Sept. 13, 1960 D. S. DUNWOODIE 2,952,205

PRINTING CYLINDER FOR MARKING MACHINES

Filed May 7, 1957 2 Sheets-Sheet 1

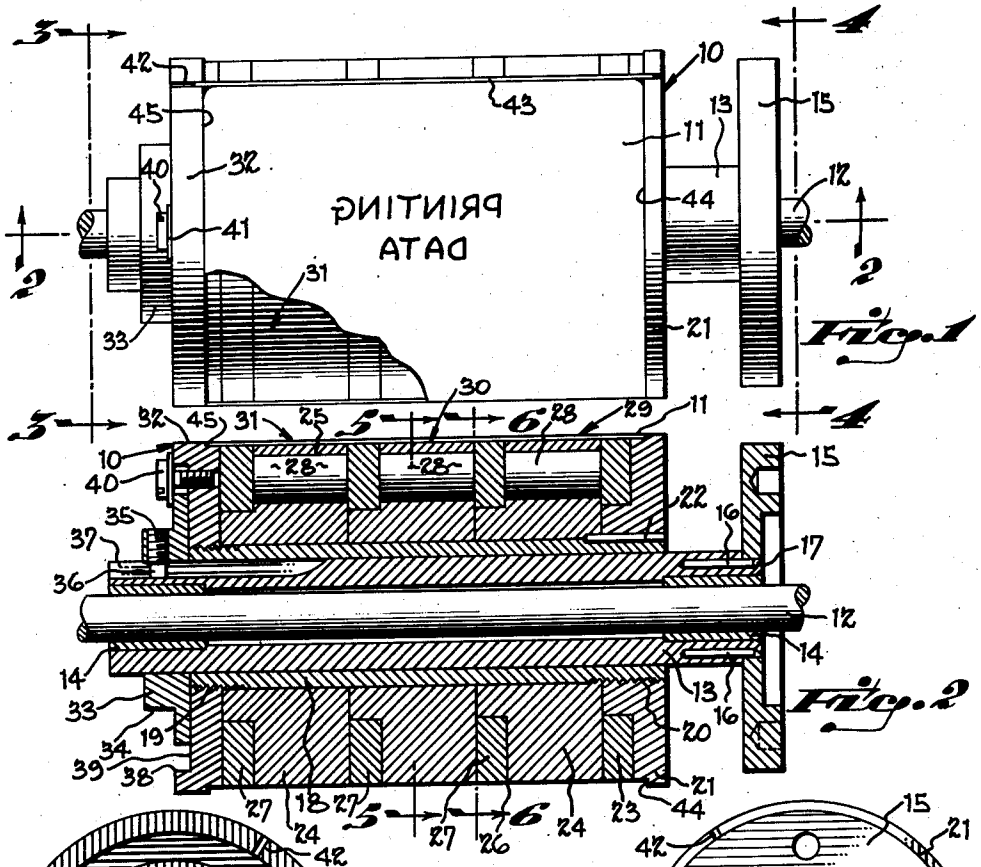


Fig. 1

Fig. 2

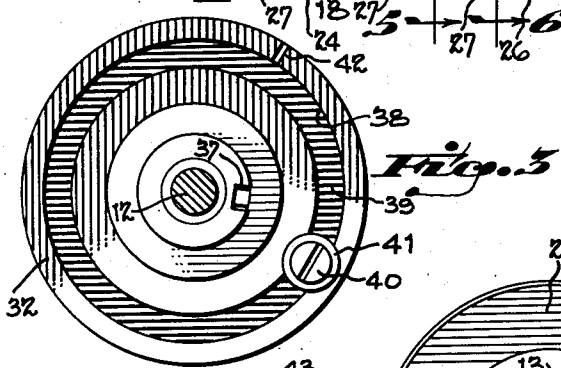


Fig. 3

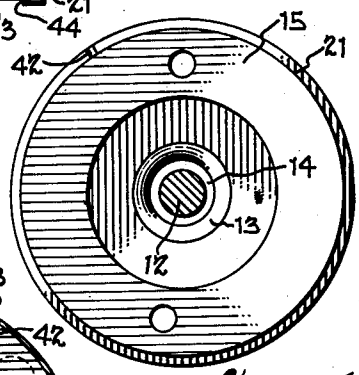


Fig. 4

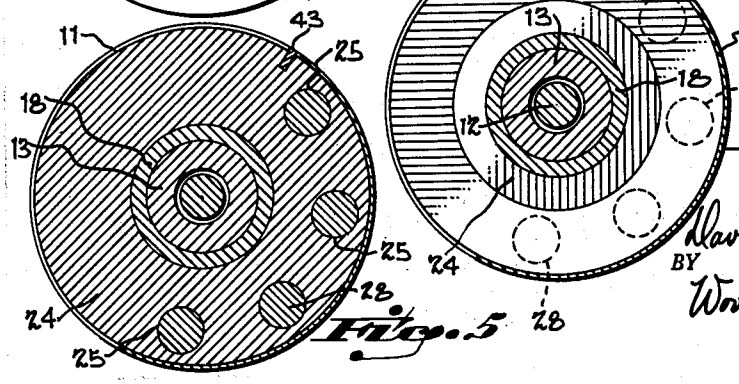


Fig. 6

Fig. 5

INVENTOR.
David S. Dunwoodie.
BY
Wood, Herron & Evans.
ATTORNEYS.

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PRINTING CYLINDER FOR MARKING MACHINES

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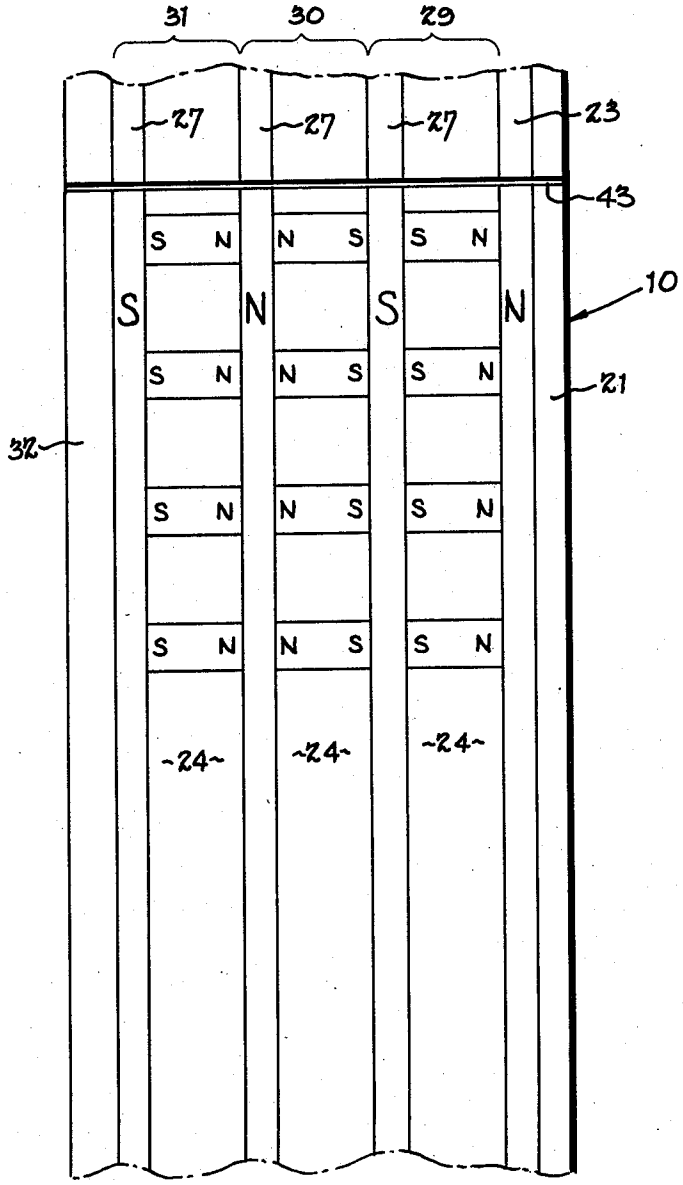


Fig. 7

INVENTOR.
David S. Dunwoodie.
BY
Wood, Herron & Evans
ATTORNEYS.

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PRINTING CYLINDER FOR MARKING MACHINES

David S. Dunwoodie, Dayton, Ohio, assignor to The Monarch Marking System Company, Dayton, Ohio, a corporation of Ohio

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6 Claims. (Cl. 101—378)

This invention relates to marking machines of the type which are like small rotary presses in that the printing characters or type pieces are carried upon rotating cylinders. Such machines are used primarily to print labels and, since the legends to be printed upon the labels usually vary from one run to the next, the printing characters must be changed frequently. In the past it has been the practice to provide a series of slots in the printing cylinder which were designed to receive individual pieces of type. In this way, the operator of the machine could make up the equivalent of a printing plate on the cylinder. However, this was a time consuming, tedious task which often resulted in errors.

The present invention is directed primarily to an improved printing cylinder for these machines, with the broad objective being to reduce "set-up" time to a minimum. In the preferred embodiment, the legends to be printed are first typed onto a thin metal plate similar to those used for addressing machines. Typewriters for this purpose are well known and readily available. The plate is then bent to conform to the curvature of the cylinder. The cylinder itself has a plurality of permanent magnets embedded in it, and the formed plate, which is made of magnetically responsive material, is simply laid in place upon the cylinder.

It is appreciated that the magnets, both permanent magnets and electro-magnets, have been used in the past for printing cylinders and no claim is made here to the use of magnets per se. The present invention is concerned with the disposition of the magnets, the way in which they are oriented with respect to one another in the cylinder, and the construction of the printing cylinder to most effectively utilize magnetic force to hold a printing plate securely in place on the cylinder. More particularly, the magnets are arranged so that their individual fields provide spots of concentrated magnetic forces which are spaced over the area of the cylinder to which the plate is affixed while at the same time providing a series of induced magnetic fields in elements which are in the form of bands extending around the cylinder at places spaced longitudinally of its axis. The combination of the individual fields and the continuous, induced fields grips the plate over substantially its entire area. By spreading out the fields in this way the plate is held securely by comparatively few magnets so that it cannot shift its position on the cylinder during a printing run. However, the force on any one area of the plate adjacent an edge is not so great that the plate cannot be lifted free of the cylinder with little effort.

Other objectives and features of the invention will be readily apparent to those skilled in the art from the following description of the drawings in which:

Figure 1 is a side elevational view showing a printing cylinder made in accordance with the principles of this invention. In this view, a printing plate is shown on the cylinder with a part of the plate being broken away to illustrate the structure of the cylinder.

Figure 2 is a cross sectional view taken on the line 2—2 of Figure 1.

Figure 3 is a view taken on the line 3—3 of Figure 1 showing the left end of the printing cylinder.

Figure 4 is a view taken on the line 4—4 of Figure 1 showing the right end of the cylinder.

Figure 5 is a cross sectional view taken on the line 5—5 of Figure 2.

Figure 6 is a cross sectional view taken on the line 6—6 of Figure 2.

Fig. 7 is a diagrammatic layout view of the surface of the cylinder showing the preferred disposition of the permanent magnets which are embedded within the cylinder.

The cylinder itself, which is designated generally by the numeral **10** in the drawings, is adapted to be used on a marking machine of the type disclosed in U.S. Patent No. 1,750,357, this patent being cited by way of example only. In a marking machine the cylinder is mounted above a platen to which labels are fed. The printing characters in the present cases are carried upon a plate **11** which extends around approximately only one-half of the cylinder. In past machines of this type the printing characters or type were secured in slots on the cylinder. However, the slots covered at the most only one-half of the surface of the cylinder. The rotation of the cylinder is synchronized with the feeding movement of feed fingers in the machine so that a label to be printed is positioned on the platen underneath of the cylinder at the time the cylinder is turned so that the printing characters are up away from the platen. Printing occurs during the next half of the revolutions of the cylinder, the printing pressure simultaneously impressing the label and advancing it toward a discharge point. In this operation, the feed fingers serve primarily as a pre-positioning means and the cylinder makes the major advance in the labels.

The printing plate **11** which is used consists of a thin sheet of magnetically responsive metal similar to that which is used in making addressing machine plates. The printing characters which are shown diagrammatically only on the plate are formed by a typewriter. The present invention is not limited to this specific method of forming characters and this is mentioned by way of example only. It will be obvious that the invention has utility with printing plates of other kinds. However, it is preferred that the plate be thin enough to have a certain amount of flexibility, this preference being explained at a later point.

The cylinder may be mounted for rotation upon a shaft of the type shown at **12**. This shaft serves only as a bearing or supporting device. A hollow shaft **13** which preferably is made of steel surrounds shaft **12**. Two bearings **14—14** are interposed between the hollow shaft **13** and the supporting shaft **12**. These bearings are received in appropriate seats machined into the opposite ends of the hollow shaft. It may be seen, therefore, that hollow shaft **13** is free to rotate with respect to the supporting shaft **12**. In an installation, hollow shaft **13** may be driven in various ways. In the present instance a driving flange **15** is provided which can be driven by a crank, bearing, a belt or other means. This flange has a central bore in it which fits over an extension at the right end of the hollow shaft **13** as shown in Figure 2. Pins **16** are provided to key the driving flange to the hollow shaft. In addition, the outer end of the extension of the hollow shaft may be staked or peened over as shown at **17** in Figure 2 to hold the driving flange in place on the hollow shaft.

The printing cylinder comprises an assembly of a number of parts of laminates which are built up on the hollow shaft from right to left as shown. These parts fit around an elongated retainer sleeve **18** which has an internal diameter to permit it to slide over the outside of the hol-

low shaft 13, this fit being such to permit relative movement between the sleeve and shaft. Both ends of the retainer sleeve are threaded as shown at 19 and 20 respectively. Before being installed on the shaft, an end clamp ring 21 is threaded onto the right end of the retainer sleeve. To lock the two together a pin such as the one shown at 22 may be inserted between the ring and sleeve going through the threads. The left face of end clamp ring 21 is machined to provide a seat for a spacer ring 23. The spacer ring is made of cold rolled steel or from other magnetically responsive metal, whereas the end clamp ring 21 is made of aluminum or some other magnetically non-responsive material. The next piece to be placed on the retainer sleeve is a magnet holder 24 which is made of aluminum or some other magnetically non-responsive material just as in the case of the end clamp ring 21. This holder in the instance shown has four bores 25 in it which are adjacent to its outer periphery and which extend parallel to the longitudinal axis of the cylinder assembly. As shown in Figure 5, these bores are spaced apart equally and they are disposed underneath less than one-half of the outer surface of the magnet holder. The left face of the magnetic holder 24 is also machined to provide a seat 26 for a spacer ring 27 which preferably is identical to spacer ring 23. The bores 25 in the magnet holder receive cylinder magnets 28 which completely fill the bores with their opposite ends abutting the two spacer rings 23 and 26.

Considering the magnet holder 24, spacer ring 27 and the four magnets 28 as a sub-assembly, there are two other substantially identical sub-assemblies employed. For purposes of identification the sub-assembly which has been described is identified generally by the numeral 29. The other two sub-assemblies are identified respectively 30 and 31, with assembly 31 being to the left and assembly 30 being in the middle. For simplification, the individual parts of the sub-assemblies 30 and 31 are identified by the same numerals used in the description of sub-assembly 29.

The three sub-assemblies are held in place upon the retainer sleeve by means of an end clamp ring 32 which is at the left end of the cylinder. This ring threads onto the threaded end 19 of the retainer sleeve 18 to clamp the three sub-assemblies securely in place against ring 21.

It will be noted that the hollow shaft 13 extends substantially beyond the end clamp ring 32 at the left. In setting up the marking machine for a particular run of labels, it is highly desirable to be able to adjust the position of the printing characters relative to a label fed into position upon the printing platen. In the present case this is done by rotatably adjusting the retainer sleeve 18 and the parts carried by it relative to the hollow shaft 13. For this purpose an adjusting flange 33 is provided which fits over the extended left end of hollow shaft 13 to rest against the outer face of end clamp ring 32. A boss 34 provided at the outer face of the adjusting flange has a set screw 35 threaded through it radially with respect to the center of shaft 13. The inner end of this set screw is cylindrical as shown at 36 and it engages into a keyway 37 machined into the left end of hollow shaft 13. The purpose of the set screw is to lock the adjusting flange 33 in position relative to the hollow shaft. The end clamp ring 32 has a rim 38 on it which extends around its outer periphery. This rim is of a depth equal to the depth of the adjusting flange 33. Additionally, the adjusting flange is of such a diameter so that a space in the nature of an annular groove 39 is provided between the outer periphery of the adjusting flange and rim 38. A large headed clamp bolt 40 is threaded into the end clamp ring at a point in the annular groove 39. A washer 41 on the bolt is sufficiently wide to span the groove 39 and thereby rest upon the adjacent edges of the adjusting flange and the rim. Tightening the bolt thus engages the washer to hold the end clamp ring 32 in fixed position relative to the adjusting flange 33. Loosening the bolt, of course, permits relative movement between these two elements and thus permits adjustment of the position of the printing plate to position it as required with respect to a label on the printing platen beneath the cylinder. It is preferred that the outer surface of the cylinder be machined after assembly to make it a true cylinder. Preferably, this is done to a depth equal to the thickness of the material of the printing plate 11. Additionally, after assembly an elongated slot 42 is cut into the surface of the cylinder. This slot receives a stop bar 43 which is made from magnetically non-responsive metal such as copper. The bar is press fitted into place and it is dimensioned so that it extends up above the machined surface of the cylinder by an amount equal to the thickness of the printing plate material. As shown in Figure 5, the cylinder is designed to rotate in a clockwise direction. The purpose of the bar is to serve as an abutment for the printing plate and thus it is located in a direction counter-clockwise away from the last one of the magnets of the series going in the counter-clockwise direction. Since the only force upon the printing plate tending to shift it on the surface of the printing cylinder is caused by printing pressure, the bar stop is all that is needed with the magnets to hold the plate in place. As shown, the printing plate fills the space longitudinally of the cylinder between two shoulders 44 and 45 provided by the machining of the cylinder. This is not necessary and the plate may be substantially shorter inasmuch as the holding effect of the two shoulders is not required.

In substance, therefore, each magnet of the twelve shown is embedded within an aluminum holder and both ends of each magnet abut a magnetically responsive spacer ring.

Reference is now made to Figure 7 which shows diagrammatically the disposition of the magnets. The magnets in the left vertical row are within what appears in the diagram to be a band. This is actually a layout of the surface of the non-magnetic holder 24 of sub-assembly 31 and it is identified accordingly. Each of the magnets in this band are disposed with their south poles to the left and their north poles to the right. The magnetically responsive spacer rings 27 appear in the diagram at the opposite sides of the magnets as vertical bands. Hence, since the spacer ring at the left abuts the four south poles of the magnets it comprises an induced south pole and it is marked S accordingly. The magnetically responsive retainer ring at the right end of these magnets therefore comprises an induced north pole and it is marked N accordingly. The magnets in sub-assembly 30 are arranged in the opposite relationship so that the poles at the left ends of these magnets are north poles and they abut the ring at the left identified in the diagram by N.

The magnets of sub-assembly 29 are arranged in the same relationship of the magnets in sub-assembly 31 so that the south poles are to the left and the north poles are to the right. The magnets of sub-assembly 29 and the magnets of sub-assembly 30 have their south poles abutting the spacer ring 27 which is interposed between them and therefore this ring has an induced south pole marked S. Spacer ring 23 to the right of the magnets in sub-assembly 29 therefore has an induced north pole. It may be seen, therefore, that there are four induced poles which extend, as shown on the diagram, vertically at the two ends and between the rows of magnets. In the cylinder these bands, of course, extend around the cylinder. In addition to the induced poles each magnet has a field around it from one pole to the other since the magnet is embedded in aluminum. Hence, there are twelve small fields spread over a substantial area of the cylinder, each one of which is effective to hold the printing plate and, in addition, there are the large bands having induced fields which cooperate with the individual fields to hold the plate in position. There is another important feature in the arrangement of the magnets shown and, it will be

noted, taking any one of the individual poles of a magnet, the closest dis-similar pole is the one at the opposite end of the magnet under consideration. Hence, the magnetic field of each magnet is clearly defined. The closest like pole is on the other side of the spacer plate. Disposed in this way, the two adjacent like poles do not "short" through the magnetically responsive spacer plate but instead provide the induced field of like polarity in the ring. The overall effect of the fields including the induced fields is to grip the printing plate over substantially its entire surface. As indicated previously, the plate material is slightly flexible. It is believed that this is important in the combination disclosed here, because it permits the plate to be lifted at one corner for example and then "peeled" away from the surface of the cylinder progressively breaking away from the holding forces of the spaced magnetic fields.

Having described my invention, I claim:

1. In a printing cylinder for a marking machine in which a curved printing plate is held magnetically upon said cylinder, the improvement comprising a stop set longitudinally in said cylinder and protruding above the surface of said cylinder by an amount less than the thickness of said printing plate, said printing cylinder comprising an assembly of a plurality of magnet holders made of magnetically non-responsive material arranged side by side lengthwise of the cylinder, a plurality of permanent magnets in each magnet holder arranged with their longitudinal axes parallel to the longitudinal axis of the cylinder, equally spaced circumferentially thereof adjacent to the surface of the holder and set with respect to said stop in the direction of rotation of said cylinder, a plurality of magnetically responsive rings exposed at the surface of said cylinder alternately with the magnet holders lengthwise of the cylinder, said magnets abutting the magnetically responsive rings, and the magnets arranged so that similar poles of the magnets in adjacent magnet holders contact that magnetically responsive ring therebetween, whereby adjacent rings have dissimilar induced magnetic poles therein.

2. A printing cylinder as set forth in claim 1 in which the magnets are cylindrical.

3. A printing cylinder as set forth in claim 2 in which the magnets are disposed in rows parallel to the central axis of the cylinder.

4. A printing cylinder for a marking machine adapted to be used in conjunction with a thin, magnetically responsive metal printing plate configurated to fit the outer surface of said cylinder, said cylinder comprising a shaft, a pair of end flanges fastened to the opposite ends of said shaft, a plurality of magnet holders made of magnetically non-responsive metal arranged side by side on the shaft between the end flanges, a plurality of magnetically responsive rings recessed in the cylinder, there being a ring at each end of each magnet holder, a plurality of permanent magnets inside of each magnet holder, each magnet having its ends in contact with the magnetically responsive rings at the respective ends of the magnet holder in which the magnet resides, the magnets in each holder being arranged with like poles contacting the same ring, whereby adjacent rings of the cylinder have dissimilar poles induced therein, and a stop extending longitudinally on said cylinder, said stop protruding above the surface of said cylinder by an amount less than the thickness of said printing plate, said magnets being set in said holders with respect to said stop in the direction of rotation of said cylinder.

5. A printing cylinder for a marking machine adapted to be used in conjunction with a thin, magnetically responsive metal printing plate configured to fit the surface of the cylinder, said cylinder comprising a plurality of magnetically non-responsive magnet holders which are disposed side by side lengthwise of the cylinder, a plurality of magnetically responsive rings, each magnet holder at one side thereof being configurated to seat a ring such that the outer surface of the ring is exposed to the surface of the cylinder, a plurality of magnets set in each magnet holder with each magnet being disposed parallel to the longitudinal axis of the cylinder and with the opposite poles thereof respectively in contact with the adjacent magnetically responsive rings, the magnets in each holder being arranged with like poles in contact with the same ring, and the magnets in adjacent holders being reversed with respect to one another whereby induced magnetic poles of alternate polarity are provided in adjacent rings and whereby said plate is held on the cylinder by the fields of the individual magnets and by the fields of the induced poles.

6. In a magnetic printing cylinder a plurality of magnet holders made of magnetically non-responsive metal, a plurality of magnetically responsive rings, the magnet holder and rings being disposed alternately side by side lengthwise of the cylinder, a plurality of magnets mounted in each magnet holder, the magnets arranged therein parallel to the longitudinal axis of the cylinder and being equally spaced from one another circumferentially of the cylinder adjacent to the outer surface thereof and extending at least partly around the circumference of said cylinder, each magnet in a holder contacting the magnetically responsive rings at the opposite sides of the magnet holder with similar poles contacting the same ring, the magnets of adjacent magnet holders being reversed with respect to the one another, whereby dissimilar induced poles are provided in alternating rings.

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