disengaged position shown in Fig. 17, the lever 77 has drawn up the link 78, causing the link 79 to close the gate 93, as shown in Fig. 14, and the toggle action of links 79, 80, and spring 81, securely hold the gate 93 closed, so that the paper may be torn off against the edge of the knife 90.

When the handwheel 8 is moved to engage the sleeve 63 with the pin 64 for advancing the paper, the lever 77 forces down the link 78 which causes link 79 to open the gate 93, as shown in Fig. 15, and the toggle action of links 79, 80, and spring 81, securely hold gate 93 open, so that the paper can be advanced through the paper duct 7.

What is claimed is:

1. In combination with a framework supporting a plotting surface, mounting means attached to said framework for supporting a paper roll adjacent to one edge of said surface, a spring loaded friction brake interposed in said mounting means, a paper drive roller supported by said framework adjacent to another edge of said surface, a spring actuated pressure roller supported by said framework in contact with said drive roller, a paper cut-off gate supported by said framework, a shaft driving said drive roller, an overriding clutch mounted on said shaft, a manually operable sleeve slidable upon said shaft, a clutch operable by the sliding motion of said sleeve to operatively connect said shaft and

sleeve, and a toggle action linkage connected to said gate and sleeve and effective to retain said gate and sleeve in either the operated or the non-operated position.

2. In combination with a framework supporting a plotting surface, a rotatable conical support mounted on said framework to support one end of a paper roll adjacent to one edge of said surface, a cylindrical hub attached to said framework and shaped to form a friction surface, a shaft mounted in said hub shaped to form a serrated cone adapted to engage the other end of the paper roll, a collar secured to said shaft, a housing rotatably mounted on said shaft and shaped to form a friction surface engaging the friction surface of said hub, a spring connecting said collar and said housing, an arcuate slot in said housing, a pin mounted in said collar and engaging said slot to limit the rotation of said shaft under the control of said spring, paper drive rollers mounted on said framework adjacent to another edge of said surface, a second shaft adapted to drive said rollers, and an overriding clutch mounted on said framework and associated with said second shaft to prevent said second shaft from rotation due to the tension exerted on the paper by said spring.

3. Mechanism for tensioning and advancing a ribbon-like material from a roll of said material over a surface supported by a framework, including a first shaft mounted on said framework for supporting said roll adjacent to one edge of said surface, a spring actuated friction brake interposed in said mounting, a coiled spring connected from said first shaft to said brake, drive rollers for said material mounted on said framework adjacent to another edge of said surface, a second shaft mounted on said framework adapted to drive said rollers, and an overriding clutch mounted on said framework and connected with said second shaft to prevent said second shaft from rotating due to the tension exerted on the material by said coiled spring.

4. Mechanism for advancing a ribbon-like material from a roll of said material over a surface supported by a framework, including a mounting attached to said framework for supporting said roll adjacent to one edge of said surface, drive rollers for advancing said material mounted on said framework adjacent to another edge of said surface, a shaft mounted on said framework adapted to drive said rollers, a cut-off gate mounted on said framework and adapted to aid in severing said material, a manually operable sleeve slidable upon said shaft, a clutch operable by the sliding motion of said sleeve to operatively connect said shaft and said sleeve, and a toggle action linkage connected to said gate and sleeve and effective to retain said gate and sleeve in either an operated or a non-operated position.

5. Mechanism for advancing a ribbon-like material from a roll of said material over a surface supported by a framework, including a mounting attached to said framework for supporting said roll adjacent to one edge of said surface, drive rollers for advancing said material mounted on said framework adjacent to another edge of said surface, a cut-off gate mounted on said framework and adapted to aid in severing said material, a shaft mounted on said framework adapted to drive said rollers, a pin in said shaft, a manually operable sleeve slidable upon said shaft and having one end adapted to engage said pin to clutch said shaft and sleeve, a yoke

mounted on said framework having surfaces engageable by said sleeve, one arm of said yoke being extended to form a lever, a first toggle link connected to said gate, a second toggle link slidably mounted on said framework, a spring mounted on said second link and impelling said second link away from said frame, and a third link connecting the end of said lever to the free ends of both of said toggle links, whereby when the sleeve is advanced to engage the pin, the first toggle link opens the gate, and the spring actuated toggle action retains the sleeve and gate in the operated position, and when the sleeve is retracted to disengage the pin, the first toggle link closes the gate, and the toggle action retains the sleeve and gate in the non-operated condition.

6. The combination in claim 5 with a spring actuated brake in said mounting for maintaining a tension on said material, and an overriding clutch mounted on said framework and connected with said shaft to prevent rotation of said shaft due to the tension in said material.

7. In combination with a frame supporting a plotting surface, a cone rotatably mounted on said frame to support one end of a paper roll adjacent to one edge of said surface, a cylindrical hub attached to said frame and shaped to form a friction surface, a shaft rotatably mounted in said hub, a serrated cone on the end of said shaft adapted to engage the other end of said roll, a collar secured to said shaft, a housing rotatably mounted on said shaft and shaped to form a friction surface engaging the friction surface of said hub, a spiral spring connecting said collar and said housing, means projecting from said collar into an arcuate slot in said housing to limit the rotation of said shaft under the control of said spring, a paper drive roller mounted on said frame adjacent to another edge of said surface, a spring actuated pressure roller supported by said frame in contact with said drive roller, a cut-off gate mounted on said frame and adapted to aid in severing the paper after passing the drive roller, a second shaft mounted on said frame and geared to said drive roller, an overriding clutch mounted on said frame and connected to said second shaft, a pin in said second shaft, a manually operable sleeve slidable upon said second shaft and having one end shaped to engage said pin, a yoke pivotally mounted on said frame having surfaces engageable by said sleeve, one arm of said yoke being extended to form a lever, a first toggle link connected to said gate, a second toggle link slidably mounted on said frame, a helical spring mounted on said second link and impelling said second link away from said frame, and a third link connecting said lever to the free ends of both of said toggle links, whereby when said sleeve is advanced to engage said pin to rotate the driving rollers to advance the paper against the tension of said spiral spring, the first toggle link opens the gate, and the toggle action retains the sleeve and gate in operated position, and when the sleeve is retracted till the overriding clutch retains the second shaft against the tension in the paper due to the spiral spring, the first toggle link closes the gate and the toggle action retains the sleeve and gate in the non-operated condition.

8. In combination with a frame supporting a plotting surface, a cone rotatably mounted on said frame to support one end of a paper roll adjacent to one edge of said surface, a cylindrical hub attached to said frame and shaped to form a

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friction surface, a shaft mounted in said hub, a serrated cone mounted on said shaft and adapted to engage the other end of the paper roll, a housing having an arcuate slot therein, rotatably mounted on said shaft and shaped to form a friction surface engaging the friction surface of said hub, a spiral spring connecting said shaft and said housing, means projecting from said shaft into the arcuate slot in said housing to limit the rotation of said shaft under the control of the spiral spring, paper drive rollers mounted in said frame adjacent to another edge of said surface, a second shaft adapted to drive said rollers, and an overriding clutch mounted on said

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frame and connected to said second shaft to prevent said second shaft from rotation due to the tension exerted on the paper by the spiral spring.

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