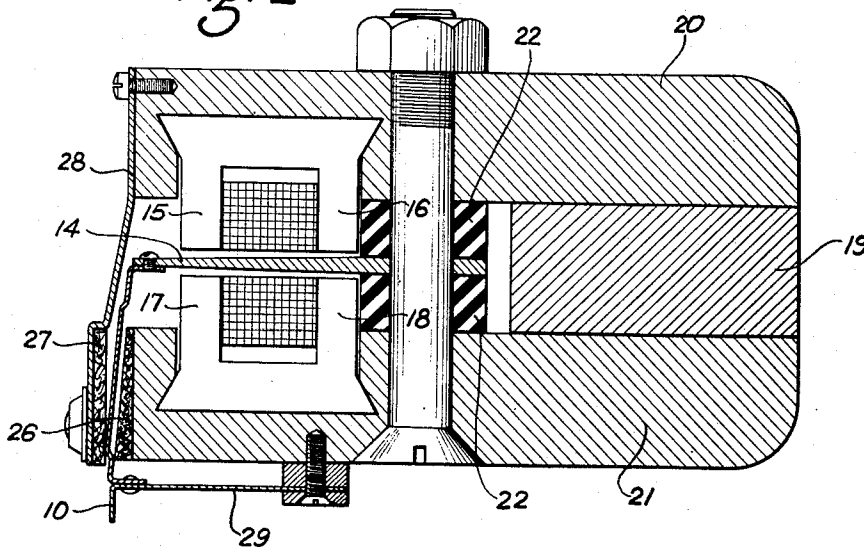
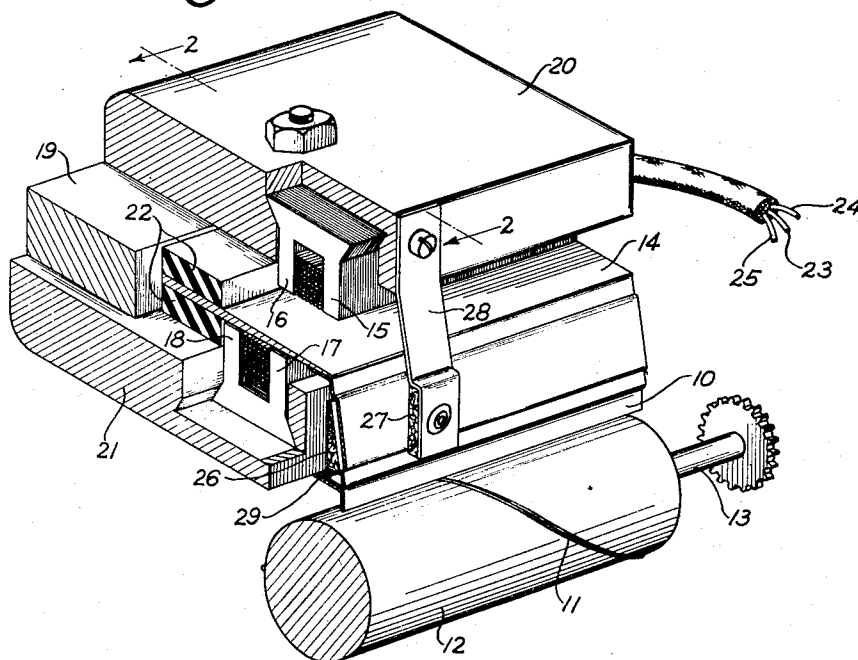


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FACSIMILE RECORDING APPARATUS

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FACSIMILE RECORDING APPARATUS

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This invention relates to facsimile reproduction apparatus and more particularly to electromagnetically operated printing bars associated with such apparatus.

The invention is specially adapted to apparatus of the type in which received signals are translated into mechanical movements of a printer bar and transformed into visible symbols on a recording medium, usually paper, by pressure produced by said movements. This pressure is ordinarily brought to bear upon the recording medium and an associated transfer material such as an inked member, a transfer paper of the coated-carbon species, or the like. Customarily the printing bar has a straight edge extending across the width of the message paper on the opposite side of which a scanning element is moved so that when the printing bar is vibrated by incoming signals it presses the paper against the scanning element thereby impressing transfer material thereon at the point defined by the intersection of the printing bar and the scanning element.

The popularity of carbon paper recording has waned due to what has been considered inherent limitations in the performance of printer bars. The designer of a printer bar is in somewhat of a quandary when faced with design factors including the following: the bar must be rigid and free of torsional twist yet its mass must be small if the desired high speed of operation is to be realized; each point along the length of the bar should strike the scanning element with equal force to insure uniform recording; and, the operating power should be kept to a minimum.

It is an object of the invention to provide a printing bar assembly which shall be inherently rigid and yet of small mass.

Another object of the invention is to provide for a printing bar an electromagnetic device which drives the bar by a unitary directly and orthogonally applied force.

Another object of the invention is the provision of a facsimile recording device of the electromagnetically driven printer bar type which will respond to frequencies of several thousands of cycles per second.

Other objects and advantages of the invention will become evident from the following description when read in connection with the accompanying drawing in which:

Fig. 1 is a sectional view in perspective of a facsimile recorder incorporating the invention; and,

Fig. 2 is an end view in section of the printing bar assembly of Fig. 1.

The facsimile recording apparatus, a fragment of which is shown in Fig. 1, includes a printing bar 10 having a length at least equal to the width of a picture to be recorded and having a cooperating movable scanner here shown as a spiral ridge 11 carried by a cylinder 12 which rotates with its shaft 13. With this arrangement it is known that if message receiving paper and carbon paper (not shown) are passed between the cylinder 12 and the printing bar 10, the message paper will be marked each time the printing bar 10 is moved back toward the cylinder 12, the location of the marks being determined by the position of the spiral ridge 11 which functions as a scanning anvil.

The printer bar 10 is secured, preferably throughout its length, to a driving member 14 which according to the invention comprises the armature of an electromagnet and is preferably made of electrical sheet steel having high permeability, high electrical resistance and high modulus of elasticity. This armature 14 is mounted between laminated pole faces 15, 16, 17 and 18 of a permanent magnet 19 having yokes 20 and 21 in which the laminated pole pieces 15 and 16, and 17 and 18, respectively, are mounted. In order to support the armature 14 as a cantilever, one end thereof is clamped between two non-magnetic bars 22 which are held firmly together by the yoke members 20 and 21. The position of the mounting members 22 is not critical and may for example lie between the pole faces 16 and 18. For push-pull operation, which is preferred, the armature 14 is centered between the pole faces 15—18 the width thereof is surrounded by two oppositely wound activating coils energized, respectively, through suitable leads 23 and 24, and 23 and 25 to raise or lower the free end of the armature 14 and hence the printing bar 10. The two coils are superimposed one over the other and disposed between the pole pieces 15—16 and 17—18 above and below the armature respectively. In this push-pull arrangement one of the coils has current on white, no current on black; the other coil has current only on black.

The spring action of the armature 14 plays an important role in high speed operation and for this reason a material of high modulus of elasticity should be employed. By tapering the armature 14 its spring action is improved and less weight has to be moved. A taper approximating a straight line approximation of a beam of uniform strength has been found satisfactory.

The printing bar 10 is preferably made of non-magnetic material such as stainless steel so that

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it will not attract the printing anvil 11. Rebound of the printing bar 10 may be prevented by suitable damping such as provided by felt pads 26 and 27 pressed against the bar 10 by a spring 28 secured to the front face of the yoke 20. The felt pads 26 and 27 are suitably secured, as by gluing, to the yoke 21 and the spring 28, respectively. The up and down motion of the printing bar 10 is stabilized and guided by a spring hinge 29 anchored to the yoke 21 and secured to the printing bar 10 near its printing edge. The number and spacing of the damping pads 26 and 27 as well as of the spring hinges are matters of choice and depend of course upon the length of the printing bar 10. Spacings of two inches for these members have been found satisfactory.

A printer bar assembly constructed in accordance with the invention and so designed that the natural period of the printer bar is about 1500 cycles per second will record at a frequency greater than 4000 cycles per second but at this frequency its sensitivity is so great that a skilled operator is required. Accordingly, for ordinary commercial operation it is preferred to record at a speed of between 2000 and 2500 cycles per second. This performance holds equally true whether the length of the printing bar is a fraction of an inch or many inches.

It will be evident from the above description that the balanced armature magnetic driver of the invention is adapted to fit into the design of many different types of recorders and will provide dependable performance at frequencies several times greater than any devices heretofore known. While a push-pull type of driver has been described in detail and is preferred it will be understood that several of the advantages of the invention are available when using one coil to move the armature 14 in one direction against the spring of the armature 14 which biases it in the other direction.

The scope of the invention is defined by the appended claims and is not limited to the specific embodiment described in detail.

I claim:

1. An electromagnetic driver of the permanent magnet type including opposed pole faces forming an airgap, a magnetizable armature extending between the pole faces and a pair of coils poled to have opposite magnetic effect surrounding the armature, characterized by the armature being tapered along its length to provide a cross section approaching the shape of a cantilever beam of uniform strength and being mounted at its thicker end in cantilever fashion.

2. An electromagnetic driver of the permanent magnet type including two pairs of opposed pole faces forming a pair of displaced and elongated air gaps, a magnetizable armature arranged in the air gaps and coextensive therewith and a pair

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of coils poled to have opposite magnetic effect surrounding the armature, characterized by the armature being tapered along its length to provide a cross section approaching the shape of a cantilever beam of uniform strength and being mounted at its thicker end in cantilever fashion.

3. An electromagnetic driver of the permanent magnet type including two pairs of opposed pole faces forming a pair of displaced and elongated air gaps, a magnetizable armature arranged in the air gaps and coextensive therewith, and a pair of coils poled to have opposite magnetic effect surrounding the armature parallel to the width thereof and between the pole faces, characterized by the armature being tapered along its length to provide a cross section approaching the shape of a cantilever beam of uniform strength and being mounted at its thicker end in cantilever fashion.

4. An electromagnetic driver for facsimile apparatus comprising a frame including a pair of magnetizable yoke members and a permanent magnet arranged therebetween, a pair of opposed pole pieces arranged on each yoke member for forming an air gap, and for dividing and directing the magnetic flux through the air gap, a magnetizable armature arranged in the air gap and coextensive therewith, said armature being tapered along its length to provide a cross section approaching the shape of a cantilever beam of uniform strength and being mounted at its thicker end in cantilever fashion, a pair of coils poled to have opposite magnetic effect surrounding the armature parallel to the width thereof and between the pole pieces, and a printing bar oscillatably mounted at one end on one of the yoke members and operatively connected at its other end to the thinner end of the armature for movement thereby.

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