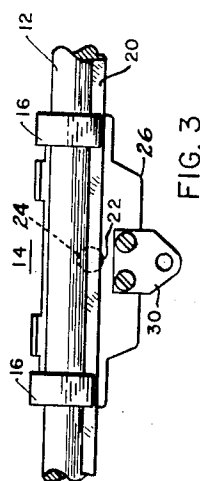
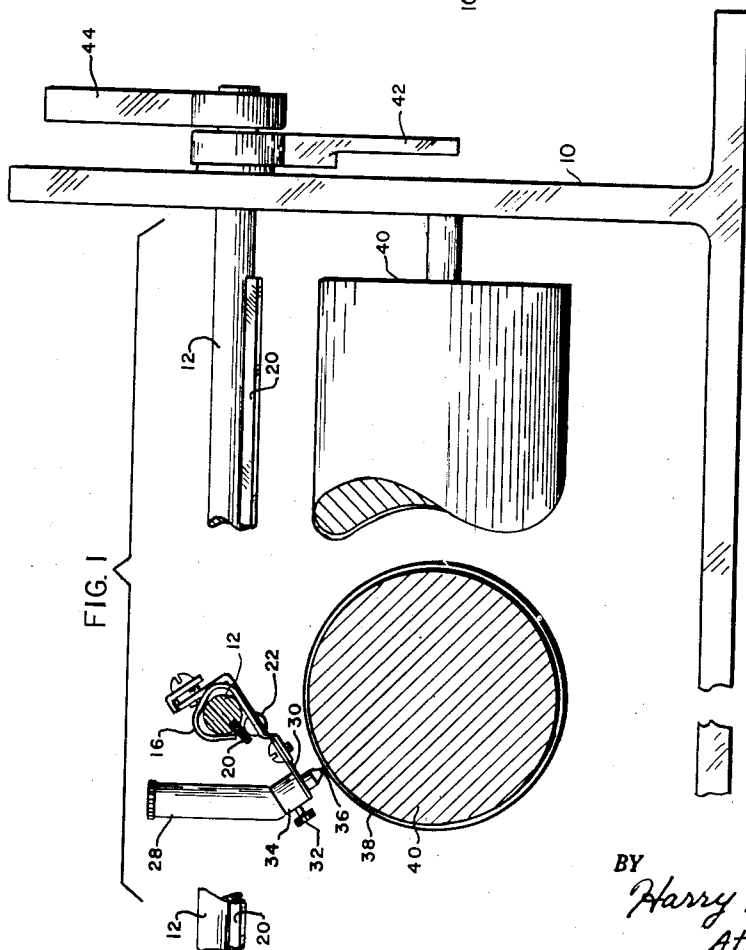
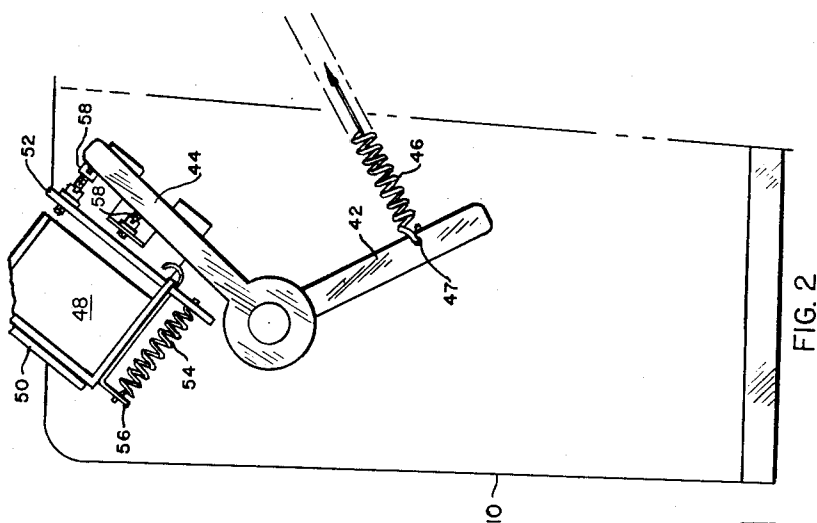


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PEN CARRIAGE AND AUTOMATIC LIFTER

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PEN CARRIAGE AND AUTOMATIC LIFTER

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2 Claims. (Cl. 346—139)

This invention relates generally to an improved pen carriage and pen lifting device for use in automatic recording instruments. More particularly, this invention relates to a pen carriage providing substantially frictionless reciprocal movement and a simple pen lifting device providing controllable positive operation.

Automatic recording instruments such as disclosed in U. S. Patent 950,555, issued to E. F. Northrup, March 1, 1910, for Electrical Recorder, are well known in the art. One of the problems connected with such an instrument is to provide a carriage for holding the marking instrument or pen which will require a minimum of power for transverse or reciprocal movement and provide a positive controllable rotational movement of the carriage to lift or lower the pen.

It would appear that the two requisites, minimum power for reciprocal movement and positive rotational movement, are mutually exclusive. This was substantially true in prior art devices. The carriage disclosed by A. Teissere et al. in U. S. Patent 1,785,883, issued December 23, 1930, for Apparatus for Engraving Printing Rollers, is an example of the type mechanism which provides a positive rotational movement but which, due to its mass, requires considerable power for reciprocal movement.

The requirement of positive rotational movement may also include the necessity of providing a pen pressure greater than would be provided solely by the weight of the pen. It has been customary to utilize a pen holder pivotally mounted on the carriage. This clearly will not provide a pen pressure in excess of that provided by gravity action on the pen.

Accordingly, it is an object of this invention to provide an improved marking instrument carriage and lifting device.

It is a further object of this invention to provide an improved marking instrument carriage and lifting device requiring a minimum of power for transverse movement.

It is a still further object of this invention to provide an improved marking instrument carriage and lifting device providing positive rotational movement.

It is an ancillary object of this invention to provide an improved marking instrument carriage and lifting device requiring a minimum of power for transverse movement and providing an instrument pressure greater than that provided by gravity action alone.

According to this invention, there is provided a guide rod having a longitudinal kerf and mounted in proximity to and substantially parallel to a platen on which the material to be marked is placed. A bar is mounted in the kerf and is of such dimensions to extend radially from the guide rod. There is also provided a pen carriage comprising an apron having a pair of clamping elements for receiving the rod, a recess for receiving a ball which rides against the bar and an aperture for receiving and holding the pen or marking instrument. A lever having a pair of radially extending arms is affixed to one end of the rod. One of the pair of arms is in operative engagement with a bias spring, which exerts a force in the direction to cause the pen to engage the material on the platen. The other of the pair of arms is in operative engagement with the armature of an electromagnetic relay, which when energized releases the lever to be rotated by the force of the bias spring causing the pen to engage the material.

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A better understanding of the present invention may be had by reading the following description in connection with the accompanying drawing in which:

Fig. 1 is a front elevation view of a portion of an automatic recording instrument and partly in section illustrating a preferred embodiment of the present invention;

Fig. 2 is an end view of the device shown in Fig. 1 illustrating certain features of the present invention; and

Fig. 3 is a plan view of a portion of the device shown in Fig. 1 illustrating further features of the present invention.

Referring now to the accompanying drawing wherein like reference characters are used throughout for like parts and in particular to Fig. 1, the frame 10 of the recording instrument is shown as a supporting member for one end of a guide rod 12. It is, of course, to be understood that the other end of the guide rod 12 (not shown) will be supported in a similar manner by the oppositely disposed portion of the frame 10. For the sake of clarity only one section of the frame 10 is shown as the method of support does not form a part of the present invention.

The carriage 14, as shown in end view, is resiliently attached to the guide rod 12 by a pair of triangularly shaped end loops or brackets 16, which are individually in contact with the guide rod 12 at three points. It is, of course, to be understood that it is well within the scope of the present invention that the end loops 16 could be of a form other than that illustrated. The triangular form, however, is preferred as it is simple in construction and the three point contact provides a minimum of friction with a positive engagement.

The guide rod 12 is provided with a longitudinal kerf adapted to receive and rigidly hold a bar 20 of rectangular cross section. It is believed to be clearly shown in Fig. 1, that the bar 20 is of such dimensions to extend radially from the periphery of the guide rod 12. The radial extension provided by the bar 20 could be formed as an integral part of the rod 12. However, such a construction would be considerably more difficult to manufacture than that shown.

A ball 22 of suitable diameter is held in a recess 24 in the apron 26 of the carriage 14. The end loops 16 and the ball 22 are so proportioned that when assembled and attached to the guide rod 12, the bar 20 rides between the outer ends of the end loops 16 and the ball 22. It is thus believed to be clear that the only points of friction between the carriage 14 and the guide system will be the point contacts of the end loops 16 and the ball 22.

A pen or other suitable marking instrument 28 is mounted on a pen plate 30, which is bolted or riveted to the front portion of the apron 26. The pen plate 30 and the apron 26 could be formed as an integral unit without exceeding the scope of the present invention. However, for simplicity of manufacture the embodiment illustrated is preferred.

When the pen 28 is clamped in an operative position by means of a set screw 32 in the pen holder block or collar 34 mounted on the pen plate 30, the pen point or marking end 36 of the pen is in position to engage the surface of a material 38, which may be graph paper, linen or other substance suitable for the desired recording.

The material 38 is carried by a platen or roller 40 which is shown as circular in cross section. The platen 40 may be formed of any suitable substance such as rubber or plastic.

The relative positioning of the guide rod 12 and the platen 40, and the dimensions of the carriage 14 should be such as to cause the pen point 36 to engage the material 38 on the platen 40 normal to the surface of the material 38. If the pen point 36 is normal to the surface of the material 38 at the point of contact, there will be an optimum of marking ability and a minimum of friction and stress.

Automatic recording instruments of the type to which

the present invention appartains are generally electrically controlled by equipment remote from the recording instrument. Accordingly, it is necessary for optimum utilization of the device to not only provide means for controlling the movement of the material 38 relative to the pen 36, but it is desirable to provide a control means to enable the disengagement or the lifting of the pen from the material when actual recording is not occurring. One of the features of the present invention is that the light weight carriage 14 enables ease of rotational movement of the pen 28 and carriage 14 thus lifting the pen from the material.

A lower lever arm 42 and an upper lever arm 44 are attached to one end of the guide rod 12 against which the forces for controlling the rotational movement of the guide rod 12 are applied. The force necessary to cause counterclockwise movement of the guide rod 12, as viewed in Fig. 2, is produced by an extended helical bias spring 46, which is attached between a point 47 on the lower arm 42 and a fixture (not shown) on the frame 10. It is believed to be clear that through the operation of the bias spring alone, the pen point 36 would, at all times, remain in contact with the material 38.

Rotation of the guide rod 12 is controlled by means of an electromagnetic relay 48 comprising an armature frame 50 adjustably mounted on the recording instrument frame 10. A leaf type armature 52 is pivotally mounted on the armature frame 50 and is spring loaded by means of an armature helical loading spring 54 extending between a lug 56 on the armature frame 50 and one end of the armature 52. The characteristics of the loading spring 54 are such that when the relay 48 is not energized the free end of the armature 52 exerts a clockwise rotational force against the upper lever arm 44 through the adjustment screws 58 sufficient to cause clockwise rotation of the guide rod 12 against the action of the bias spring 46 thus lifting the pen point 36 from the surface of the material 38. It is, of course, to be understood that the upper and lower lever arms can be an integral unit or separate arms as illustrated. Separate arms are shown as they facilitate adjustment.

In operation, as above stated, the recording instrument generally is controlled by remote electrical equipment. There are three distinct operations which govern the recorded result: the rate that the recording material 38 is carried past the pen 28 which is determined by a first measured function; the rate of transverse or reciprocal movement of the pen 28 which is guided by the guide rod 12 across the material 38 and influenced by a second measured function; and, the contact between the pen point 36 and the material 38 which is desired only when data to be recorded are being received.

Since the equipment for performing the first two above mentioned control functions forms no part of the present invention, it has been omitted from the drawing and could comprise any equipment well known in the art. An example of a belt drive mechanism for providing transverse movement of the pen 28 and carriage 14 is disclosed in U. S. Patent No. 1,732,104, issued October 15, 1929, to M. Mee, for Autographic Machine.

As above described, the relative forces exerted by the bias spring 46 and the relay armature 52 against the lever system are such that when the relay 48 is not energized the lever arms 42 and 44 are held in a clockwise position keeping the pen point 36 poised above but not in contact with the material 38 carried by the platen 40. Upon receiving the proper electrical signal the relay 48 is energized causing the armature to be moved against the force of the loading spring 54, thus releasing the force exerted against the upper lever arm 44 and enabling the bias spring 46, which is operating against the lower lever arm 42, to rotate the lever mechanism in a counterclockwise direction. Rotation of the lever arm mechanism also rotates the guide rod 12 and the bar 20 in a counterclockwise direction. The bar 20 which is in engagement with the ball 22 carried by the carriage 14 will cause the pen point 36 to be moved into engagement with the material 38.

At the end of the energizing signal the relay is de-energized allowing the loading spring 54, acting through the armature 52 and the adjustment screws 58, to impart a clockwise rotation of the lever system against the force of the bias spring 46.

It is preferred to have the bias spring 46 operate in

a direction to cause engagement between the pen point 36 and the material 38. A positive engagement is thus provided which is not dependent upon the strength of the relay energizing signal, and the ultimate applied force is adjustable by regulating the force of the bias spring 46.

After the pen point 36 has been lowered to contact the material 38, recording will be made in accordance with the transverse movement of the carriage 14 and the movement of the material 38. It is believed to be clear that a more delicate control can be had over the transverse movement of the carriage 14 if the friction between the carriage 14 and the guide rod 12 and bar 20 is a minimum. It is further believed to be apparent from the above discussion that the three point contact between the guide rod 12 and the end loops 16 and the contact provided by the ball 22 between the carriage 14 and the bar 20 will provide a low friction loss upon transverse movement of the carriage.

There has thus been described an improved carriage and pen lifting device which is simple and inexpensive in manufacture, requires a minimum of power for transverse or reciprocal movement and produces a positive rotational movement capable of exerting a pen pressure greater than would be exerted by gravity action alone.

What is claimed is:

1. In a recording system, the combination of record receiving means, a guide rod mounted in proximity with and substantially parallel to said record receiving means, a carriage slidably engaging said guide rod for longitudinal movement along the length thereof and adapted to receive a pen, means preventing the rotation of said carriage about said guide rod, bias spring means coupled to said guide rod for rotating said guide rod so as to force said pen carriage toward said record receiving means, and means coupled to said guide rod for releasing said bias spring means and rotating said guide rod in a direction so as to separate said pen carriage from said record receiving means, said releasing means comprising relay means having an armature, and a loading spring connected to one end of said armature, the other end of said armature being in engagement with a lever arm coupled to said guide rod, said bias spring means operating against another lever arm coupled to said guide rod to exert pressure on said pen to bring it into engagement with said record receiving means when said first-named lever arm rotates said guide rod in response to the activation of said relay means.

2. In a recording system, the combination of record receiving means, a guide rod mounted in proximity with and substantially parallel to said record receiving means, said rod having a radial extension thereon which extends longitudinally therealong, a carriage engaging said guide rod and adapted to receive a pen, ball bearing means disposed within said carriage and against said radial extension, means slidably engaging said guide rod and forcing said radial extension against said ball bearing means, said carriage thus being slidably engaged for substantially frictionless longitudinal movement along said guide rod but being prevented from rotating about said guide rod, bias spring means coupled to said guide rod for rotating said guide rod so as to force said pen carriage toward said record receiving means, and means coupled to said guide rod for releasing said bias spring means and rotating said guide rod in a direction so as to separate said pen carriage from said record receiving means, said means slidably engaging said guide rod comprising a pair of triangularly shaped end loops in spaced parallel relation and in slidable engagement with said rod, and an apron fixedly attached to said end loops, said ball bearing means being disposed partially within a recess in said apron and in engagement with said radial extension, said end loops forcing said radial extension against said ball bearing means so that said pen carriage slidably engages said guide rod for longitudinal movement therealong and is prevented from rotating about said guide rod, said releasing means being coupled to said guide rod through a first lever arm, and said bias spring means being coupled to said guide rod through a second lever arm, said releasing means comprising a relay including a frame, an armature pivotally mounted on said frame, and a loading spring means connected between a portion of said frame and one end of said armature, the other end of said armature being in contact with said first lever arm, said loading spring means

exerting a greater force on said guide rod than said bias spring means, whereby said bias spring means rotates said guide rod in a direction so as to bring said pen carriage toward said record receiving means in response to the energization of said relay, and said loading spring means rotates said guide rod in a direction so as to separate said pen carriage from said record receiving means in response to the de-energization of said relay.

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