

Description

The present invention relates to an apparatus for changeably setting the width of a path for guiding a sheet in a sheet feeder.

Background of the Invention

For example, in an automatic photographic printing operation, a continuous strip of photographic paper is intermittently fed to a printing position, and it is necessary in order to carry out proper printing to accurately feed the photographic paper along a predetermined guide path.

Photographic paper varies in width, therefore, it is necessary to change the width of the photographic paper guide path accurately so as to conform to the width of the photographic paper being used.

A typical conventional means for changeably setting the width of a sheet guide path is known from US-A-4750660 and has a shaft that crosses the guide path and a pair of sheet guide members which are mounted on the shaft at both sides, respectively, of the guide path to define the width of the guide path, the guide members being in engagement with respective threads which are provided on both end portions of the shaft in opposite directions to each other, so that the guide members move toward and away from each other on the shaft in response to the rotation of the shaft, thereby determining the respective portions of the guide members, and thus setting the width of the guide path.

The above-described conventional apparatus for changeably setting the width of the guide path suffers, however, from the following disadvantages:

It is difficult to rotate the shaft accurately, and since undesirable play, for example, backlash in the thread engagement, is likely to occur, it is difficult to position the guide members accurately by rotation of the shaft. In order to overcome these disadvantages, a sensor of high accuracy and a complicated detecting mechanism are needed.

Problem to be Solved by the Invention

It is an object of the present invention to eliminate the above-described disadvantages of the prior art and provide an apparatus which is capable of changeably setting the width of the guide path accurately.

Summary of the Invention

More specifically, the present invention provides an apparatus for changeably setting the width of a sheet guide path for a sheet, comprising: a

pair of sheet guide members set at both sides, respectively, of the sheet guide path to face each other and to be movable in the transverse direction of the sheet guide path so as to define the width of the sheet guide path therebetween; and a pair of positioning members which move the sheet guide members, respectively, in the transverse direction to position the corresponding sheet guide members, the positioning members being rotatable about a mutual axis extending in the transverse direction and each having a plurality of cam surfaces which are circumferentially offset from each other about the mutual axis and stepwisely offset from each other in the direction of the mutual axis, the sheet guide members being engaged with the cam surfaces of the corresponding positioning members, thereby being position in the transverse direction.

Brief Description of the Drawings

The present invention will be described below in detail by way of one embodiment and with reference to the accompanying drawings.

Fig. 1 is a front view showing the essential part of the apparatus for changeably setting the width of a sheet guide path according to the present invention.

Fig. 2 is a side view of a guide path width sensing means employed in the apparatus shown in Fig. 1.

Fig. 3 is a perspective view of a sheet guide member positioning member employed in the apparatus shown in Fig. 1.

Detailed Description of the Invention

Referring to Fig. 1, an apparatus 10 for changeably setting the width of a sheet guide path comprises a pair of sheet guide members 12 which are set adjacent to the longitudinally extending edges, respectively, of a sheet S to be guided to define the width of a guide path for the sheet S, and a pair of positioning members 14 which move the respective sheet guide members 12 in the transverse direction of the sheet S (or the sheet guide path) to position them.

The sheet guide members 12 are slidably mounted on a second shaft 16 extending in the transverse direction of the sheet guide path. The second shaft 16 is secured to side plates 18 of the apparatus. In addition, a compression spring 20 is set between the two sheet guide members 12 to bias them away from each other.

The positioning members 14 are fixedly mounted on a first shaft 24 that is rotatably attached to the side plates in parallel to the shaft 16. Each positioning member 14 has an inner cylindrical

member 26 secured to the first shaft 24 and an outer cylindrical member 28 that is secured to the outer side of the cylindrical member 26. The opposing surfaces of the two outer cylindrical members 28 each have a plurality of flat cam surfaces 30 which are circumferentially offset from each other and stepwisely offset in the direction of the axis, each pair of adjacent cam surfaces 30 being connected by a slant surface 32. In addition, the left-hand (as viewed in Fig. 1) outer cylindrical member 28 has a gear 36 formed at the left-hand end thereof, the gear 36 being meshed with a gear 40 that is rotatably set on the left-hand side plate and that is driven to rotate by a motor 38, so that the two positioning members 14 are rotated by the motor 38.

Each sheet guide member 12 has a rotating roller 42, which is pressed against one of the cam surfaces 30 by the force from the compression spring 20, so that, when the corresponding positioning member 14 is rotated, the roller 42 rotates to maintain the contact with the cam surfaces 30.

In the illustrated embodiment, the cam surfaces 30 of the two positioning members 14 are symmetric with respect to the longitudinal axis of the apparatus, so that, when the positioning members 14 are rotated to change the cam surface 30 engaged with each sheet guide member 12 to an adjacent cam surface 30, the two sheet guide members 12 are moved toward or away from each other through the same distance of the second shaft 16.

The illustrated embodiment is further provided with a means 43 for detecting the width of the sheet guide path defined between the sheet guide members 12 by detecting the position of rotation of the shaft 24. More specifically, the detecting means 43 comprises a rotary disc 44 attached to the right-hand end of the shaft 24 and a sensor 46 secured to the right-hand side plate 18. The disc 44 is provided with a plurality of holes 48 which are circumferentially spaced apart from each other to correspond to the respective positions of the cam surfaces 30 formed on the outer cylindrical member 28, as shown in Fig. 2, so that the cam surface 30 that is in engagement with the roller 42 of the sheet guide member 12 is detected by sensing the corresponding hole 48 in the disc 44 with the sensor 46, thereby enabling detection of the width of the sheet guide path defined between the two sheet guide members 12.

As has been described above, the apparatus according to the present invention is arranged such that the axial positions of the sheet guide members 12 that define the width of the sheet guide path are determined by use of a plurality of pairs of cam surfaces 30 which face each other at a predetermined distance in the widthwise direction. Accord-

ingly, by selecting a desired pair of cam surfaces 30 which are to be engaged with the sheet guide members 12, the width of the sheet guide path defined therebetween is surely and accurately set, so that it is possible to eliminate the disadvantages in the above-described prior art apparatus in which the respective positions of the sheet guide members are set by use of thread engagement.

Claims

1. An apparatus for changeably setting a width of a sheet guide path for a sheet, comprising:
 - a pair of sheet guide members (12) set at both sides, respectively, of said sheet guide path to face each other and to be movable in a transverse direction of said sheet guide path so as to define the width of said guide path therebetween; and
 - a pair of positioning members (14) which move one of said sheet guide members (12), respectively, in said transverse direction to position the corresponding sheet guide members characterised in that, said positioning members being rotatable about a mutual axis extending in said transverse direction and each having a plurality of cam surfaces (30) which are circumferentially offset from each other about said mutual axis and stepwisely offset from each other in the direction of said mutual axis, said sheet guide members (12) being engaged with said cam surfaces (30) of said corresponding positioning members (14), thereby being positioned in said transverse direction.
2. The apparatus of Claim 1, wherein said positioning members (14) are fixedly mounted on a first shaft (24) extending in said transverse direction so that said cam surfaces (30) which are to be engaged with said sheet guide members (12) can be selected by rotating said shaft.
3. The apparatus of Claim 2, further comprising means (44 and 46) for detecting the width of said sheet guide path defined by said sheet guide members (12) by detecting the position of rotation of said first shaft (24).
4. The apparatus of Claim 3, wherein said sheet guide members (12) are slidably set on a second shaft (16) extending in said transverse direction.
5. The apparatus of Claim 4, wherein said cam surfaces (30) formed on each positioning member (14) face the other positioning mem-



member 26 secured to the first shaft 24 and an outer cylindrical member 28 that is secured to the outer side of the cylindrical member 26. The opposing surfaces of the two outer cylindrical members 28 each have a plurality of flat cam surfaces 30 which are circumferentially offset from each other and stepwisely offset in the direction of the axis, each pair of adjacent cam surfaces 30 being connected by a slant surface 32. In addition, the left-hand (as viewed in Fig. 1) outer cylindrical member 28 has a gear 36 formed at the left-hand end thereof, the gear 36 being meshed with a gear 40 that is rotatably set on the left-hand side plate and that is driven to rotate by a motor 38, so that the two positioning members 14 are rotated by the motor 38.

Each sheet guide member 12 has a rotating roller 42, which is pressed against one of the cam surfaces 30 by the force from the compression spring 20, so that, when the corresponding positioning member 14 is rotated, the roller 42 rotates to maintain the contact with the cam surfaces 30.

In the illustrated embodiment, the cam surfaces 30 of the two positioning members 14 are symmetric with respect to the longitudinal axis of the apparatus, so that, when the positioning members 14 are rotated to change the cam surface 30 engaged with each sheet guide member 12 to an adjacent cam surface 30, the two sheet guide members 12 are moved toward or away from each other through the same distance of the second shaft 16.

The illustrated embodiment is further provided with a means 43 for detecting the width of the sheet guide path defined between the sheet guide members 12 by detecting the position of rotation of the shaft 24. More specifically, the detecting means 43 comprises a rotary disc 44 attached to the right-hand end of the shaft 24 and a sensor 46 secured to the right-hand side plate 18. The disc 44 is provided with a plurality of holes 48 which are circumferentially spaced apart from each other to correspond to the respective positions of the cam surfaces 30 formed on the outer cylindrical member 28, as shown in Fig. 2, so that the cam surface 30 that is in engagement with the roller 42 of the sheet guide member 12 is detected by sensing the corresponding hole 48 in the disc 44 with the sensor 46, thereby enabling detection of the width of the sheet guide path defined between the two sheet guide members 12.

As has been described above, the apparatus according to the present invention is arranged such that the axial positions of the sheet guide members 12 that define the width of the sheet guide path are determined by use of a plurality of pairs of cam surfaces 30 which face each other at a predetermined distance in the widthwise direction. Accord-

ingly, by selecting a desired pair of cam surfaces 30 which are to be engaged with the sheet guide members 12, the width of the sheet guide path defined therebetween is surely and accurately set, so that it is possible to eliminate the disadvantages in the above-described prior art apparatus in which the respective positions of the sheet guide members are set by use of thread engagement.

Claims

1. An apparatus for changeably setting a width of a sheet guide path for a sheet, comprising:
 - a pair of sheet guide members (12) set at both sides, respectively, of said sheet guide path to face each other and to be movable in a transverse direction of said sheet guide path so as to define the width of said guide path therebetween; and
 - a pair of positioning members (14) which move one of said sheet guide members (12), respectively, in said transverse direction to position the corresponding sheet guide members characterised in that, said positioning members being rotatable about a mutual axis extending in said transverse direction and each having a plurality of cam surfaces (30) which are circumferentially offset from each other about said mutual axis and stepwisely offset from each other in the direction of said mutual axis, said sheet guide members (12) being engaged with said cam surfaces (30) of said corresponding positioning members (14), thereby being positioned in said transverse direction.
2. The apparatus of Claim 1, wherein said positioning members (14) are fixedly mounted on a first shaft (24) extending in said transverse direction so that said cam surfaces (30) which are to be engaged with said sheet guide members (12) can be selected by rotating said shaft.
3. The apparatus of Claim 2, further comprising means (44 and 46) for detecting the width of said sheet guide path defined by said sheet guide members (12) by detecting the position of rotation of said first shaft (24).
4. The apparatus of Claim 3, wherein said sheet guide members (12) are slidably set on a second shaft (16) extending in said transverse direction.
5. The apparatus of Claim 4, wherein said cam surfaces (30) formed on each positioning member (14) face the other positioning mem-



ber (14), said sheet guide members (12) being biased away from each other by a compression spring (20) set therebetween, thereby being engaged with the corresponding cam surfaces (30).

6. The apparatus of Claim 5, wherein each pair of adjacent cam surfaces (30) formed on each positioning member (14) are connected by a slant surface (32).

Patentansprüche

1. Vorrichtung zum veränderbaren Einstellen der Breite einer Führungsbahn für ein Blatt, mit zwei zu beiden Seiten der Blattführungsbahn angeordneten, einander zugekehrten Blattführungselementen (12), die quer zur Blattführungsbahn derart bewegbar sind, daß sie die Breite der Bahn bestimmen, und zwei Positioniermitteln (14), die jeweils eines der Blattführungselemente (12) in Querrichtung bewegen, um es zu positionieren, dadurch gekennzeichnet, daß die Positioniermittel um eine sich in Querrichtung erstreckende gemeinsame Achse drehbar sind und jeweils eine Vielzahl von Nockenflächen (30) aufweisen, die an der Umfangsfläche der gemeinsamen Achse gegeneinander und in Richtung der gemeinsamen Achse stufenweise versetzt sind, und daß die Blattführungselemente (12) in Eingriff mit den Nockenflächen (30) der jeweiligen Positioniermittel (14) bringbar und dadurch in Querrichtung angeordnet sind.
2. Vorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß die Positioniermittel (14) auf einer ersten, sich in Querrichtung erstreckenden Welle (24) fest gelagert sind, so daß die Nockenflächen (30), die in Eingriff mit den Blattführungselementen (12) bringbar sind, durch Drehung der Welle anwählbar sind.
3. Vorrichtung nach Anspruch 2, dadurch gekennzeichnet, daß Mittel (44, 46) vorgesehen sind, um die Breite der durch die Blattführungselemente (12) bestimmten Blattführungsbahn durch Ermitteln der Drehposition der ersten Welle (24) festzustellen.
4. Vorrichtung nach Anspruch 3, dadurch gekennzeichnet, daß die Blattführungselemente (12) verschiebbar auf einer sich in Querrichtung erstreckenden zweiten Welle (16) angeordnet sind.

5. Vorrichtung nach Anspruch 4, dadurch gekennzeichnet, daß die auf jedem der Positioniermittel (14) ausgebildeten Nockenflächen (30) dem anderen Positioniermittel (14) zugewandt sind und daß die Blattführungselemente (12) unter der Spannung einer dazwischen angeordneten Druckfeder (20) stehen und dabei mit den jeweiligen Nockenflächen (30) in Eingriff gelangen.

6. Vorrichtung nach Anspruch 5, dadurch gekennzeichnet, daß die jeweils einander benachbart angeordneten Nockenflächen (30), die auf jedem Positionierelement (14) vorgesehen sind, über eine geneigte Fläche (32) miteinander verbunden sind.

Revendications

1. Dispositif pour fixer de manière variable la largeur d'une rampe de guidage de feuille pour une feuille, comprenant :
une paire d'éléments de guidage de feuille (12) disposés sur les deux côtés, respectivement, de ladite rampe de guidage de feuille de façon à faire face l'un à l'autre et à pouvoir être déplacés dans la direction transversale de ladite rampe de guidage de feuille afin de définir entre eux la largeur de ladite rampe de guidage de feuille, et
une paire d'éléments de positionnement (14) qui déplacent l'un desdits éléments de guidage de feuille (12), respectivement, dans ladite direction transversale pour positionner les éléments de guidage de feuille correspondants, caractérisé en ce que lesdits éléments de positionnement peuvent tourner autour d'un axe commun s'étendant dans ladite direction transversale et comportent chacun une pluralité de surfaces de came (30) qui sont décalées les unes des autres suivant la circonférence autour dudit axe commun et sont décalées les unes des autres par degrés dans la direction dudit axe commun,
lesdits éléments de guidage de feuille (12) coopérant avec lesdites surfaces de came (30) desdits éléments de positionnement correspondants (14), étant ainsi positionnés dans ladite direction transversale.
2. Dispositif selon la revendication 1, dans lequel lesdits éléments de positionnement (14) sont montés de manière fixe sur un premier arbre (24) s'étendant dans ladite direction transversale de sorte que lesdites surfaces de came (30) qui doivent venir en contact avec lesdits éléments de guidage de feuille (12) peuvent être choisies en faisant tourner ledit arbre.



3. Dispositif selon la revendication 2, comprenant en outre des moyens (44 et 46) pour détecter la largeur de ladite rampe de guidage de feuille définie par lesdits éléments de guidage de feuille (12) en détectant la position de rotation dudit premier arbre (24). 5
4. Dispositif selon la revendication 3, dans lequel lesdits éléments de guidage de feuille (12) sont montés avec faculté de coulissement sur un second arbre (16) s'étendant dans ladite direction transversale. 10
5. Dispositif selon la revendication 4, dans lequel lesdites surfaces de came (30) formées sur chaque élément de positionnement (14) font face à l'autre élément de positionnement (14), lesdits éléments de guidage de feuille (12) étant écartés l'un de l'autre par un ressort de compression (20) disposé entre eux, venant ainsi en contact avec les surfaces de came correspondantes (30). 15 20
6. Dispositif selon la revendication 5, dans lequel chaque paire de surfaces de came adjacentes (30) formées sur chaque élément de positionnement (14) sont reliées par une surface inclinée (32). 25

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