(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 048 418**
B2

(12) # NEW EUROPEAN PATENT SPECIFICATION

(45) Date of publication of the new patent specification: **21.01.87**

(51) Int. Cl.⁴: **B 41 J 35/00**

(21) Application number: **81107217.2**

(22) Date of filing: **12.09.81**

(54) **Multiposition ribbon cassette system.**

(30) Priority: **22.09.80 US 189122**

(43) Date of publication of application:
31.03.82 Bulletin 82/13

(45) Publication of the grant of the patent:
13.06.84 Bulletin 84/24

(45) Mention of the opposition decision:
21.01.87 Bulletin 87/04

(84) Designated Contracting States:
DE FR IT NL

(56) References cited:
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EP 0 048 418 B2

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Description

This invention relates to a multicolor ribbon cassette system for use in a printer or the like comprising a shuttle which is adapted to carry said printhead across a printing medium, and supporting means, coupled to said shuttle and movable in conjunction with the print head for supporting a ribbon cassette having a ribbon therein, said ribbon cassette carrying a portion of said ribbon parallel to the printing medium, said supporting means being pivotal about an axis to change the vertical position of the ribbon cassette and of the printing bands of the ribbon with respect to the printhead.

In most types of printing mechanisms, ranging from simple typewriters to complex printers, ribbon shifting is accomplished by holding a section of the ribbon in a pivoting bail arm which moves the ribbon up or down to align the correct color band with the printing mechanism such as a printhead. The bail arm supports the ribbon in an operating plane which is parallel to a printing medium. One particular arrangement, which is directed to a ribbon cassette with bicolor-capability, is disclosed in US—A—4,088,218 to Depew. This system, which is specifically designed for use with a matrix printhead, includes a body portion having a chamber for storing a ribbon. The ribbon passes around an extension which is pivotal to move the ribbon either up or down with respect to its position within the cassette. Although a pivotal bail arm is generally satisfactory when only two colors are to be employed, excessive vertical movement of the ribbon can cause snagging and dragging, especially when the ribbon is carried within a cassette.

DE—A—2,337,626 discloses a multiposition ribbon cassette system of the type specified above in which the shifting of the ribbon is accomplished by pivotal motion of the cassette rather than translational motion of the ribbon. In this prior art system the ribbon cassette is pivoted about an axis which is parallel to the printing medium. As a result the ribbon plane is tilted with respect to the printing medium when changing the vertical position of the ribbon cassette with respect to the printhead. Therefore the ribbon cannot be accurately positioned in a plane parallel to the printing medium.

Therefore it is an object of the present invention to provide a simple and reliably operating multiposition ribbon cassette system for shifting the ribbon to enable each one of a plurality of printing bands on the ribbon to be positioned in a constant plane with respect to the printing medium and aligned accurately with respect to the printhead.

This object is achieved in a system of the type specified above in that said pivot axis of said supporting means is perpendicular to said printing medium and said portion of said ribbon is maintained in a plane parallel to said printing medium when changing the vertical position of said ribbon cassette with respect to said printhead.

Movement of the entire ribbon assembly eliminates any kind of snagging of the ribbon. Although the entire cassette is moved in order to change printing bands and color respectively on the ribbon, the mechanism by which this is accomplished is extremely simple. When another color is desired, the mechanism is shifted to align a different printing band to the printhead with the effective ribbon portion remaining in the same plane parallel to the printing medium.

The system is particlarly useful in conjunction with matrix printer which includes a print head that is carried on a shuttle mechanism. Other printers which can utilize the invention include ball and daisy wheel types. A pivot plate has one end secured to the shuttle so as to enable the pivot plate to rotate about an axis which is perpendicular to both printing medium and the portion of the ribbon which is in a printing position. A ribbon cassette is detachably mounted on the pivot plate. A ribbon drive motor is secured to the underside of the pivot plate and advances the ribbon within the cassette. By pivoting the pivot plate, different portions of the ribbon carried in the cassette will be positioned adjacent the print head. However, since the ribbon is pivoting about an axis perpendicular to the printing medium, it will remain parallel to the printing medium as it is moved.

The movement of the pivot plate is controlled by means of a barrel cam which is driven by a stepper motor. The barrel cam and the stepper motor is attached to the shuttle, and the cam is coupled to the pivot plate by means of a cam follower. The position of the cam is controlled by a suitable logic circuit. Other types of positioning arrangements such as a movable ramp, may also be utilized. The cam arrangement, however, provides a simple means of accurately positioning the ribbon cassette with respect to the print head.

In the drawings:

FIGURE 1 is a perspective view of a portion of a printer assembly showing the multicolor ribbon cassette system of the present invention in a lowered position;

FIGURE 2 is a top plan view of the ribbon cassette of the present invention;

FIGURE 3 is a rear plan view of the multicolor ribbon cassette system of the present invention;

FIGURE 4 is a side plan view of the multicolor ribbon cassette system of the present invention;

FIGURE 5 is a plan view of the track of a cam used to control the position of a ribbon cassette, showing the orientation of a ribbon corresponding to each position of the cam; and

FIGURE 6 is a perspective view of a portion of a printer assembly showing the ribbon cassette system in a varied position.

Referring to FIGURES 1 and 6, a printer 10 is shown having a wire matrix print head 12 carried on a shuttle mechanism 14. The print head 12 is biased against a front portion 14a of the shuttle. The shuttle moves along a pair of rails 16 which are attached to a frame 18. A ribbon cassette 20 is carried on the shuttle and includes an opening

20a through which the print head 12 extends. The ribbon cassette 20 carries a ribbon 22, an exposed portion of which (22a) is carried in a front of the print head and is substantially parallel to a printing medium 24.

Referring now to FIGURES 2, 3 and 4, the ribbon cassette 20 is detachably connected to a pivot plate 26 which serves to position the ribbon cassette 20 with respect to the print head 12. The pivot plate 26 is pivotally connected to the shuttle 14 by means of a pair of hinges 28 which enable the pivot plate 26 to rotate about an axis which is perpendicular to the printing medium 24 and ribbon portion 22a. Because of this configuration, the ribbon portion 22a will remain parallel to the printing medium 24 as the pivot plate 26 and ribbon cassette 20 are pivoted. The pivoting of the pivot plate 26 will align a different portion of the height of the ribbon portion 22a with the front 12a of the print head. The ribbon 22 is advanced by means of a ribbon drive motor 38 which is connected to the underside of the pivot plate 26. This enables the ribbon 22 to be advanced within the cassette 20 even when the pivot plate 26 is in a tilted postion. It should be noted that the tilting of the cassette 20 will not impair the printing action of the printer. At all times, the ribbon portion 22a will be parallel to both the front of the print head 12 and the printing medium 24.

The position of the pivot plate 26 is controlled by means of a barrel cam 32 which is attached to the shuttle 14. The barrel cam is driven by a motor 36 and is coupled to the pivot plate 26 by means of a bar shaped cam follower 34. The cam 32 includes a substantially spiral groove 32a having four flat rest positions which serve to define four distinct printing positions (FIGURE 5) for the ribbon cassette 20. The cam follower includes a protrusion 34a which cooperates with the spiral groove 32a and a protrusion 34b which extends into a notch 26a in the pivot plate. The motor 36, which is a stepper motor in the present embodiment of the invention, operates to rotate the cam 32 so that the cam follower portion 34a is positioned in one of the four flat portions of the spiral groove 32a. The flat portions enable accurate ribbon height positioning to be achieved despite slight inaccuracies in motor position, and also prevents rotation of the cam 32 which would otherwise be caused by the application of downward force on the cassette 20. The motor 36 is controlled by a suitable logic circuit 39. In the present embodiment of the invention, the logic circuit 39 is such that when power is first applied to the printer 10, the stepper motor 36 is commanded to bring the cassette 20 down to the horizontal position by shifting the cam follower 34 down four times. If the cassette 20 is already down or partially down, the motor 36 simply stalls for all or some of the four shift commands. Once this initiallizing process has been completed, the logic circuit 39 knows that the cassette is on band one of the ribbon 22 and keeps track of the position of the cassette as long as the power remains on. The positions of a four band ribbon 22 with respect to the front of the printhead 12a corresponding to different positions of the cam 32 are shown in FIGURE 5. When the ribbon cassette 20 is horizontal, band 1 of the ribbon 22 is aligned with the printhead 12a, while when the cassette 20 is tilted fully upward, band 4 of the ribbon 22 is aligned with the printhead 12a.

In the present embodiment of the invention two different types of ribbon cassettes can be employed. the first type includes four separate color bands to provide four color printing capability. The second type includes an all black (or other single color) ribbon. Both types of cassettes utilize a ribbon having the same width (one inch). In order to automatically determine what type of cassette is installed in the printer, a two step process is utilized. Each ribbon cassette includes a projection or fin 40 extending from the bottom surface of the cassette. When the pivot plate is in its horizontal position, the projection 40 on either cassette is detected by means of an optical sensor 42 located on the shuttle 14. After it has been determined that a ribbon cassette is in place, the pivot plate is shifted up two positions and the sensor 42 again activated. The length of the projection 40 on a cassette having a four color ribbon is shorter than that on a cassette having a single color ribbon. The length of a single color projection is shown in in FIGURE 3 by a dashed line 40a. When the pivot plate is in a raised position, the sensor 42 will detect only the longer of the two projections. The logic circuit 39 receives information from the sensor 42 in order to determine the presence and type of cassette being used.

In summary, the present invention is directed to a simple and effective way of utilzing a multi-color ribbon cassette in a printing mechanism. Although the invention has been described in terms of use with a matrix printer, it could easily be adapted for use with other types of printers. By shifting the position of the entire cassette instead of simply moving a portion of the ribbon, installation of a cassette is a very simple procedure, since nothing special has to be done with the ribbon (i.e., threading into a bail arm). The system can easily handle more than two colors despite the large distance between the plural color tracks. In addition, the system provides for more accurate positioning than do typical bail systems.

Although the invention has been described in terms of a single embodiment, it should be recognized that modifications and variations will readily occur to those skilled in the art. For example, many alternate methods could be utilized to actuate and position the pivot plate, including use of a rotating bar, solenoids or a cable instead of a stepper motor or the use of a linear wedge ramp instead of a barrel cam. Consequently, it is intended that the claims be interpreted to cover such modifications and equivalents.

Claims

1. A multiposition ribbon cassette system for positioning a ribbon having two or more printing bands with respect to the printhead of a printer or the like comprising:

a shuttle (14) which is adapted to carry said printhead (12) across a printing medium (24), and

supporting means (26), coupled to said shuttle and movable in conjunction with the print head for supporting a ribbon cassette (20), having a ribbon (22) therein, said ribbon cassette carrying a portion (22a) of said ribbon parallel to the printing medium (24), said supporting means (26) being pivotal about an axis to change the vertical position of the ribbon cassette (20) and of the printing bands of the ribbon with respect to the printhead (12).

characterized in that sadi pivot axis of said supporting means (26) is perpendicular to said printing medium (24) and said portion (22a) of said ribbon (22) is maintained in a plane parallel to said printing medium (24) when changing the vertical position of said ribbon cassette (20) with respect to said printhead.

2. A system according to claim 1, characterized in that the supporting means comprises a pivot plate (26) pivotally secured to the shuttle (14), wherein said pivot plate is pivotal about said axis.

3. A system according to claim 2, characterized by comprising a ribbon drive motor (38) attached to the pivot plate (26), said ribbon drive motor coupling to a ribbon cassette (20) and operable to advance the ribbon (22) in the cassette.

4. A system according to claim 2 or 3, characterized by further including a multiposition cam (32) coupled to the pivot plate (26), said cam being movable to position the pivot plate in one of a plurality of locations.

5. A system according to claim 4, characterized in that said cam (32) is mounted on said shuttle (14) and further including:

a cam motor (36) attached to the shuttle for controlling the position of the cam (32); and

a cam follower (34) connecting the cam to the pivot plate (26).

6. A system according to claim 5, characterized in that said cam (32) is cylindrical and includes a substantially spiral slot (32a) on its outer surface and in that said cam follower (34) comprises a rod coupled to said slot.

7. A system according to claim 5 or 6, characterized in that said cam motor (36) is a stepper motor.

8. A system according to one of claims 1 to 7, characterized by further including an optical sensor (42) for detecting the presence of a fin (40) located on each ribbon cassette (20).

9. A system according to claim 8, characterized in that the configuration of said fin (40) is a function of one of two types of ribbon (22) carried within the ribbon cassette (20) and in that said sensor (42) is such that when the pivot plate (26) is in a first position either configuration of said fin (40) will be detected and when the pivot plate (26) is in a second position only one configuration will be detected, thereby facilitating determination opf the type of ribbon carried within the ribbon cassette.

Patentansprüche

1. Anordnung mit mehreren Schaltstellungen für die Positionierung einer Bandkassette mit einem Band mit zwei oder mehreren Druckbereichen relativ zu einem Druckkopf eines Druckers o. dgl., aufweisend: einen Wagen (14), der geeignet ist, den Druckkopf (12) über ein Druckmedium zu führen, Trägermittel (26), verbunden mit dem Wagen und bewegbar in Verbindung mit dem druckkopf, zur Halterung einer ein Band (22) enthaltenden Bandkassette (20), wobei die Bandkassette einen Abschnitt (22a) des Bandes parallel zum Druckmedium (24) führt und die Trägermittel (26) um eine Achse schwenkbar sind, um die vertikale Stellung der Bandkassette (20) und der Druckbereiche des Bandes relativ zum Druckkopf (12) zu ändern, dadurch gekennzeichnet, daß die Schwenkachse der Trägermittel (26) rechtwinklig zum Druckmedium (24) verläuft und der Abschnitt (22a) des Bandes (22) in einer parallelen Ebene zum Druckmedium (24) gehalten ist, wenn die vertikale Position der Bandkassette (20) relativ zum Druckkopf (12) geändert wird.

2. Anordnung nach Anspruch 1, dadurch gekennzeichnet, daß die Trägermittel eine Schwenkplatte (26) aufweisen, die schwenkbar am Wagen (14) gelagert ist, wobei die Schwenkplatte um die genannte Achse schwenkbar ist.

3. Anordnung nach Anspruch 2, dadurch gekennzeichnet, daß sie einen Bandabtriebsmotor (38) aufweist, der an der Schwenkplatte angebracht, mit einer Bandkassette (20) gekuppelt und so ausgebildet ist, daß er das Band (22) in der Kassette antreiben kann.

4. Anordnung nach Anspruch 2 oder 3, dadurch gekennzeichnet, daß sie des weiteren einen Multipositions-Kurvenkörper (32) aufweist, der mit der Schwenkplatte (26) gekuppelt ist, wobei der Kurvenkörper (32) zum Postionieren der Schwenkplatte in eine von mehreren Stellungen verstellbar ist.

5. Anordnung nach Anspruch 4, dadurch gekennzeichnet, daß der Kurvenkörper (32) auf dem Wagen (14) montiert ist und die Anordung ferner enthält: einen Motor (36), angebracht auf dem Wagen zur Steuerung der Position des Kurvenkörpers (32) und eine Stoßstange (34), die den Kurvenkörper mit der Schwenkplatte (26) verbindet.

6. Anordnung nach Anspruch 5, dadurch gekennzeichnet, daß der Kurvenkörper (32) zylindrisch ist und an seiner Außenfläche eine im wesentlichen spiralförmige Nut (32a) und die Stoßstange (36) einen Stift aufweist, der mit der Nut gekuppelt ist.

7. Anordnung nach Anspruch 5 oder 6, dadurch gekennzeichnet, daß der Motor (36) ein Schrittmotor ist.

8. Anordnung nach einen der Ansprüche 1 bis 7,

dadurch gekennzeichnet, daß sie ferner einen optischen Fühler (42) für die Erkennung des Vorhandenseins einer Rippe (40) enthält, die an jeder Bandkassette (20) angebracht ist.

9. Anordnung nach Anspruch 8, dadurch gekennzeichnet, daß die Rippe (40) eine von zwei Typen von in der Bandkassette (20) befindlichen Bändern (22) abhängige Konfiguration hat und daß der Fühler (42) derart ausgebildet ist, dä er in einer ersten Position der Schwenkbarplatte (26) jede Konfiguration der Rippe (40) erkennt und in einer zweiten Position der Schwenkplatte (26) nur eine Konfiguration erkennt, wodurch die Erkennung des Typs des in der Bandkassette befindlichen Bandes erleichtert wird.

Revendications

1. Système de cassette pour ruban à position multiple pour mettre en position un ruban, ayant deux ou plus de deux bandes imprimantes, par rapport à la tête d'impression d'une imprimante ou appareil analogue, comprenant:

une navette (14) agencée pour faire passer ladite tête d'impression (12) en travers d'un élément d'impression (24) et

un moyen support (26) accouplé à ladite navette et mobile en même temps que la tête d'impression pour supporter une cassette de ruban (20) munie d'un ruban à l'intérieur, cette cassette portant une portion (22a) de ce ruban paralléle à l'élément d'impression (24), ledit moyen support (26) étant monté pivotant autour d'un axe pour changer la position verticale de la cassette (20) et des bandes imprimantes du ruban par rapport à la tête d'impression (12),

caractérisé par le fait que ledit axe de pivotement dudit moyen support (26) est perpendiculaire audit élément imprimant (24) et ladite portion (22a) dudit ruban (22) est maintenue dans un plan parallèle audit élément d'impression (24) quand la change la position verticale de la dite cassette (20) par rapport à la dite tête d'impression.

2. Système selon la revendication 1, caractérisé par le fait que le moyen support comprend une plaque pivotante (26) montée pivotante sur la navette (14), pivotant autour dudit axe.

3. Système selon la revendication 2, caractérisé par le fait qu'il comprend un moteur (38) d'entraînement du ruban fixé sur la plaque pivotante (26), ledit moteur étant accouplé à une cassette de ruban (20) et actionnable pour entraîner le ruban (22) dans la cassette.

4. Système selon la revendication 2 ou 3, caractérisé par le fait qu'il comprend, en outre, un came (32) à position multiple, accouplée à la dite plaque pivotante (26), ladite came étant déplaçable pour mettre la plaque pivotante dans une de ses diverses positions.

5. Système selon la revendication 4, caractérisé par le fait que ladite came (32) est montée sur ladite navette (14) et qu'elle comprend, en outre, un moteur de came (36) fixé sur la navette pour commander la position de la came (32), et un suiveur de came (34) reliant la came à la plaque pivotante (26).

6. Système selon la revendication 5, caractérisé par le fait que ladite came (32) est cylindrique et comporte une fente (32a), sensiblement en former de spirale, sur sa surface extérieure et ledit suiveur de came (34) comprend une tige accouplée à ladite fente.

7. Système selon la revendication 5 ou 6, caractérisé par le fait que l'edit moteur de came (36) est un moteur pas-à-pas.

8. Système selon l'une des revendications 1 à 7, caractérisé par le fait qu'il comprend, en outre, un capteur optique (42) pour détecter la présence d'une patte (40) prévue sur chaque cassette (20).

9. Système selon la revendication 8, caractérisé par le fait que la configuration de ladite patte (40) est fonction de l'un des deux types de ruban (22) portés par la cassette (20) et ledit capteur (42) est tel que, lorsque la plaque pivotante (26) est dans une première postion, chacune des deux configurations de la patte (40) est détectée et, lorsque la plaque pivotante (26) est dans une seconde position, seule und des configurations est détectée, ce qui facilite la détermination du type de ruban porté dans la cassette.

Fig. 1.

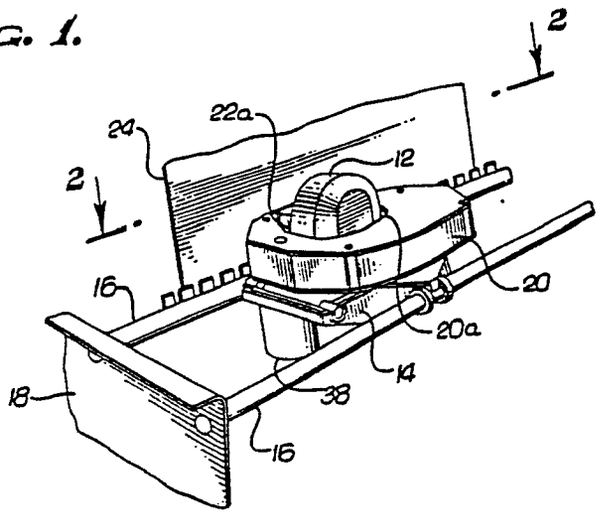
2
22a
24
12
2
16
20
20a
14
18
38
16

Fig. 2.

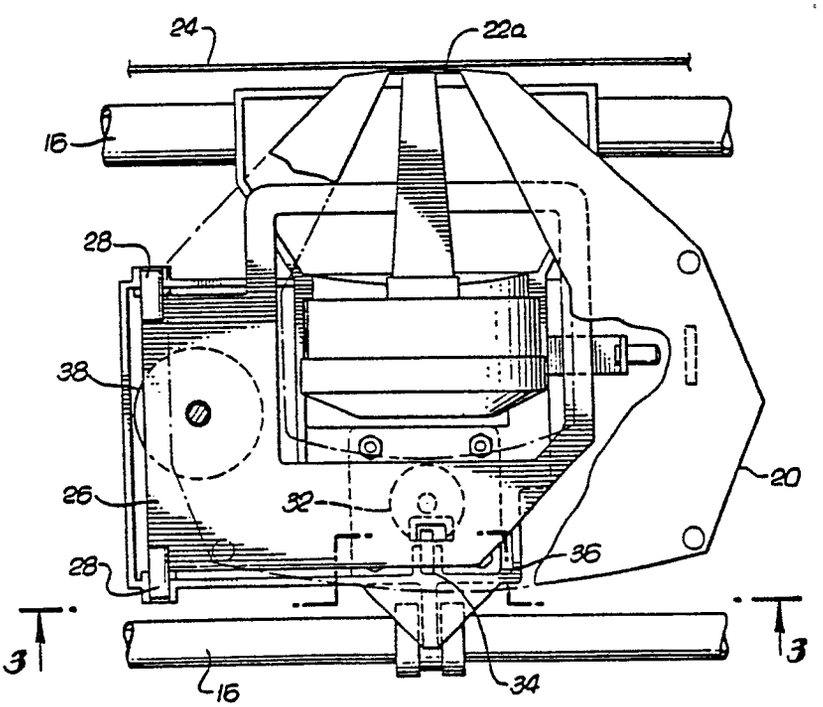
24
22a
16
28
38
20
26
32
36
28
3
3
16
34

Fig. 3.

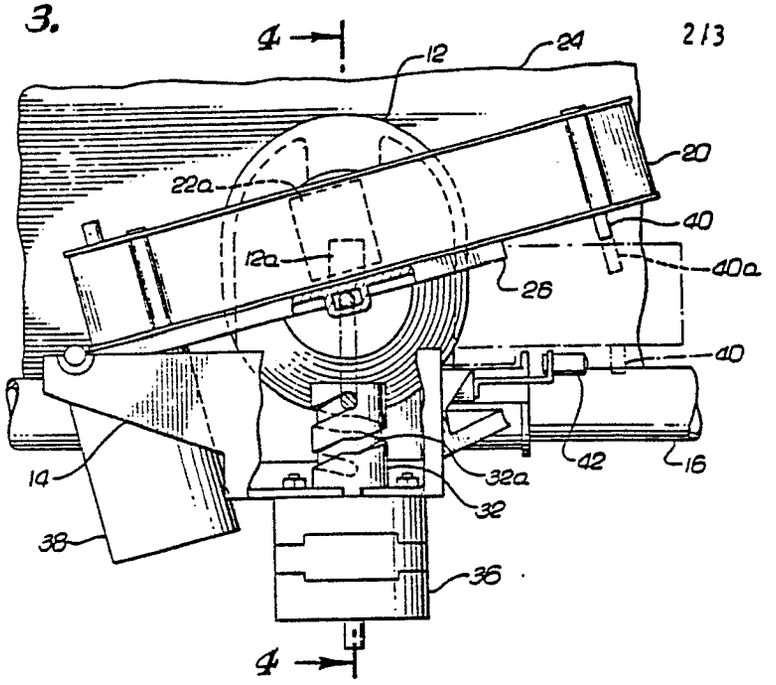
4
12
24
213
20
22a
40
12a
40a
26
40
14
32a
42
16
32
38
36
4

Fig. 4.

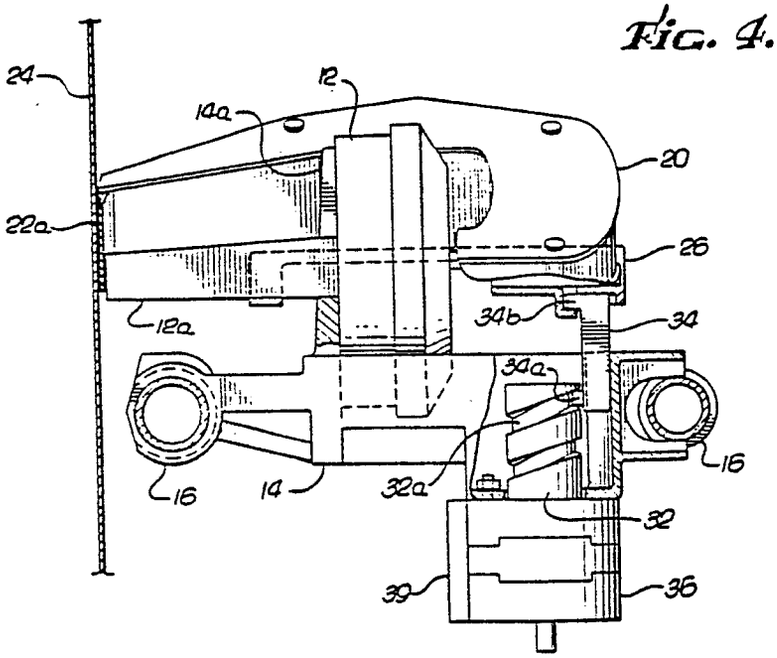
24
12
14a
20
22a
26
34b
34
12a
34a
16
16
14
32a
32
39
36

Fig. 6.

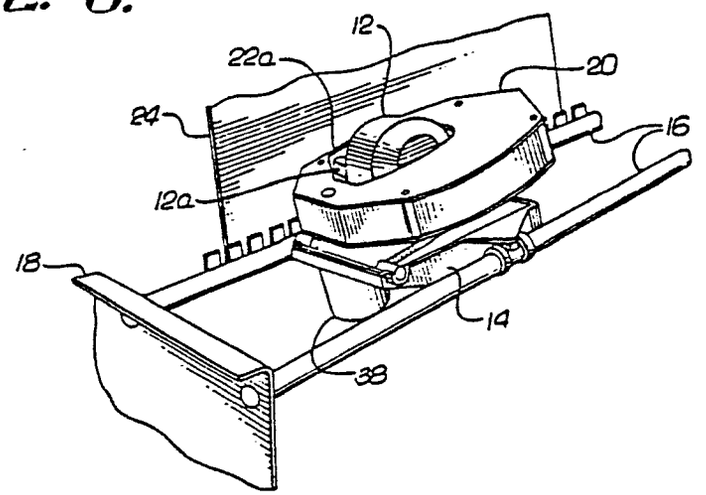

Fig. 5.