Oct. 18, 1966 B. HOWARD 3,279,576

TYPE CYLINDER HAVING TILTABLE TYPE

Filed Nov. 6, 1964 2 Sheets-Sheet 1

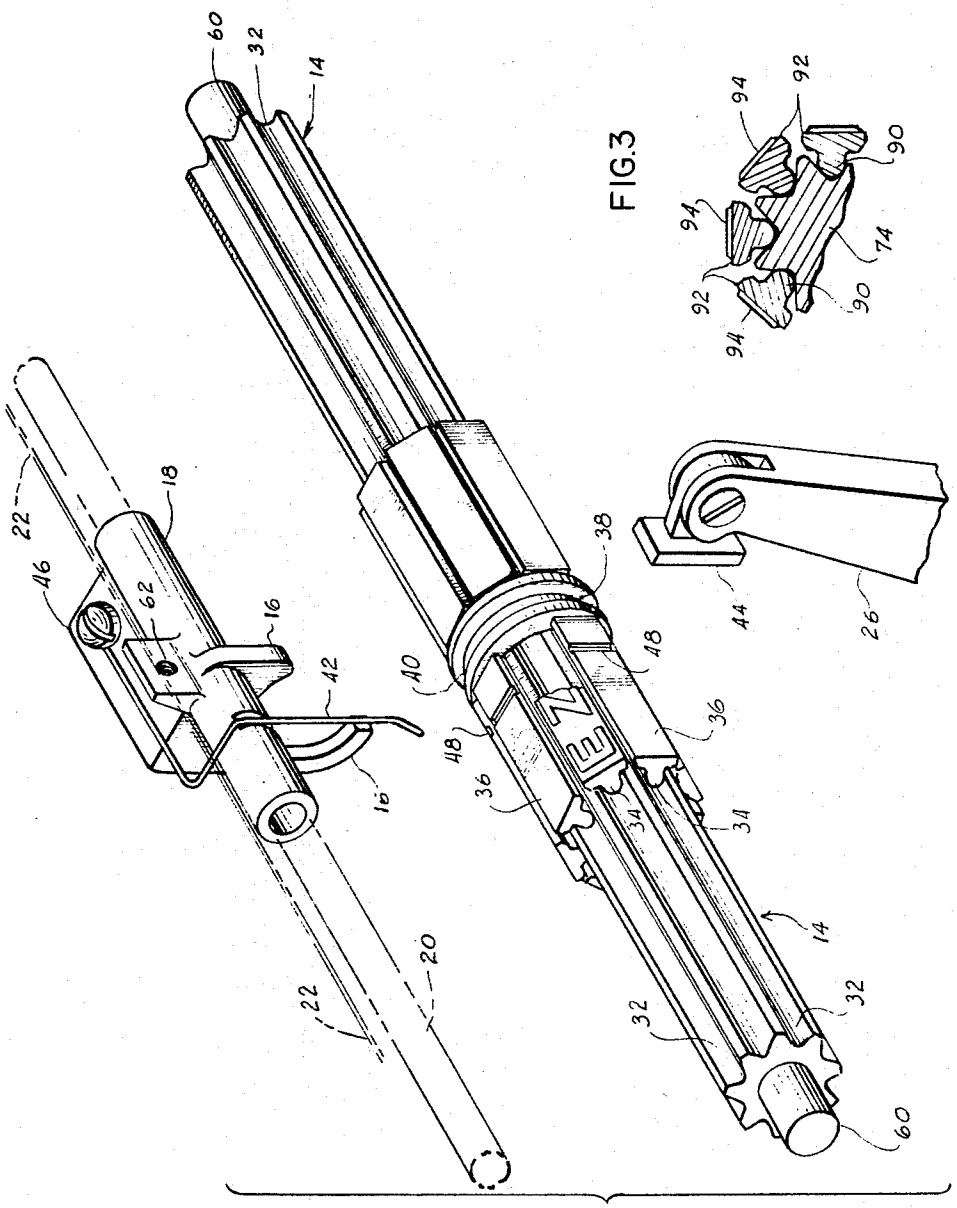


FIG. 1

FIG. 3

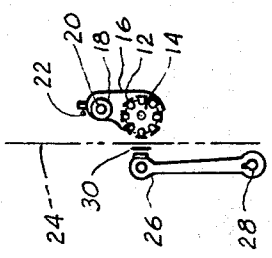


FIG. 2

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TYPE CYLINDER HAVING TILTABLE TYPE

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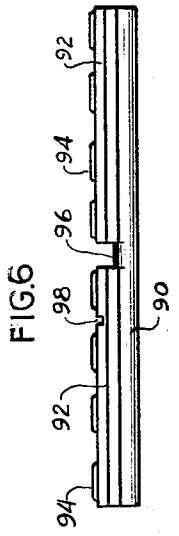


FIG.6

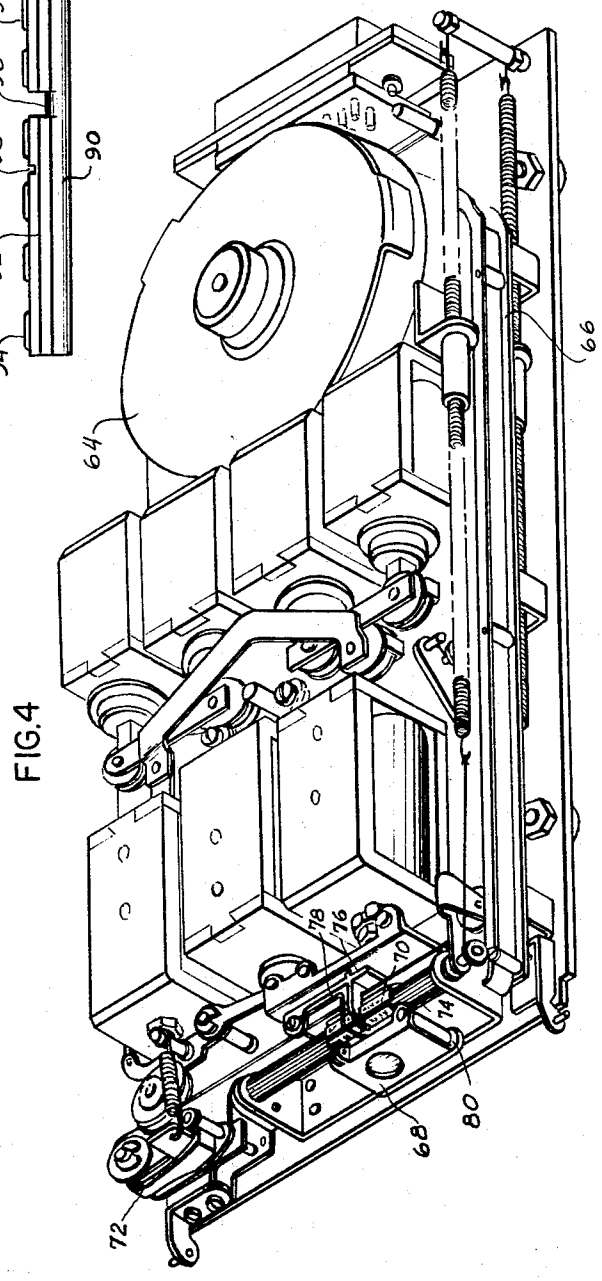


FIG.4

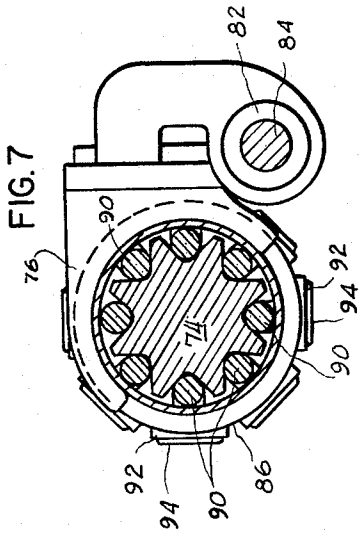


FIG.7

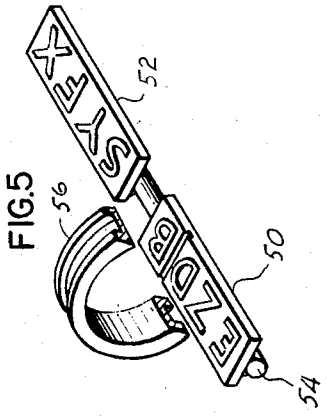


FIG.5

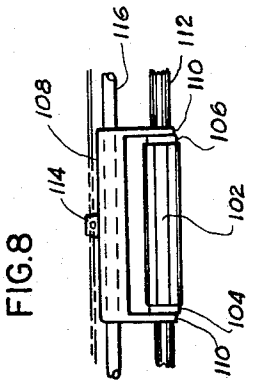


FIG.8

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United States Patent Office 3,279,576 Patented Oct. 18, 1966

3,279,576

TYPE CYLINDER HAVING TILTABLE TYPE

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Filed Nov. 6, 1964, Ser. No. 409,499
12 Claims. (Cl. 197—49)

This invention relates to type cylinders, and more particularly to type cylinders which are slidable on a splined shaft.

A known form of printer, particularly for telegraph use, employs a prismatic cylinder having permanently affixed lines of type. The cylinder is rotatable by means of a splined shaft, and is axially slidable on the shaft, for rotative and axial character selection. A hammer hits an ink ribbon and the paper against the selected character of the type cylinder. The general object of the present invention is to improve such type cylinders.

The rotary motion is subject to slight angular variations, depending on the adjustment of the machine and its components. A cushioned laminated hammer face has been used in an effort to secure slight corrections in the angular relationship between the type cylinder and the hammer. More specific objects of the present invention are to overcome the difficulty of error in alignment, and to provide type strips which float or tilt freely and therefore are self-adjustable to correct such error in rotative alignment. An ancillary object is to eliminate the need for a cushioned or pivoted hammer face.

Other objects of the invention are to simplify the manufacture and to reduce the cost of the type cylinder, and to facilitate a change of type.

To accomplish the foregoing general objects, and other more specific objects which will hereinafter appear, my invention resides in the type cylinder and shaft assembly, and the elements thereof, and their relation one to another, as are hereinafter more particularly described in the following specification. The specification is accompanied by drawings in which:

FIG. 1 is a perspective exploded view of a type cylinder and associated printer elements embodying features of the present invention;

FIG. 2 is a fragmentary end elevation explanatory of the relation of the parts shown in FIG. 1;

FIG. 3 is a fragmentary section through a type cylinder;

FIG. 4 is a perspective view of a telegraph printer in which the type cylinder is used;

FIG. 5 is a fragmentary view showing two parts of a type cylinder;

FIG. 6 is an elevation of an integral type strip;

FIG. 7 is a section through the retainer ring of a type cylinder; and

FIG. 8 is a schematic elevational view of a modification.

Referring to the drawing, and more particularly to FIG. 2, the type cylinder **12** is octagonal and it is slidable on a splined shaft **14**. Its axial movement is provided by means of a yoke **16** having a sleeve **18** slidable on a guide rod **20**, the yoke itself being moved by means of a cable indicated at **22**. The paper to be printed is represented by a broken line **24**. A hammer **26** is carried by shaft **28** and serves to strike the paper against one of the characters on the front of the type cylinder **12**. The paper **24** may be of the self-inking type, or if not, an ink ribbon **30** is located between the hammer face and the paper.

Telegraph printers of the type here considered, and in which the present improved cylinder may be used, are disclosed in my Patents Nos. 2,727,944, issued December 20, 1955; 2,769,029, issued October 30, 1956; and 3,063,540, issued November 13, 1962, all entitled "Telegraph Printer." Other telegraph printers in which the type cylinder may be used are disclosed in my copending patent

applications Serial Nos. 340,615, filed January 28, 1964, and entitled "Miniaturized Electrically Operated Printer," and 303,739 filed August 22, 1963, and entitled "Electrically Operated Printer."

Referring now to FIG. 1 of the drawing, the type cylinder and shaft assembly comprises a shaft **14** having spaced longitudinal grooves **32**. There are a plurality of pivots **34** positioned one in each groove, and type strips **36** secured to the pivots **34**. A retainer ring **38** is disposed around the pivots **34** to hold the assembly together around the shaft **14**. The proportioning of the parts is such that the strips **36** are tiltable by reason of the pivots **34**. The strips have characters, only two of which are shown.

Referring now to FIG. 5, for a very limited amount of production the type strips **50** and **52** may be metal strips which are soldered or brazed to round steel rod such as drill rod, indicated at **54**. When a single retainer ring **56** is employed at the middle of the cylinder, as here shown, it may be said that the type strip is interrupted to receive the ring **56**, or differently expressed, that each pivot rod **54** has a pair of type strips **50** and **52** which are disposed end-to-end with a space therebetween dimensioned to just receive the retainer ring **56**. The parts are preferably so dimensioned that the retainer ring is received directly around the exposed middle portion of the rod **54** and therefore does not interfere with the desired rocking action.

For larger volume production the type strips and rod are preferably integrally molded, and such is the case in FIGS. 1, 3, 6 and 7. A hard plastics material may be used, or metal, and in the latter case the tiltable type strip may be cast or may be made by an electroforming process. The characters on the type strips are formed as a part of the molding operation.

Because the bottom of the pivot **34** (FIG. 2) is rounded for rocking of the type strip, and because the top of pivot **34** where exposed inside the retainer ring **38**, also is rounded to accommodate the same rocking action while engaging the retainer ring, it is convenient to describe the type strip assembly, even when integrally molded, as comprising a pivot rod **34**, and a type strip **36** on the pivot rod **34**, and a retainer ring **38** disposed around the pivot rods **34** to hold the assembly together around the shaft **14**. This terminology referring to both a "rod" and a "strip" is used for convenience, and is not intended to exclude integrality.

The yoke **16** (FIG. 1) and its sleeve **18** are movable longitudinally of the shaft **14**, the yoke sleeve **18** being slidable on a guide rod **20** which is parallel to the shaft. The retainer ring **38** is annularly grooved at **40** to receive the yoke **16** in order to move the cylinder axially without interfering with rotation of the cylinder by means of the shaft **14**. A light positioning spring **42** bears against that type strip which is facing the hammer **44** carried by hammer arm **26**. The spring **42** is secured to the yoke at **46**, and the type strips may be grooved or recessed to receive the spring, as is indicated at **48**.

For small production a standard pinion rod may be used as the shaft **14**, the ends of the rod being turned down to form trunnions **60** of desired length. The pinion rod here shown has eight teeth, and there are eight grooves between the teeth. The cylinder comprises eight tiltable type strips. The cable which moves the yoke **16** axially is indicated by the broken line **22**, it being secured to the yoke by means of a screw received at **62**.

To assemble the parts of the type cylinder the eight tiltable strips may be passed through and spread around the inside of the retainer ring **40**, following which the pinion rod or shaft **14** is slid axially through the assembly.

One form of printer in which the type cylinder may be used is shown in FIG. 4. This is a compact tape

printer. It is a lightweight printer which may be used in airborne computers or other airborne equipment, or for military purposes, or for any purpose in which compactness and lightweight are important.

The paper tape is fed from a reel at **64** to and along a tape guide **66**, and then across the front of the printer between a type hammer **68** and a type cylinder **70**. The tape then is carried through a suitable tape feed mechanism at **72**. The type cylinder is moved axially on pinion shaft **74** by means of a yoke **76** which also carries a positioning spring **78**. The rotational character selection is obtained by means of a cable which is threaded back and forth around three selector pulleys moved by solenoids, the motion of the three pulleys being in the ratio of one to two to four, thus providing eight positions. The type cylinder, as in FIGS. 5 and 6, is eight characters long, as well as eight characters around, and its axial position is also obtained by means of a cable which is threaded around three pulleys which are movable by solenoids in the ratio of one to two to four, again establishing eight axial positions.

When printing on a tape, as here shown, the only axial movement required of the type cylinder is for character selection. When printing on a sheet, the type cylinder has an additional step-by-step movement across the paper to print the lines of type, and the splined shaft is appropriately lengthened, and the hammer is arranged for step-by-step movement with the type cylinder. Thus, in FIG. 2 for example, the shaft **28** would be a splined shaft, with the hammer slidable therealong. This is not needed when printing on tape, as in FIG. 4, because the printing station then is fixed. Another difference in FIG. 4 is that the hammer **68** is pivoted at **80**, that is, the hammer arm extends horizontally instead of vertically as shown in FIGS. 1 and 2.

In FIG. 4, the guide rod for the yoke **76** is not visible because instead of being located above the pinion rod as in FIG. 1, it is located behind and somewhat below the pinion rod. This relation is shown in FIG. 7, in which the sleeve **82** of yoke **76** slides on guide rod **84**. The retainer ring is shown at **86**, the section being taken through the groove of the retainer ring, in which groove the yoke **76** is located.

The splined shaft **74** is called a pinion shaft for convenience, and with limited production a pinion shaft may, in fact, be used. However, for larger production the groove shape may be especially designed, with a shape somewhat different from a conventional pinion tooth shape. Such a shaft is shown at **74** in FIG. 7, the sides of the groove being straight, and disposed at an angle of 90°. The shaft may be machined or may be extruded out of a relatively soft metal which later is hard-coated. A molded plastics material may be used for the shaft, provided that a suitable plastics material is selected.

FIG. 7 also shows the round or rod-like midportion **90** of the tiltable print strips **92**. A different or more typical section through the print strips is shown in FIG. 3, in which the rod portion **90** expands into the strip portion **92**.

The integral type strip of FIGS. 3 and 7 is also shown in FIG. 6. It is eight characters long, the raised characters being shown at **94**, projecting from strip **92**. The gap for the retainer ring and the exposed rounded top of the pivot are shown at **96**. The long bottom pivot surface is shown at **90**. The width of the retainer ring is exaggerated in FIGS. 2 and 5 for clarity, but FIG. 6 shows how gap **96** is small enough to fit between two characters **94** while spacing the characters uniformly. The channel **98** for the positioning spring similarly fits between two characters.

In FIG. 7 it may be noted that the outer diameter of the retainer ring **86** is smaller than that of the cylinder, so that there is no interference when printing. The radius of the top of the rod at the gap **96** (FIG. 6) may differ slightly, if desired, from the radius of the bottom of the rod. For example, it may be smaller to help reduce the diameter of the retainer ring **86** (FIG. 7).

The type cylinder may be assembled with retainer rings at the ends instead of at the middle, and such an arrangement is shown in FIG. 8 in which the type strips **102** are uninterrupted. The pivot rods are extended at the ends, and are confined by retainer rings **104** and **106**. The type cylinder is moved by means of a yoke **108** which may straddle the retainer rings **104** and **106** to move the type cylinder axially. The ends **110** of the yoke **108** straddle the pinion shaft **112**. The cable for axial movement may be secured at **114**, the sleeve portion of the yoke **108** being slidable on a guide rod **116**.

A positioning spring is preferably employed, must as shown in FIG. 1, but has been omitted in FIG. 8 to simplify the drawing.

It is believed that the construction and method of assembly and use of my improved type cylinder, as well as the advantages thereof, will be apparent from the foregoing detailed description. The individual type strips can change their angular position in relation to the hammer to permit slight corrections in angular relationship for better printing. The individual strips tilt freely on the pinion rod, and if slightly out of alignment there is a correction as the hammer strikes the paper against the type cylinder. This greatly improves the quality of printing, and it does away with the need for a special cushioned or pivoted hammer face. Instead, a simple solid hammer face may be used.

Another advantage arises in manuafcture because of the ease of assembly of the parts of the type cylinder. Servicing is facilitated. If it be desired to change the alaphabet in the machine, one or more strips may be changed by removing the type cylinder assembly from the splined shaft; making the appropriate substitution; and restoring the type cylinder to the shaft.

It will be understood that while I have shown and described the invention in several preferred forms, changes may be made without departing from the scope of the invention, as sought to be defined in the following claims. In the claims the reference to type strips and pivot rods is not intended to exclude the preferred construction in which they are integrally molded. The term pinion shaft is not inteded to require a true gear-tooth shape.

I claim:

1. A type cylinder and shaft assembly for use with a printing hammer, said shaft having uniformly spaced longitudinal grooves, said type cylinder comprising a plurality of pivot rods positioned one in each groove, type strips on said rods, a retainer ring around said rods to hold the assembly together around the shaft, a yoke movable longitudinally of the shaft, said retainer ring being annularly grooved to receive said yoke for moving the cylinder axially without interfering with rotation of the same by the shaft, and a light positioning spring carried by said yoke and bearing against that type strip which is facing the hammer.

2. A type cylinder and shaft assembly for use with a printing hammer, said shaft being a long pinion-like shaft, said type cylinder comprising a plurality of pivot rods positioned one in each groove between pinion teeth, a plurality of pairs of type strips with one pair on each of said rods, the paired strips being disposed end-to-end on a pivot rod with a space therebetween, a retainer ring around said rods in the space between said strips to hold the assembly together around the pinion shaft, a yoke movable longitudinally of the pinion shaft, and said retainer ring being annularly grooved to receive said yoke for moving the cylinder axially without interfering with rotation of the cylinder by means of the pinion shaft, said strips being tiltable by reason of said pivot rods.

3. A type cylinder and shaft assembly for use with a printing hammer, said shaft being a long pinion-like shaft,

said type cylinder comprising a plurality of pivot rods positioned one in each groove between pinion teeth, a plurality of pairs of type strips with one pair on each of said rods, the paired strips being disposed end-to-end on a pivot rod with a space therebetween, a retainer ring around said rods in the space between said strips to hold the assembly together around the pinion shaft, a yoke movable longitudinally of the pinion shaft, said retainer ring being annularly grooved to receive said yoke for moving the cylinder axially without interfering with rotation of the cylinder by means of the pinion shaft, and a positioning spring carried by said yoke and bearing against that pair of type strips which is facing the hammer and serving to position the said pair of strips for parallel contact with the hammer.

4. A type cylinder and shaft assembly for use with a printing hammer, said shaft being a long pinion-like shaft having eight teeth, said type cylinder comprising eight pivot rods positioned one in each groove between pinion teeth, eight pairs of type strips with one pair on each of said rods, the paired strips being disposed end-to-end on a pivot rod with a space therebetween, a retainer ring around said rods in the space between said strips to hold the assembly together around the pinion shaft, a yoke movable longitudinally of the pinion shaft, and said retainer ring being annularly grooved to receive said yoke for moving the cylinder axially without interfering with rotation of the cylinder by means of the pinion shaft, said strips being tiltable by reason of said pivot rods.

5. A type cylinder and shaft assembly for use with a printing hammer, said shaft being a long pinion-like shaft having eight teeth, said type cylinder comprising eight pivot rods positioned one in each groove between pinion teeth, eight pairs of type strips with one pair on each of said rods, the paired strips being disposed end-to-end on a pivot rod with a space therebetween, a retainer ring around said rods in the space between said strips to hold the assembly together around the pinion shaft, a yoke movable longitudinally of the pinion shaft, said retainer ring being annularly grooved to receive said yoke for moving the cylinder axially without interfering with rotation of the cylinder by means of the pinion shaft, and a positioning spring carried by said yoke and bearing against that pair of type strips which is facing the hammer and serving to position the said pair of strips for parallel contact with the hammer.

6. A type cylinder and shaft assembly for use with a printing hammer, said shaft being a long pinion-like shaft, said type cylinder comprising a plurality of pivot rods positioned one in each groove between pinion teeth, said rods being oscillatable in said respective grooves, type strips fixed on said rods outside said shaft, and a retainer ring around said rods to hold the assembly together around the pinion shaft, said strips and rods being freely tiltable in said grooves, the tilt being limited to a small angle by reason of the strips, each type strip being self-adjustable to parallel the hammer face when struck by the hammer.

7. A type cylinder and shaft assembly for use with a printing hammer, said shaft having spaced longitudinal grooves, said type cylinder comprising a plurality of pivot rods positioned one in each groove, said rods being oscillatable in said respective grooves, type strips fixed on said rods outside said shaft, and a retainer ring around said rods to hold the assembly together around the shaft, said strips and rods being freely tiltable in said shaft grooves, the tilt being limited to a small angle by reason of the strips, each type strip being self-adjustable to parallel the hammer face when struck by the hammer.

8. A type cylinder and shaft assembly for use with a printing hammer, said shaft having spaced longitudinal grooves, said type cylinder comprising a plurality of pivot rods positioned one in each groove, said rods being oscillatable in said respective grooves, type strips fixed on said rods outside said shaft, a retainer ring around said rods to hold the assembly together around the shaft, said strips and rods being freely tiltable over a small angle either side of a normal position by reason of said pivot rods being seated in said grooves, the tilt being limited to a small angle by reason of the strips, a light positioning spring bearing against the outer face of that type strip which is facing the hammer and tending to hold it in normal position, and means to support said spring, each type strip being self-adjustable to parallel the hammer face when struck by the hammer.

9. A type cylinder and shaft assembly for use with a printing hammer, said shaft having spaced longitudinal grooves, said type cylinder comprising a plurality of pivot rods positioned one in each groove, said rods being oscillatable in said respective grooves, type strips fixed on said rods outside said shaft, a retainer ring around said rods to hold the assembly together around the shaft, a yoke movable longitudinally of the shaft for moving the cylinder axially without interfering with rotation of the same by the shaft, said strips and rods being freely tiltable on said pivot rods, the tilt being limited to a small angle by reason of the strips, each type strip being self-adjustable to parallel the hammer face when struck by the hammer.

10. A type cylinder and shaft assembly as defined in claim 9, in which there are two retainer rings, one at each end of the cylinder, and in which the yoke straddles the ends of the cylinder.

11. A type cylinder and shaft assembly for use with a printing hammer, said shaft having spaced longitudinal grooves, said type cylinder comprising a plurality of pivot rods positioned one in each groove, type strips fixed on said rods outside said shaft, a retainer ring around said rods to hold the assembly together around the shaft, a yoke movable longitudinally of the shaft for moving the cylinder axially without interfering with rotation of the same by the shaft, said strips and rods being tiltable over a small angle by reason of said pivot rods, whereby each type strip is self-adjustable to parallel the hammer face when struck by the hammer, there being a single retainer ring, and said retainer ring being annularly grooved to receive the yoke.

12. A type cylinder and shaft assembly for use with a printing hammer, said shaft having spaced longitudinal grooves, said type cylinder comprising a plurality of pivot rods positioned one in each groove, type strips fixed on said rods outside said shaft, a retainer ring around said rods to hold the assembly together around the shaft, a yoke movable longitudinally of the shaft for moving the cylinder axially without interfering with rotation of the same by the shaft, said strips and rods being tiltable over a small angle by reason of said pivot rods, whereby each type strip is self-adjustable to parallel the hammer face when struck by the hammer there being a single retainer ring, said retainer ring being annularly grooved to receive the yoke, and said retainer ring being narrower than the space between adjacent characters of the type strips and being located in the space between two characters of a type strip.

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