April 14, 1964 C. A. CHRISTOFF 3,128,695

PRINTER

Filed Dec. 1, 1961 2 Sheets-Sheet 1

FIG. 1

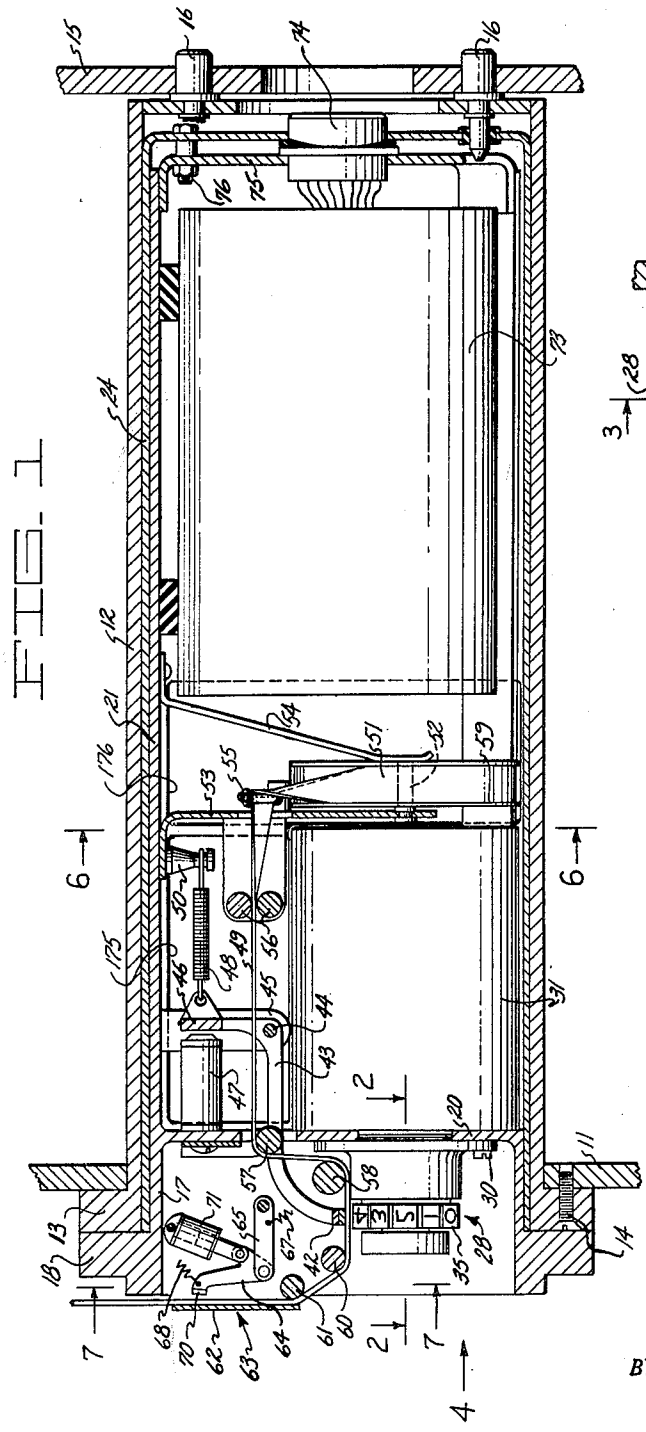


FIG. 2

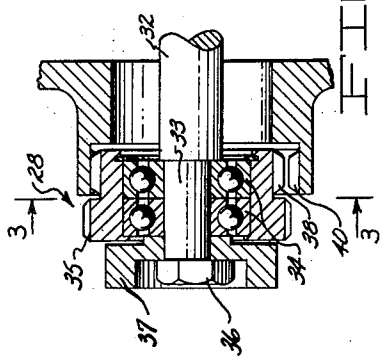
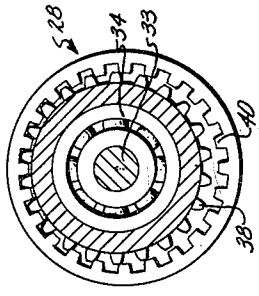


FIG. 3



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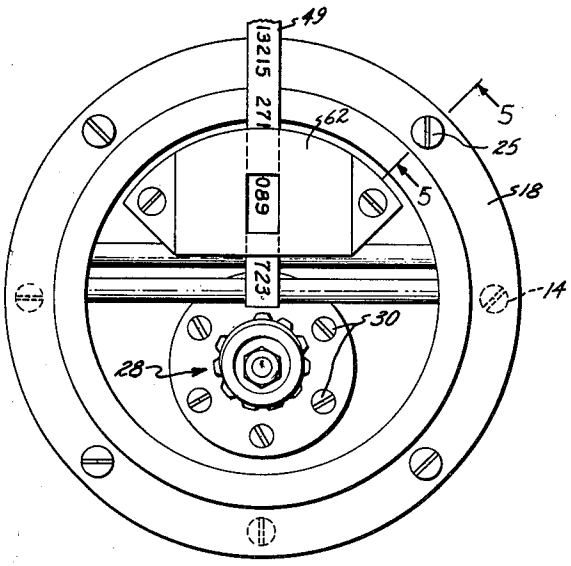


FIG. 4

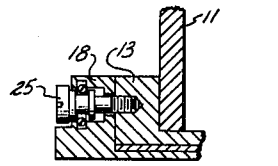


FIG. 5

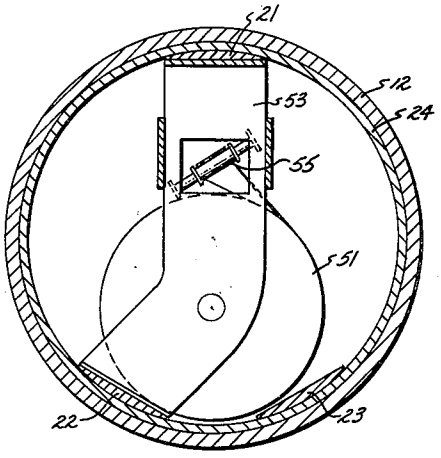


FIG. 6

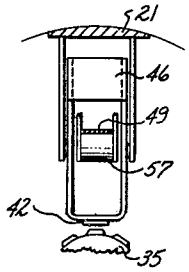


FIG. 7

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United States Patent Office 3,128,695 Patented Apr. 14, 1964

3,128,695

PRINTER

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Filed Dec. 1, 1961, Ser. No. 156,201
5 Claims. (Cl. 101—93)

This invention relates to printers and has particular reference to a printer for selectively and serially printing data on a strip of paper or the like.

A principal object of the invention is to provide a compact miniature printer capable of serially printing data on a strip of paper or the like and arranged to be housed within a small space, such as, for example, an instrument mounting opening in an aircraft panel.

Another object is to provide a relatively high speed miniature printer which is highly reliable and unaffected by vibration.

Another object is to provide a simple miniature printer which has few operating parts and is inexpensive to manufacture.

Another object is to facilitate servicing of a miniature printer of the above type.

The manner in which the above and other objects of the invention are accomplished will be readily understood on reference to the following specification when read in conjunction with the accompanying drawings, wherein:

FIG. 1 is a longitudinal sectional view through a printer embodying a preferred form of the present invention.

FIG. 2 is an enlarged sectional view through the print head and is taken along the line 2—2 of FIG. 1.

FIG. 3 is a transverse sectional view through the print head and is taken along the line 3—3 of FIG. 2.

FIG. 4 is a front view of the printer and is taken in the direction of the arrow 4 of FIG. 1.

FIG. 5 is a sectional view taken along the line 5—5 of FIG. 4 illustrating the means for removably attaching the printer to a panel.

FIG. 6 is a transverse sectional view taken along the line 6—6 of FIG. 1.

FIG. 7 is a sectional view taken substantially along the line 7—7 of FIG. 1.

Referring to the drawings, the miniature printer is shown as being mounted in a panel 11 such as an aircraft instrument panel. For this purpose, a cylindrical container 12 is provided which is mounted in an opening in the panel and has a flange 13 thereon attached to the panel by screws 14. The rear end of the container is supported on a bulkhead 15 by studs 16 which are inserted in holes in the bulkhead.

The printer comprises a housing 17 which is flanged at 18 to fit against the flange 13. The housing has a bulkhead 20 and three spaced ribs 21, 22 and 23 (FIG. 6) integral therewith. The latter ribs extend lengthwise of the container and are slideably fitted within a shell 24 which thus forms part of the housing and which, in turn, is slideably mounted within the container.

The housing 17 and its shell 24 are removably attached to the container 12 by retainer screws 25 (FIGS. 4 and 5) which pass through openings in the flange 18 and are threaded in the flange 13 of the container.

Grommets 26 of rubber or the like are fitted in openings in the rear wall of the shell 24 and are fitted over inwardly projecting ends of certain of the studs 16 to properly orient the printer in position.

The printer comprises a print head, generally indicated at 28, mounted by screws 30 on the forward face of the bulkhead 20, which screws also attach a motor 31 to the rear face of the bulkhead.

It will be noted that the axis of the motor 31 is located

below the axis of the container and housing leaving space above the motor for various mechanisms. An output shaft 32 of the motor extends forwardly through an opening in the bulkhead 20 and terminates in an eccentric shaft portion 33. Ball bearings 34 are mounted on the eccentric shaft portion to rotatably support a type wheel 35 having a plurality of type characters spaced thereabout. The bearings and type wheel are retained on the shaft by a nut 36 threaded on the end thereof to also secure a counterbalance disc 37 to the shaft.

In this case, eleven character spaces are provided around the wheel. Ten numeral type characters ranging from 0 to 9 are formed in ten such spaces and the eleventh space is left blank to accommodate paper spacing. Also formed integrally with the type wheel is an external spur gear 38 having 22 gear teeth thereon. Gear 38 extends concentrically about the eccentric shaft portion 33 and meshes with an internal gear 40 having 24 teeth. The latter is formed in a flanged member 41 and extends concentrically about the shaft 32.

As disclosed in the Witt et al. Patent No. 2,915,968, issued on December 15, 1959, the ratio between the teeth of gear 38 and the teeth of gear 40 is such that as the type wheel is moved in an orbit about the axis of shaft 32, it will creep or move in a reverse direction by an amount equal to the pitch spacing between two adjacent type characters during each revolution of the shaft 32. As the type wheel and gear 38 move about the internal gear, a point on the pitch circle of gear 38 will describe a hypocycloidal curve in which such point, as it reaches the cusp of its outward travel, will be moving substantially radially outwardly. Thus, each of the type characters will likewise move in substantially the same manner and will be effective to transmit a printing impression during such radially outward movement.

Obviously, the wheel 35 may be divided into any desired number of type character spaces to accommodate a greater or lesser number of type characters. However, in such case it would be essential to vary the number of teeth in the external and internal gears accordingly so that the wheel would creep from one type character to another during each revolution of the shaft 32.

A printing platen 42 (FIGS. 1 and 7) is located directly above the type wheel 35 and is in the form of a bail having spaced arms 43 pivoted at 44 on brackets 45 depending from the upper housing rib 21. An upwardly extending part of the arms 43 forms an armature 46 cooperable with an electromagnet 47 suitably secured to the housing bulkhead 20. A spring 48 is tensioned between the armature and a post 50 depending from the rib 21 to normally hold the platen in its illustrated position, out of the path of the type wheel 35.

A supply of narrow paper tape or strip 49 for receiving an imprint from the type wheel 35 is provided in the form of a roll 51 located directly behind the motor 31, the axis of the roll extending substantially coaxial with the motor. The paper is preferably of the type which automatically renders a printing impression thereagainst visible.

The roll 51 is rotatably mounted on a stud 52 supported by a bracket 53 secured at its upper end to the rib 21 and discs 59 are mounted on the stud on opposite sides of the roll to guide the same. A leaf spring 54 also attached at one end to the rib 21 yieldably maintains the roll in position on the stud 52.

As the tape is unwound from the roll 51, it is guided over an inclined roller 55 and between a pair of guide rollers 56 within the space provided between the motor and the rib 21. Rollers 55 and 56 are rotatably mounted on arms extending from the bracket 53.

From the rollers 56, the tape is guided between the legs

43 of the platen and around additional guide rollers 57 and 58 rotatably supported by brackets on the bulkhead 20. The tape then passes between the platen 42 and the type wheel 35 from whence it is guided around additional guide rollers 60 and 61 and through a vertically extending guide channel formed by an apertured plate 62 suitably secured to the housing 17.

A paper tape spacing device generally indicated at 63 is provided for advancing the tape subsequent to each printing operation. The spacing device comprises a lever 64 pivoted intermediate its ends on one end of a link 65, the other end being fulcrummed at 66 on a part of the housing 17. A tension spring 67 normally holds the link and lever in their lower positions illustrated in FIG. 1 and a second relatively weaker tension spring 68 normally holds the lever 64 in a clockwise position wherein a friction pad 70 thereon is maintained out of engagement with the tape. The opposite end of the lever is pivotally connected to the armature of a solenoid 71 suitably supported within the housing 17. Upon energization of the solenoid, the lever 64 will be first rocked counterclockwise to engage the pad 70 with the tape and thereafter, the lever will be raised by the solenoid, causing the pad 70 to advance the tape upwardly so that a new type character may be printed.

Electric circuitry for controlling the electromagnet 47 and solenoid 71 in proper timed relation with the rotation of the type wheel is enclosed within a container 73 mounted within the housing 17 at the rear of the tape roll. Such circuitry may, for example, be similar to that disclosed in the above Witt et al. patent. An electrical connector 74 is mounted between the rear wall of the shell 24 and a plate 75 suitably attached to the rear ends of the ribs 21, 22 and 23 of the housing. The plate is also secured to the rear wall of the shell by screws 76. The connector 74 is wired to the control circuitry within the container 73 and is adapted to be electrically connected to outside control circuits through a second mating connector (not shown).

Describing now the operation of the printer, the motor may be operated either continuously or only during printing operations. Just prior to arrival of a selected type character on the wheel 35 at the printing point directly below the platen 42, the electromagnet 47 is energized, lowering the platen and an underlying portion of the tape 49 into the path of the type wheel. As the latter rises in following the aforementioned hypocycloidal path, printing contact will be made to transfer an imprint of the selected type character onto the lower surface of the tape. Thereafter, the solenoid 71 is energized to advance the tape so that it can be read as indicated in FIG. 4 from the front of the panel.

In order to service the printer, and to replenish the tape roll 51 when desired, the screws 25 are unthreaded from the flange 13, permitting the housing 17 to be withdrawn partly so that access may be had to the mechanism and to the tape roll supply through openings 175 and 176 in the shell 24.

Although the invention has been described in detail and certain specific terms and languages have been used, it is to be understood that the present disclosure is illustrative rather than restrictive and that changes and modifications may be made without departing from the spirit or scope of the invention as set forth in the claims appended hereto.

Having thus described the invention, what is desired to be secured by United States Letters Patent is:

1. A printer comprising
an elongate housing,
a motor in said housing having its axis extending along the length of said housing, said motor being located adjacent one side of said housing,
an output shaft at one end of said motor and driven by said motor,
an internal gear fixed relative to said housing,

a cylindrical type member having type characters spaced therearound,
an eccentric bearing portion on said shaft rotatably supporting said type member,
an external gear carried by said type member and meshing with said internal gear,
the ratio of the number of teeth of said external gear to the number of teeth of said internal gear being such that said type character will advance from one of said type characters to another during each revolution of said shaft,
means cooperable with said type member for transferring an imprint of a selected type character to a record medium,
means in said housing at the opposite end of said motor for supporting a roll of record medium in strip form for rotation about an axis extending lengthwise of said housing, and means for guiding said record medium from said supply roll intermediate said motor and the opposite side of said housing and intermediate said imprint transferring means and said type member.

2. A printer comprising
an elongate container,
a motor in said container having its axis extending along the length of said container,
means supporting said motor in said container adjacent one side of said container,
an output shaft at one end of said motor and driven by said motor, an internal gear,
means supporting said gear in said container concentrically of said shaft,
a cylindrical type member having type characters spaced therearound,
an eccentric bearing portion on said shaft rotatably supporting said type member,
an external gear integral with said type member and meshing with said internal gear,
the ratio of the number of teeth of said external gear to the number of teeth of said internal gear being such that said type member will advance from one of said type characters to another during each revolution of said shaft,
a platen cooperable with said type member for transferring an imprint of a selected type character to a record medium,
means intermediate said motor and the opposite side of said container for actuating said platen,
a roll of said record medium in said container at the opposite end of said motor, means supporting said roll for rotation about an axis extending lengthwise of said container,
and means for guiding said record medium from said supply intermediate said motor and the opposite side of said container and intermediate said platen and said type member.

3. A printer comprising
an elongate container,
a printer frame slideably mounted in said container and removable through one end of said container,
a bulkhead carried by said frame and extending across the interior of said container,
a motor supported on the side of said bulkhead remote from said end and having its axis extending along the length of said container, said motor being located adjacent one side of said container and having
a drive shaft at one end thereof and extending on the opposite side of said bulkhead,
an internal gear supported on said opposite side of said bulkhead concentrically of said shaft, said shaft having
an eccentric bearing portion thereon on said opposite side of said bulkhead,
a type member having type characters spaced therearound, said type member being rotatably supported by said eccentric portion,

an external gear integral with said type member and meshing with said internal gear,

the ratio of the number of teeth of said external gear to the number of teeth of said internal gear being such that said type member will advance from one of said type characters to another during each revolution of said shaft,

a platen cooperable with said type member for transferring an impression of a selected type character onto a record medium,

a roll of record medium carried by said frame at the opposite end of said motor, means supporting said roll for rotation about an axis extending lengthwise of said container,

and means for guiding said record medium from said roll intermediate motor and the opposite side of said container and intermediate said platen and said type member.

4. A printer comprising

an elongate housing,

a motor in said housing having its axis extending along the length of said housing,

a type wheel driven by said motor and located adjacent one end of said motor,

said type wheel having

type characters spaced therearound,

means cooperable with said type wheel for transferring an imprint from a selected type character onto a record medium,

a supply roll of record medium in strip form in said housing adjacent the opposite end of said motor,

means in said housing supporting said roll for rotation about an axis extending lengthwise of said housing,

and means for guiding said record medium from said supply roll over said motor and intermediate said imprint transferring means and said type wheel.

5. A printer comprising

an elongate container, said container being open at one end,

a printer frame slideably mounted in said container and removable through said end, said frame having a radially outwardly extending flange,

means removably attaching said flange to a panel surrounding said container whereby said frame may be removed from said container,

a bulkhead carried by said frame and extending across the interior of said container,

a motor supported on the side of said bulkhead remote from said end and having its axis extending along the length of said container, said motor having

a drive shaft at the end thereof adjacent said bulkhead and extending on the opposite side of said bulkhead,

a stationary internal gear supported by said bulkhead on said opposite side of said bulkhead and concentrically of said shaft, said shaft having

an eccentric bearing portion thereon on said opposite side of said bulkhead,

a type member having type characters spaced therearound, said type member being rotatably supported by said eccentric portion,

an external gear integral with said type member and meshing with said internal gear,

the ratio of the number of teeth of said external gear to the number of teeth of said internal gear being such that said type member will advance from one of said type characters to another during each revolution of said shaft,

a platen cooperable with said type member for transferring an impression of a selected type character onto a record medium,

a roll of said record medium carried by said frame at the opposite end of said motor,

means supporting said roll for rotation about an axis extending lengthwise of said container,

and means for guiding said record medium from said roll intermediate said motor and said frame and intermediate said platen and said type member.

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