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RECORDED WITH ARTICULATED ARM FOR RECEIVER REMOVAL

Filed Oct. 14, 1965

3 Sheets-Sheet 1

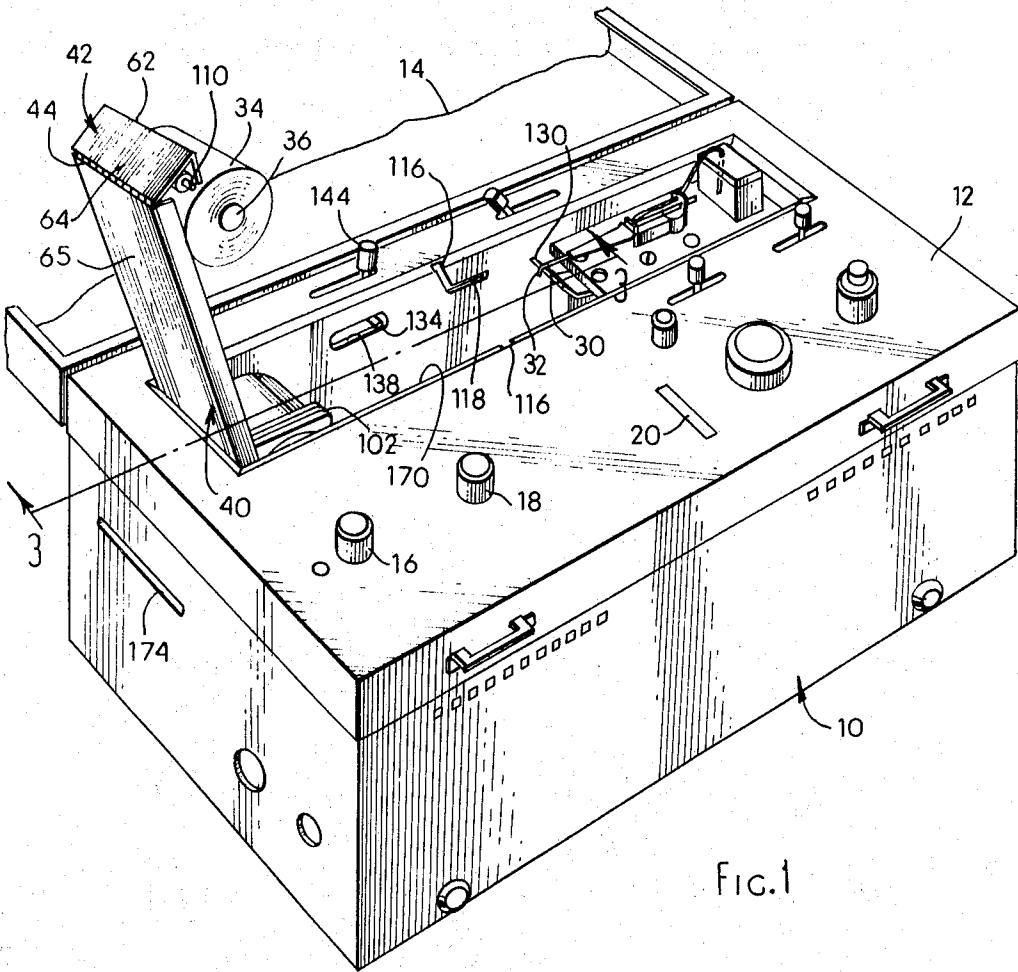


FIG. 1

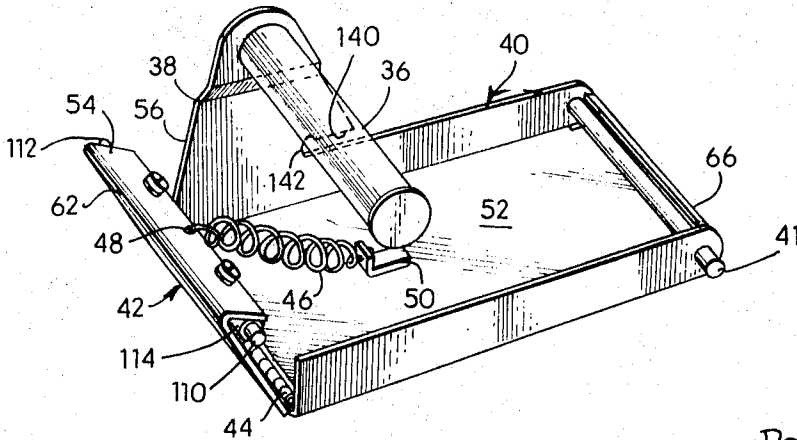


FIG. 2

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3 Sheets-Sheet 2

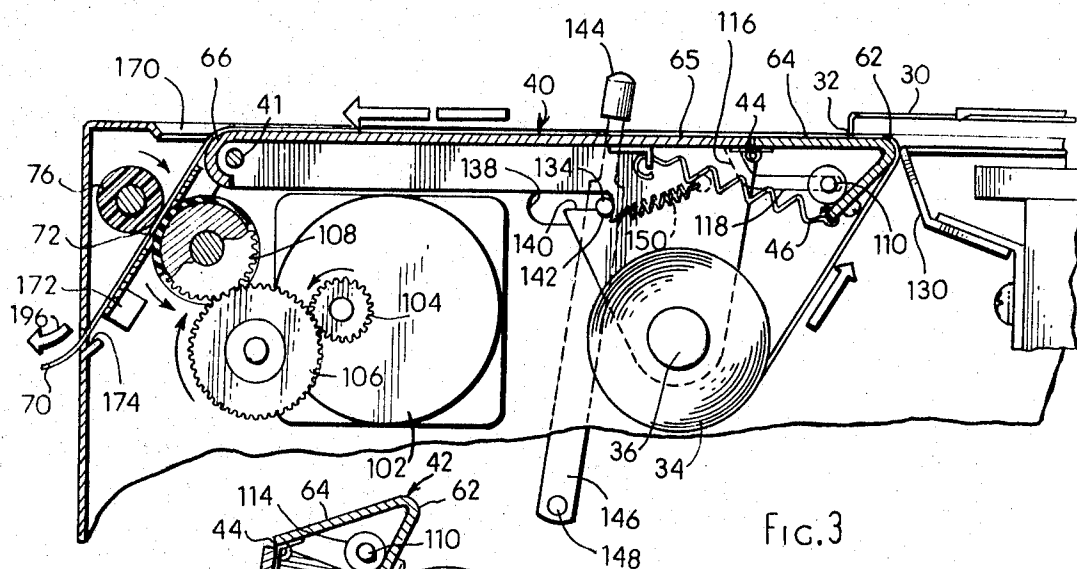


FIG. 3

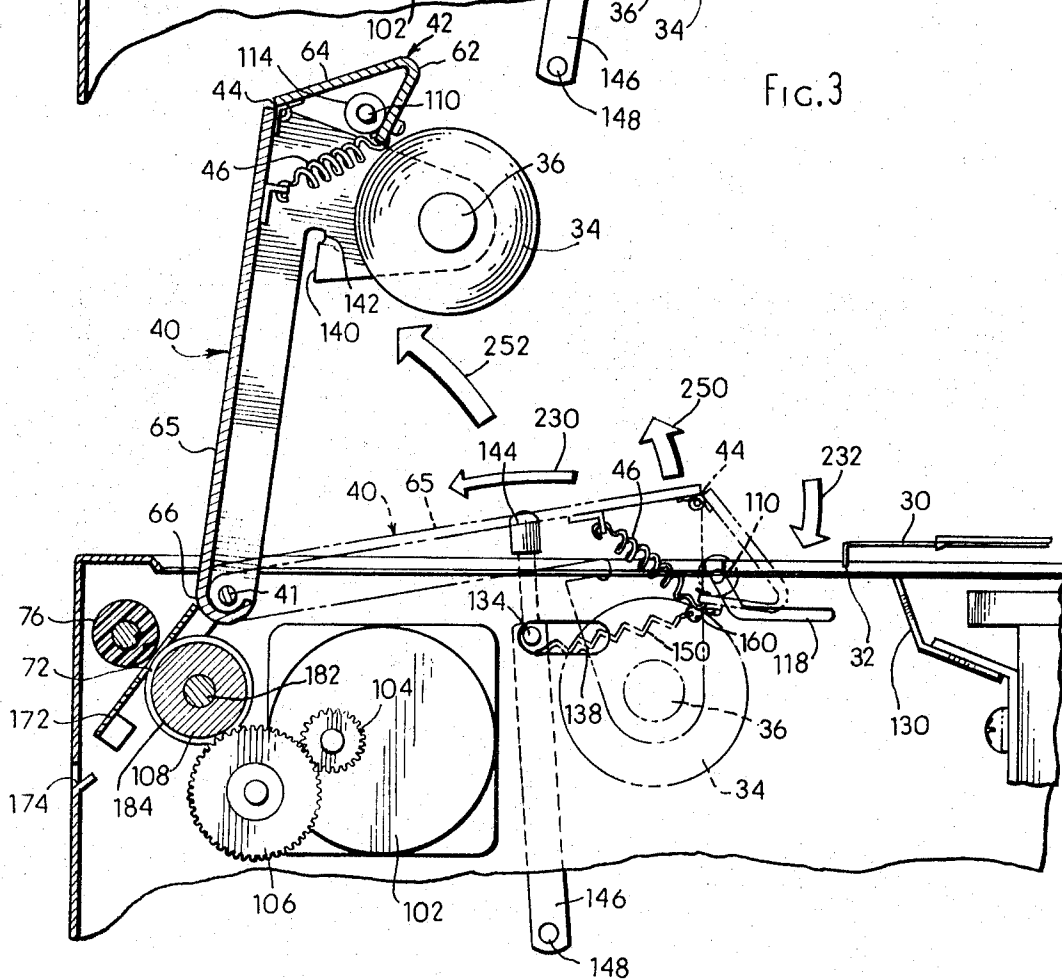


FIG. 4

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3,341,858

**RECORDER WITH ARTICULATED ARM
FOR RECEIVER REMOVAL**

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ABSTRACT OF THE DISCLOSURE

An arm for paper or other recording media is pivoted and articulated to permit the arm and media to be moved by cams into an exact position relative to the recording device.

This invention relates to an improved storing and dispensing device for recording media and is particularly adapted for such use in conjunction with such apparatus as electrocardiograph machines and the like.

In the operation of electrocardiograph machines and the like, there is generally provided a tracing element in the form of a needle or heating element which moves, responsively to information given it by operation of the machine. It is intended that this stylus or needle will trace a pattern onto a recording media such as paper or heat sensitive recording material and the tracing can then be interpreted by one skilled in the art to provide diagnostic information. In the case of an electrocardiograph machine, the stylus is one of the more sensitive parts of the machine and is delicately balanced to improve the sensitivity of the machine. In the process of operation, the recording media comes into contact with the stylus and because the recording media must be replenished from time to time, there is always the danger of damaging the stylus during the process of loading the recording media and then bringing it into operative position.

Frequently, it happens that in the process of loading the machine and replenishing the record-receiving rolls, those skilled in the art can easily cause damage to the stylus, affecting its reliability of reading, or its sensitivity and increasing the incidence of repair work for the machine.

What the present invention proposes, is a new and improved dispensing device for the recording media intended for operation in such apparatus as electrocardiograph machines and the like, and having several important features, including a means for readily loading and moving the recording media and replenishing such record-receiving media but without likelihood of damaging the stylus which produces the tracing on the recording media. It is an important feature of the present invention that the mounting and dispensing device for the apparatus can be quickly and easily operated to permit replenishing of the rolls of record-receiving media as the need arises but in such a manner that the stylus is not exposed to harmful engagements with the media which is automatically and reliably brought into a precise operating position to receive a tracing from the stylus. Moreover, the device is operative so that one need not be skilled in the art to accomplish the loading, replacement and reoperation of the apparatus as the need arises.

It has been further found, that in such devices as electrocardiograph devices, it is convenient to provide a versatility of operation of the electrocardiograph machine so that its operation can be temporarily suspended, permitting the investigator to write on the recording media at a particular point of tracing so that the recording media will carry interpretive information as well as the tracing proper.

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It is another object of the present invention to provide a dispensing apparatus for recording media which provides that the recording media can be manually drawn through the machine, overriding its drive mechanism so that any portion of the tracing can be made immediately available.

It is an overall object of the present invention to provide an economical and novel dispensing and mounting means for record-receiving material such as paper and the like, which permits a rapid, convenient means for replenishing rolls of such record-receiving material but without producing injury to the operative portions of the apparatus with which it is combined and comes into physical contact therewith.

Other objects and features of the present invention will become apparent from a consideration of the following description, which proceeds with reference to the accompanying drawings, wherein:

FIGURE 1 is an isometric view of an electrocardiograph apparatus incorporating the present invention therein;

FIGURE 2 is an isometric view of the dispensing and support device for a roll of paper used in the electrocardiograph apparatus of FIGURE 1, said device being shown detached from the apparatus in FIGURE 1;

FIGURE 3 is an enlarged sectional view taken through the dispensing device and apparatus, this being an enlarged detail view, looking generally in the direction of the arrows 3—3 of FIGURE 1;

FIGURE 4 illustrates the components of FIGURE 3 during the loading operation, the dotted line position showing the dispensing device position when the locking pawl is released and the full line position for the dispensing device being shown in its raised position for receiving the replacement roll;

FIGURE 5 is an enlarged isometric detail view showing the driving mechanism for drawing the paper through the device during operation of the electrocardiograph machine; and,

FIGURE 6 is an enlarged section view of the overriding clutch by which paper can be drawn through the apparatus independently of the motor drive means.

Referring now to the drawings, the electrocardiograph machine, designated generally by reference numeral 10 includes a cabinet 12 having a cover 14 and suitable controls. The apparatus includes several manually adjustable dials including an on-off switch 16, a recording control switch 18 by which the recording can be initiated, checked or run continuously, stylus centering control 20, and an attenuator control which provides for virtually any signal amplitude. Numbers on the control indicate the peak-to-peak amplitude of a sharp pulse waveform which will cause a pen deflection when applied to the patient electrode input. These various adjustments, do not form a part of the present invention but are provided as part of the generally improved design of the overall machine.

The invention is usable in providing tracings on recording paper either with an ink stylus or a heating element stylus in combination with heat-sensitive recording paper or other media. For convenience of description, the present invention will be described in conjunction with an ink type stylus, it being understood that the specific recording means can be varied within the scope of the present invention. The recording is effected in the selected embodiment, by means of a stylus 30 which has an end or point 32 engageable with the surface of the recording paper, which is shown generally in the form of a supply roll 34 (FIGURE 1) and which is passed under the point 32 of the stylus 30 which traces a path over the paper as the paper is drawn beneath the stylus needle point end 32. The stylus 30 is moved back and forth by electrical

operation in accordance with an amplified signal derived from a raw signal which is fed through a preamplifier and amplifier (not shown), these raw signals being responsive to electrical signals from the patient. The present invention is adapted for use in recording fetal electrocardiograms but the particular manner of deriving the raw signal, and of refining it as well as actuating the stylus 30 in response to such raw signal does not form part of the present invention. It should be understood that the present invention is usable in any recording apparatus where it is desired to load and unload paper where such loading presents problems of possible injury to sensitive recording instrument elements associated therewith.

In the present invention the paper supply is in the form of a roll 34 which is mounted on a spindle 36 which extends transversely from a depending flange 38 secured to a mounting arm 40 pivotally supported on cabinet 12 by means of a hinge pin 41. The arm 40 has an articulated end portion 42 with a wrist pin connection 44 and a spring 46 which is stretched between opening 48 and a mounting bracket 50 suitably secured to the undersurface 52 of the arm 40 so that the end portion 42 is normally cocked or humped to the position shown in FIGURES 1 and 2 wherein flange 54 engages edge 56 of the depending mounting flange 38 for the spindle 36. The purpose of the articulated connection is so that when the arm 40 is loaded with paper as indicated in FIGURES 1 and 4, the arm 40 can be lowered into operative position and the articulated end will come down and then under the point 32 of the stylus (FIGURES 3, 4). In other words, the articulated portion 42 first has a downward position, and then as it is straightened from the position shown in FIGURE 4 to that of FIGURE 3, the position 42 will come into slight lifting engagement with the point 32 of the stylus, the end of the stylus can engage the paper with a slight but adequate normal force sufficient for the stylus to describe the tracing on the paper which is passed between the arm 40 and stylus point 32. While the arm is still raised, the paper 34 is passed over the curved change-direction guide surface 62 of the articulated portion 42 and is then passed over the outer surface 64 of articulated portion 42 and outer surface 65 of the arm 40, the end 66 of the arm being also curved so the paper can move smoothly over the surfaces 62, 64 and 65 without catching or becoming wrinkled.

As shown in FIGURES 3, 4, and 5, the end 70 of the paper, after passing over end 66 is received between the surfaces of two drive rolls 72, 74 which are spaced apart in order to grip the paper at its edges, and the surfaces of two spaced, coating, idler rolls 76, 78. The idler rolls 76, 78 are mounted on a journal pin 80 biased at its ends 82, 84 against power rolls 72, 74 by means of resilient wire springs 86, 88 which are coiled around pins 90 received in partition 92 of the cabinet. Legs 94 of the springs are locked against edges 96 of the partitions 92 and the ends of the wire springs are retained within grooves 98 in journal pin 80 by Belleville washers 100 which are forced over the ends 82, 84 of the journal shaft 80. By controlling the output speed of the motor 102 which acts through the gear train comprised of inner meshed gears 104, 106 and 108, and a shaft 182 carrying drive rolls 72, 74, it is possible to expand or compress the tracing. For example, if the stylus needle is oscillating at a fast rate, the speed of the paper can be increased to increase the spacing between swings of the needle on the tracing paper.

The articulated end portion 42 is straightened from its humped position about the hinge articulation 44, against the resistance of the spring 46. The straightening is effected by further downward movement of the arm 40 after the articulated portion is positioned as shown dotted in FIGURE 4 and is moved into the position shown in FIGURE 3. This movement is caused by engagement of cam followers 110 and 112 on pin 114 which is carried by articulated portion 42. The two cam followers 110

and 112 enter spaced cam slots 116 (FIGURES 1, 3 and 4), the cam slots having an inclined portion into which the cam followers 110, 112 initially fit, and are then biased along horizontal portions 118 to straighten the articulated portion 42. The articulated portion 42 in the process of being straightened, brings its undersurface upwardly against the needle 32 from a lower position to a raised position that brings the surface of the paper against the point of the needle 32.

Where the paper passes over the changed direction guide surface 62 a tensioning bar 130 bears lightly against the paper to resist the drawing movement of the paper through the device as the paper is contacted by the point 32 of the stylus, it is under sufficient tension to prevent wrinkling or curling of the edges of the paper and the paper is caused to lie flat against the upper surface of the arm, conforming entirely to the surface so that the stylus will trace on a wrinkle-free section of the paper at all times.

Once the arm is located in the operative position shown in FIGURE 3 a locking pawl 134 movable within a track 138 passes through a slot 140 and enters notch 142 of the depending flange 38 holding the arm downwardly in the position shown in FIGURE 3. The locking pawl 134 can be manually retracted by knob 144 which operates lever 146 pivoted 148 on the cabinet and to cause the pawl 134 to move out of the notch 142 against the resistance of spring 150 which is stretched between lever 146 and an opening 160. Lever 146 is biased by the spring 150 to a normal position shown in FIGURE 3 to retain the arm 40 in its operative position. After the paper has passed the stylus point 32 and received its tracing, it moves across a considerable span of the arm 40 if the investigator so desires, the operation can be momentarily terminated by suitable operation of one of the instrument controls and, the paper being accessible through opening 170, it is possible to use the upper surface 64 of the arm 40 as a writing support for inscribing any additional information on the paper, in proximity with a desired portion of the tracing. As the paper continues to travel, it passes over the end 66 and on to an inclined guide surface 172 which directs the paper downwardly and toward the outlet slot 174 where the paper leaves the machine with its tracing. The power rollers 72, 74 extend partially through openings 176 and 178 to form surfaces with idler rollers 76, 78 which grip the paper and pull it through the device.

It sometimes happens, that the investigator wishes to remove a section of the recording paper and this can be accomplished by means of an overriding clutch which permits the paper to be manually pulled through the machine at a rate faster than that provided by the motor 102. This is accomplished by means of a friction clutch 180 (FIGURE 6) which provides a connection from power shaft 182 through sleeves, 184 and 186 to the drive rolls 72, 74. The drive rolls 72, 74 each have a resilient outer covering which engages the surface of the paper and which forms a friction grip with the paper causing it to move without slippage through the surfaces formed between the resilient friction surface of the power rollers and the opposing surface of the idler rollers 76, 78.

The friction clutch is in the form of a plurality of bearings 190 received within tapered recesses 192 and forming a drive connection between the shaft 182 and rollers 184 and 186 when the shaft 182 is moving in a counterclockwise direction.

However, paper can be drawn manually through the slot 174 in the direction of the arrow 196 (FIGURE 3) and in the direction of the arrow 198 (FIGURE 6) because the balls 192 do not resist relative rotation of the rollers 184, and 186 in the direction of the arrow 200. That is, rollers 184 and 186 can be rotated counterclockwise at a faster speed than the counterclockwise rotation of the power shaft 182. This is indicated schematically by means of the arrow 202 at the bottom of FIGURE 6, which indicates that rollers 184 and 186 can be moved

counterclockwise relatively to the power shaft 182 but cannot move at a slower rate and rotation of the power shaft 182 as indicated by crossbar 204 on the arrow 202. Thus, the paper will always move through the device at the speed dictated by the motor 102 through the gear train 104, 106, 108 but if desired, the paper can be manually gripped and drawn through the apparatus to immediately remove any tracing portion desired and without interfering with normal operation of the electrocardiograph apparatus.

The operation of the machine need be interrupted only momentarily to allow for replenishing of the paper rolls from time to time, which operation is easily and quickly accomplished merely by manually moving the knob 144 from the position shown in FIGURE 3 to that of FIGURE 4 that is, in the direction of the arrow 230. The surfaces 62, 64 of the articulated end portion 42 will be caused to move from a flat or straightened position to a tilted or humped position by means of the spring 46, in the direction of the arrow 232 (FIGURE 4). The movement of end portion 42 occurring about the hinged connection 44 causes the cam followers 110 and 112 to move toward the left within horizontal tracks 118 of the cam slots 116 in the cabinet (FIGURE 4). The articulated portion 42 thus moves downwardly and away from the point 32 of the stylus 30. Once the articulated section is in the position shown in FIGURE 4, the cam followers enter the inclined sections of the cam slot and permit the arm 49 to be pivoted counterclockwise, in the direction of the arrow 250 (FIGURE 4) and by continuing such movement as indicated by the arrow 252 the arm will be fully raised to provide insertion of a new roll of tracing paper onto the spindle 36.

When the new roll of the paper is inserted, the machine is ready for resuming operation, which can be accomplished by pivoting the arm clockwise from the position shown in FIGURE 4. When the arm 40 is pivoted about pin 41, oppositely in direction to the arrow 252, the cam followers 110 and 112 enter the inclined sections of the cam slot 116. The cam followers will then enter the horizontal section 118 of the cam slot and further downward movement will cause the humped section 42 to become straightened, against the resistance of spring 46. This combination of forward and straightening movements of the articulated section 42 about the hinged connection 44, oppositely to the direction of the arrow 232, will cause the articulated section to move under and upwardly into contact with the needle point 32 of the stylus 30. The slight raised movement of the section 42 causes the needle 32 to rest with precisely the correct normal pressure against the paper and without need for further adjustment.

The paper has, before lowering of the arm, been passed over the end 62 and the paper is then pulled over the span of the outer surface 65 of the arm 40, passed over the rounded end 66 (FIGURE 3) and between the resilient outer surfaces of the rollers 72, 74 which are spaced apart and grip the opposite edges of the paper with the idler rollers 76, 78. With the paper gripped at its opposite edges, there is a reduced likelihood of wrinkling the paper because of the uniform tension on the paper as it passes through the device.

Uniform tension on the paper is also promoted by engagement of resilient means 130 which lightly engages the surface of the paper as it moves off the supply roll and over the curved guide surface 62 (FIGURE 3); by maintaining this constant light tension on the paper, the paper is made to conform with surface 62 insuring, a wrinkle-free condition of the paper. The surface 64 also provides a convenient writing surface for inscribing any additional information on the paper in proximity with the portion of the tracing desired to be commented on, this being readily accomplished by temporarily suspending operation of the motor and the stylus or needle 30. Both

operations can be resumed by suitable operation of any one of the controls readily provided for that purpose.

The paper is at all times movable relatively to the stylus at a controllable speed.

The process of loading and unloading the paper, automatically establishes the correct normal force for the tracing needle 30 against the surface of the paper and without any problem of adjustment. This correct normal pressure is automatically effected so that those skilled in the art, as well as those unskilled in the art can easily use the machine and are assured of the proper operating conditions at all times. The replenishing of the rolls can take place without likely damage to the sensitive part of the apparatus, which is the needle 30 susceptible to being easily damaged because of its sensitivity to the output signal of the apparatus. The needle is of course one of the most sensitive portions of the apparatus and is prone to being injured and one of the important features of the present invention is that the frequent loading and unloading operations are far more unlikely to produce injury to the needle or to detract from its sensitivity and reliability in operation. Moreover, the speed of replenishing the rolls is much improved so that inconvenience to the patient and to the user of the machine because of downtime is at a minimum.

Although the present invention has been illustrated and described in connection with a single example embodiment, it will be understood that this is illustrative of the invention and is by no means restrictive thereof. It is reasonably to be expected that those skilled in this art can make numerous revisions and adaptations of the invention, and it is intended that such revision and adaptations will be included within the scope of the following claims as equivalents of the invention.

I claim:

1. In a recording apparatus, a mounting and dispensing device for paper or other media on which a recording is effected by a stylus or other tracing element, comprising: a support arm having a pivot providing that the support arm can be both raised and lowered, journal means for mounting a quantity of paper, or other media, which is dispensed by unrolling movement thereon, an articulated section of said support arm having spring means biasing said section toward the under-surface of said support arm, cam-and-cam follower means for effecting straightening of said section during pivoting of said support arm into operative position wherein said articulated section is moved from below said stylus into operative engagement with said stylus during lowering of said arm, means for releasably locking said arm in its lowered operative position, said paper being drawn between said stylus and articulated section and thereafter passed over the surface of said arm.

2. In a recording apparatus, a mounting and dispensing device for paper or other media on which a recording is effected by a stylus or other tracing element, comprising: a support arm having a pivot providing that the support arm can be both raised and lowered, journal means for mounting a quantity of paper, or other media, which is dispensed by unrolling movement thereon, an articulated section of said support arm having spring means biasing said section toward the under-surface of said support arm, cam-and-cam follower means for effecting straightening of said section during pivoting of said support arm into operative position wherein said articulated section is moved from below said stylus into operative engagement with said stylus during lowering of said arm, means for releasably locking said arm in its lowered operative position, said paper being drawn between said stylus and articulated section and thereafter passed over the surface of said arm, and drive means forming surfaces through which said paper is passed to effect movement of the paper, or other recording media, past said stylus which is moved by machine operation to provide a recording onto said paper or other recording media.

3. In a recording apparatus, a mounting and dispensing device for paper, or other media, on which a recording is effected by a stylus or other tracing element, comprising: a support arm having a pivot providing that the support arm can be both raised and lowered, journal means for mounting a quantity of paper, or other media, on said arm, said journal means permitting said paper to be dispensed by unrolling movement therefrom, said arm having an articulated section, cam-and-cam follower means for effecting straightening of said section during pivoting of said support arm into operative position wherein said articulated section is moved from below said stylus into operative engagement with said stylus during lowering of said arm, means for releasably locking said arm in its lowered operative position, said paper being drawn between said stylus and articulated section and thereafter passed over the surface of said arm, guide means at the end of said articulated section to provide a change-direction for the paper, or other media, as it is passed from its storage past said stylus and onto the flat upper support surface of said arm, and resilient means biasing said articulated section toward the undersurface of the arm to effect its angular movement to a position which provides clearance from said stylus before raising said arm.

4. In a recording apparatus, a mounting and dispensing device for paper or other media on which a recording is effected by a stylus or other tracing element, comprising: a support arm having a pivot providing that the support arm can be both raised and lowered, journal means for mounting a quantity of paper, or other media, which is dispensed by unrolling movement thereon, an articulated section of said support arm having spring means biasing said section toward the undersurface of said support arm, cam-and-cam follower means for effecting straightening of said section during pivoting of said support arm into operative position wherein said articulated section is moved from below said stylus into operative engagement with said stylus during lowering of said arm, means for releasably locking said arm in its lowered operative position, said paper being drawn between said stylus and articulated section and thereafter passed over the surface of said arm, and drive means forming surfaces through which said paper is passed to effect movement of the paper, or other recording media, past said stylus which is moved by machine operation to provide a recording onto said paper or other recording media and one-way clutch means permitting paper to be drawn freely through said drive means.

5. In a recording apparatus, a mounting and dispensing device for paper or other media on which a recording is effected by a stylus or other tracing element, comprising: a support arm having a pivot providing that the support arm can be both raised and lowered, journal means for mounting a quantity of paper, or other media, which is dispensed by unrolling movement thereon, an articulated section of said support arm having spring means biasing said section toward the undersurface of said support arm, cam-and-cam follower means for effecting straightening of said section during pivoting of said support arm into operative position wherein said articulated section is moved from below said stylus into operative engagement with said stylus during lowering of said arm, means for releasably locking said arm in its lowered operative position, said paper being drawn between said stylus and articulated section and thereafter passed over the surface of said arm, and drive means forming surfaces through which said paper is passed to effect movement of the paper, or other recording media, past said stylus which is moved by machine operation to provide a recording onto said paper or other recording media, motorized means acting through said drive means and including a gearing means for driving the paper at a controllable rate, and clutch means for overriding said drive means

and motorized means whereby portions of the paper can be drawn freely through the device.

6. In apparatus such as electrocardiographs, or the like, for recording information, a device for quick-changing the recording media, comprising: carrier means having a pivot mounting providing movement of said carrier from a raised loading position to a horizontal retracted position for operation, a roll support suspended on said carrier means and adapted to receive a roll with said recording media thereon, means forming an articulated end portion of said arm and including a spring for bending back said end portion to form a humped position thereof, a cam-and-cam follower constructed in said apparatus and arm to effect straightening of said arm against the resistance of said spring as the arm is pivoted into operative position and a stylus under which said end portion is positioned and then raised into contacting relation by said cam-and-cam follower to receive a tracing thereon as said arm is moved into operative position.

7. In apparatus such as electrocardiographs, or the like, for recording information, a device for quickchanging the recording media, comprising: carrier means having a pivot mounting providing movement of said carrier from a raised loading position to a horizontal retracted position for operation, a roll support suspended on said carrier means and adapted to receive a roll with said recording media thereon, means forming an articulated end portion of said arm and including a spring for bending back said end portion to form a humped position thereof, a cam-and-cam follower constructed in said apparatus and arm to effect straightening of said arm against the resistance of said spring as the arm is pivoted into operative position and a stylus under which said end portion is positioned and then raised into contacting relation by said cam-and-cam follower to receive a tracing thereon as said arm is moved into operative position, and means forming a change-direction guide at the end of said portion and over which said recording media is passed during operation of said device.

8. In apparatus such as electrocardiographs, or the like, for recording information, a device for quickchanging the recording media, comprising: carrier means having a pivot mounting providing movement of said carrier from a raised loading position to a horizontal retracted position for operation, a roll support suspended on said carrier means and adapted to receive a roll with said recording media thereon, means forming an articulated end portion of said arm and including a spring for bending back said end portion to form a humped position thereof, a cam-and-cam follower constructed in said apparatus and arm to effect straightening of said arm against the resistance of said spring as the arm is pivoted into operative position and a stylus under which said end portion is positioned and then raised into contacting relation by said cam-and-cam follower to receive a tracing thereon as said arm is moved into operative position, means forming a change-direction guide at the end of said portion and over which said recording media is passed during operation of said device and drive means for continuously moving said media past the stylus to receive its tracing.

9. In apparatus such as electrocardiographs, or the like, for recording information, a device for quickchanging the recording media, comprising: carrier means having a pivot mounting providing movement of said carrier from a raised loading position to a horizontal retracted position for operation, a roll support suspended on said carrier means and adapted to receive a roll with said recording media thereon, means forming an articulated end portion of said arm and including a spring for bending back said end portion to form a humped position thereof, a cam-and-cam follower constructed in said apparatus and arm to effect straightening of said arm against the resistance of said spring as the arm is pivoted into operative position and a stylus under which said end portion is positioned and then raised into contacting relation by

said cam-and-cam follower to receive a tracing thereon as said arm is moved into operative position, means forming a change-direction guide at the end of said portion and over which said recording media is passed during operation of said device, motor means for operating said drive means, and a clutch operatively interposed between said motor means and drive means, whereby the media can be drawn through the device independently of said drive means and motor means.

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J. W. HARTARY, *Assistant Examiner*.