# United States Patent [19]

**Kohlhage**

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[54] **DATA OUTPUT PRINTER**


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[73] Assignee: **Triumph Werke Nuremberg A.G.,** Nuremberg, Germany



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[30] **Foreign Application Priority Data**

June 19, 1971 Germany ..... 2130566

[52] **U.S. Cl.** ..... **197/18,** 197/49, 101/110

[51] **Int. Cl.** ..... **B41j 23/04**

[58] **Field of Search** ..... 197/18, 49, 55, 53; 101/93, 99, 110, 367, 368, 376



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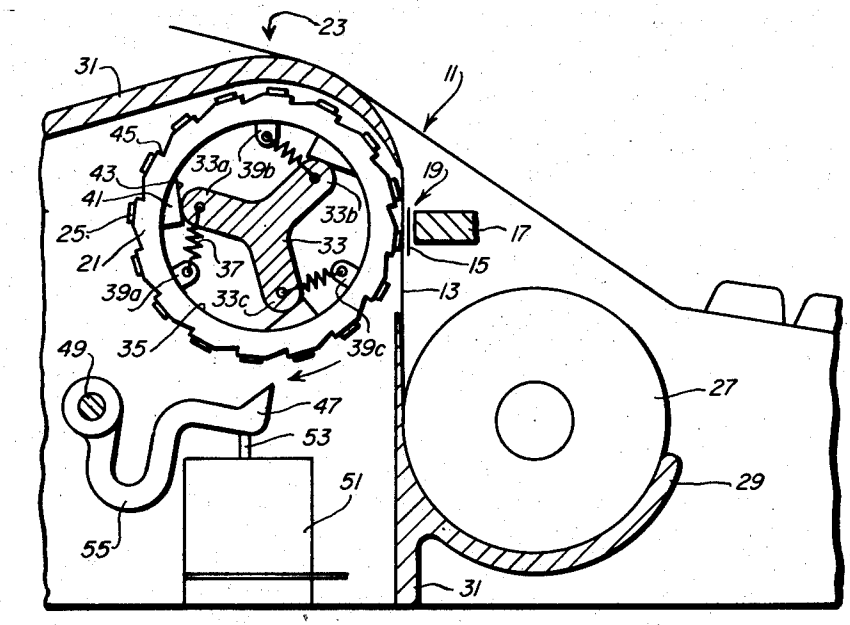
*Primary Examiner*—Robert E. Pulfrey
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[57] **ABSTRACT**

Rotatably driven type wheels carrying type characters on the periphery thereof are supported resiliently about a normal operating axis for movement to a printing position to impact a selected type character against a recording medium. The movement of the type wheel to the printing position is accomplished by engaging a relatively stationary stop member with an abutment on the type wheel to stop the normal rotational movement of the type wheel and enable the associated rotational kinetic energy to pivot the type wheel about the stop member to impact the selected type character against the recording medium at the printing position. To ensure full engagement of the stop member with the abutment on the type wheel and reduce the accompanying stresses, the stop member yieldably engages the abutment prior to stopping the normal rotational movement of the type wheel.


**3 Claims, 4 Drawing Figures**



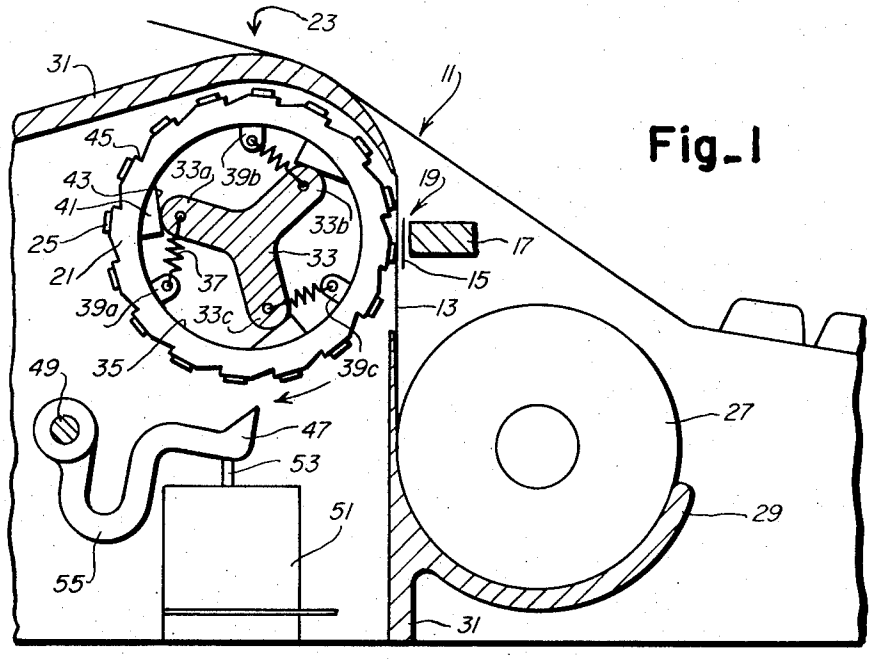



Fig_1

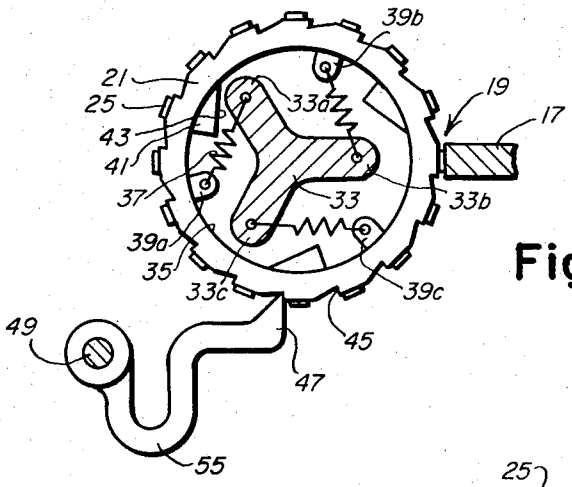



Fig_2

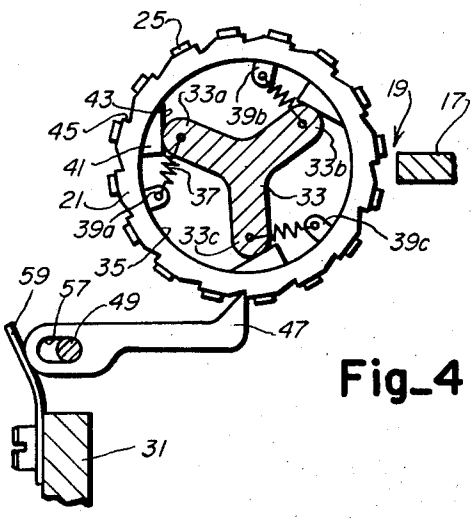



Fig_4

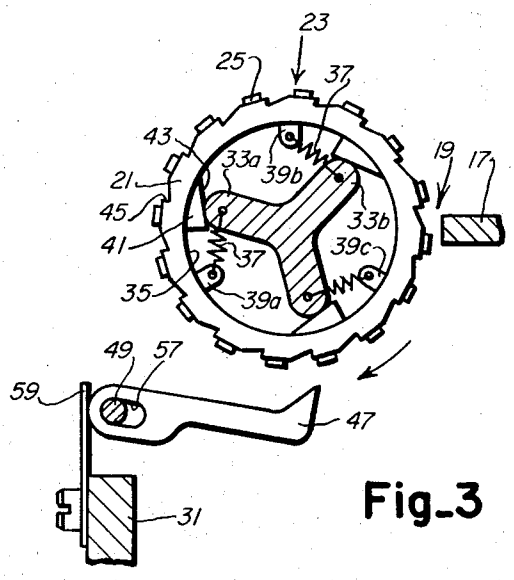



Fig_3

# DATA OUTPUT PRINTER

This invention relates to a data printing apparatus having a rotatably driven type wheel which is moved to a printing position to impact a type character on the periphery of the wheel against a recording medium, and more particular to a printing apparatus in which the type wheel is moved to the printing position by using the rotational kinetic energy associated with the rotatably driven wheel.

In a data printer, for example one which may be used with an electronic table calculator, it is desirable that the printing operation be accomplished with a minimum of noise and vibration. However, in a data printer using the rotational kinetic energy associated with the rotatably driven wheel to move it to the printing position, the printing operation is usually accompanied by jarring vibrations and noise as the wheel is diverted from a normal rotating position to a printing position. Furthermore, the portions of the data printer used in diverting the rotatably driven type wheel to the printing position undergo abrasive contact resulting in undesirable wear on the parts.

In the past, there have been data printers in which a rotatably driven type wheel was moved to the printing position by using the associated rotational kinetic energy, and attempts have been made to reduce or eliminate the jarring vibrations, noise and abrasive wear which accompanied the printing operation. For example, in German Patent No. CH-109,322, and U.S. Pat. No. 1,520,089 the braking mechanism used to divert the rotatably driven type wheel from a normal operating position to a printing position was interconnected to the type wheel by means of slip clutch so as to more gradually divert the rotating type wheel to the printing position. However, such a mechanism is inherently bulky and precludes the use of a plurality of type wheels in close association for printing a line of type at a time. Accordingly, such a mechanism is undesirable for use as a compact data printer, for example in a table calculator.

Accordingly, an object of the present invention is to reduce the noise, vibration and abrasive contact accompanying the printing operation of a data printer in which a rotatably driven type wheel is moved to the printing position by using the associated rotational kinetic energy.

Still other objects, features and advantages of the present invention will be apparent to those skilled in the art from a reading of the following detailed description of the invention taken in conjunction with the accompanying drawings, wherein:

FIG. **1** is a side elevational view of a data printer according to the present invention with a rotatably driven type wheel in a normal operating position,

FIG. **2** shows the rotatably driven type wheel at the printing position with a type character impacting against a platen,

FIG. **3** shows another embodiment of a data printer constructed according to the present invention with a rotatably driven type wheel in a normal operating position, and

FIG. **4** shows the embodiment of FIG. **3** when a printing operation is initiated.

Referring generally to the figures in the drawing, and more particularly to FIG. **1**, there is shown a data printer, generally indicated **11**, for printing characters



or symbols onto a recording medium **13** in response to data signals. The recording medium **13** is located beside a suitable marking material **15**, and between a platen **17** which is located at a printing position, generally indicated at **19**, and a type wheel **21** which is located at a normal operating position, generally indicated at **23**. The type wheel **21** has a plurality of type characters **25** formed on the periphery thereof, and is rotatably driven in the direction indicated by the arrow shown in FIG. **1**. When a selected character is to be printed onto the recording medium **13**, the type wheel **21** is moved from the normal operating position **23** to the printing position **19** where the selected type character is impacted against the platen **17**. After a line of type has been printed, the recording medium **13** may be advanced by a suitable sheet feeding mechanism, not shown, for printing another line of type. In addition, the marking material **15** may be advanced past the printing position **19** in preparation for another printing operation.

As shown, the recording medium **13** is fed upwardly from a suitable supply roll **27** which may be contained in a concave pan **29** formed from a portion of housing **31** of the data printer **11**. The marking material **15** may be located on either side of the recording medium **13**, and may be in the form of a suitable inked ribbon. The means for advancing the recording medium **13** and the means for advancing the marking material **15** are not shown, since they form no part of the present invention and may be conventional. Furthermore, the recording medium **13** and the marking material **15** have been deleted from the other figures of the drawing for clarity in showing the operation of the data printer **11** during a printing operation. Although only a single type wheel **21** is shown in FIG. **1**, it is to be understood that a plurality of type wheels may be located at the normal operating position and rotatably driven in the direction of the arrow.

In the normal operating position, the type wheel **21** is supported for rotation about a normal operating axis, and may be rotatably driven by drive means in the form of a drive shaft **33** which is rotatable about its axis. To minimize the space required for the data printer **11**, each of the type wheels **21** may be in the form of a ring having an interior opening or bore **35** through which the drive shaft **33** is received. The type wheel **21** may be rotatably driven in concentric relation with the axis of the rotating drive shaft **33** by suitably resilient means in the form of springs **37** connected between the type wheel **21** and the rotatable drive shaft **33**. As shown, the drive shaft **33** has flutes or ribs **33***a*, **33***b*, **33***c* and the springs **37** are each stretched between a suitable projecting eyelet **39***a*, **39***b*, **39***c* formed on the interior surface of the type wheel **21** and an eyelet formed in each of the ribs **33***a*, **33***b*, **33***c* of the drive shaft **33**. The type wheel **21** is prevented from relative rotational movement about the drive shaft **33** in the direction of rotation as indicated by the arrow by means of wedge-shaped interior abutments **41** projecting from the interior surface **35** of the type wheel **21** and having forward surfaces **43** engaging the ribs **33***a*, **33***b*, **33***c* of the drive shaft **33**.

To print a selected type character on the recording medium **13**, the type wheel **21** is moved from the normal operating position **23**, as shown in FIG. **1**, to the printing position **19**, as shown in FIG. **2**, to impact the type character **25** against the recording medium **13**. To

accomplish this movement, stop means are provided for momentarily stopping the rotational movement of the type wheel **21** at a location radially spaced from the normal operating axis so as to enable the rotational kinetic energy associated with the type wheel **21** to pivotally move it to the printing position **19.**

As shown, the stop means may include a plurality of stop abutments **45** formed on the periphery of the type wheel **21** and a stop engaging means in the form of a pawl **47** which is movable into engagement with the stop abutment **45.** The stop abutments **45** are each formed between a pair of type characters **25** on the periphery of the type wheel **21,** and the pawl **47** is supported adjacent the periphery of the type wheel **21** for pivotal movement about a suitable rod or axis **49** located in the housing **31** of the data printer **11.** To move the pawl **47** in response to a data signal for printing a selected type character, a solenoid **51** may be provided having a plunger **53** operably connected to the pawl **47** for pivotally moving the pawl **47** about the rod **49** and into engagement with a particular stop abutment **45.** To provide for simultaneous printing of several type characters along the line of type, each one of a plurality of rotatably driven type wheels at the normal operating position may be provided with a separate pawl and associated solenoid.

Accordingly, when a particular type character **25** is to be printed onto the recording medium **13** as shown in FIG. **2,** the solenoid **51** is energized in response to a data signal for moving the pawl **47** into engagement with a particular stop abutment **45** associated with the type character **25** selected to be printed. When the pawl engages the selected stop abutment **45,** the rotational movement of the type wheel **21** about the normal operating axis is momentarily stopped, and the rotational kinetic energy associated with the type wheel moves the wheel pivotally about the end of the pawl **47** to strike the selected type character **25** against the platen **19** to mark the recording medium **13.** As shown in FIG. **2,** as the type wheel **21** moves to the printing position **19,** the drive shaft **33** continues to rotatably drive the type wheel **21** with the resilient means **37** enabling the type wheel to move laterally from the normal operating position **23** to the printing position **19.**

Upon movement of the type wheel **21** to the printing position **19,** the resilient means **37** exerts a return force against the pawl **47** urging the type wheel **21** back to the normal operating position **23.** To return the type wheel **21** from the printing position **19,** the pawl **47** is forcibly driven from engagement with the stop abutment **45** by suitable means, not shown, and returned to its normal position, as shown in FIG. **1.** Although not shown, the removal of the pawl **47** from engagement with the stop abutment **45** may be accomplished by suitable spring means. When the pawl **47** is removed from engagement with the stop abutment **45,** the type wheel **21** returns to its normal operating position **23** with the forward edges **43** of the interior wedge-shaped stop abutment **41** again engaging the ribs **33***a*, **33***b*, **33***c* of the drive shaft **33** to prevent relative rotational movement in the direction indicated by the arrow shown in FIG. **1.**

From the foregoing, it will be apparent that the engagement of a rapidly rotating stop abutment **45** on the driven type wheel **21** with the relatively stationary pawl **47** will result in a sharp jolt to the housing **31** of the data printer **11** along with the accompanying undesirable noise as the type wheel **21** is diverted to the printing position **19.** In addition, a sudden and rigid engagement of the pawl **47** with a stop abutment **45** may not result in full engagement with the stop abutment **45** to provide proper printing. Furthermore, the movement of the pawl **47** into engagement with a stop abutment **45** and the subsequent forcible disengagement results in undersirable abrasive contact and wear.

In accordance with the present invention, the jolting impact of the pawl **47** with a stop abutment **45** is reduced by providing stop engaging means which flexibly divert the type wheel **21** from the normal operating position **23** to the printing position **19.** As shown in FIGS. **1** and **2,** the stop engaging means includes a pawl **47** having a U-shaped bent portion **55** located between the pawl tooth and the pivot rod **49** so as to resiliently yield about the bent portion upon engagement with the stop abutment **45** to flexibly pivot the type wheel **21** to the printing position **19.** In addition, when the type wheel **21** is at the printing position **19,** the yielding of the pawl **47** about the U-shaped bent portion **55** facilitates the removal of the pawl **47** from engagement with the stop abutment **45** and hence serves to reduce undesirable wear.

Another embodiment of the invention is shown in FIGS. **3** and **4,** and the printing mechanism is operable in the same manner as previously described in connection with FIGS. **1** and **2.** This embodiment is generally similar to the embodiment shown in FIGS. **1** and **2,** and accordingly similar parts have been identified with like reference numerals. In this embodiment, the stop engaging means includes a pawl **47** which is slidably supported about the rod **49** which is received in a guide slot **57** formed in the pawl **47.** As shown in FIG. **3,** the pawl **47** is normally urged in one direction about the rod **49** by resilient means of a flat leaf spring **59** pressing against one end of the guide slot abuts the rod **49.** The leaf spring **59** may be secured to a portion of the housing **31** of the data printer **11** by suitable means, for example screws or bolts.

In operation, the pawl **47** yieldably engages an abutment **45** of the type wheel **21** by sliding about the rod **49** against the urging of the leaf spring **59** prior to stopping the normal rotational movement of the type wheel **21,** as shown in FIG. **4.** Subsequently, when the pawl **47** is driven from engagement with the stop abutment **45,** the pawl **47** is slidably returned to the normal operating position, as shown in FIG. **3,** by the urging of the flat leaf spring **59.**

While only a limited number of embodiments have been illustrated and described, it will be apparent to those skilled in the art that various modifications and improvements may be made without departing from the scope and spirit of the invention. Accordingly, it is to be understood that the invention is not to be limited by the illustrative embodiments, but only by the scope of the appended claims.

What is claimed is:

**1.** In a printing machine having a type wheel resiliently supported about an axis at a normal operating position for being rotatably driven, a type character on the periphery of the type wheel for impacting against a recording medium at a printing position spaced apart from the normal operating position, a stop abutment on the type wheel operably associated with the type character and radially spaced from the axis of rotation of the type wheel, and a stop engaging means into engage-

ment with the stop abutment in response to a signal to print the associated type character by enabling rotational kinetic energy associated with the type wheel to pivot the type wheel about the stop engaging means and displace the axis of rotation of the type wheel from the axis at the operating position, the improvement comprising:

said stop engaging means including a stop member having a stop portion for engaging the stop abutment of said type wheel and being pivotally supported about a pivot point fixedly spaced from said axis at the normal operating position for pivotal movement into engagement with the stop abutment, and

said stop engaging means further including resilient means resiliently flexing in response to the force of said type wheel upon engagement of the stop portion with the stop abutment for enabling said stop member to undergo a yielding movement while said type wheel pivots about the stop portion during movement from the normal operating axis to impact the type character against the recording medium at the printing position.

**2.** In a printing machine according to claim **1**, said stop member being constructed from a resilient material and said resilient means being in the form of a bend in said stop member between the stop portion and the pivot point fixedly located from the axis at the normal operating position for resiliently deforming upon engagement of the stop portion with said stop abutment prior to stopping the normal rotational movement of said type wheel about the normal operating axis.

**3.** In a printing machine according to claim **1**:

said stop member being supported for slidable movement about the pivot point fixedly spaced from the axis at the normal operating position,

said resilient means being in the form of biasing means for slidably urging said stop member in one direction about the pivot point, and

said stop member being slidably movable in an opposite direction against the urging of said resilient biasing means to yieldably engage said stop abutment on said type wheel prior to stopping the normal rotational movement of said type wheel about the normal operating axis.

* * * * *