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(54) **DEVICE FOR TRIMMING AND AUTOMATIC CUTTING OF IMAGES ON PAPER AND OTHER GRAPHIC AND PHOTOGRAPHIC SUBSTRATES, IN PARTICULAR OF LARGE SIZE**

VORRICHTUNG ZUM TRIMMEN UND ZUM AUTOMATISCHEN BESCHNEIDEN VON BILDERN AUS PAPIER UND ANDEREN GRAPHISCHEN UND PHOTOGRAPHISCHEN SUBSTRATEN, INSBESONDERE MIT GROSSER GRÖSSE

DISPOSITIF DE ROGNAGE ET DE DECOUPAGE AUTOMATIQUES D'IMAGES SUR PAPIER ET AUTRES SUBSTRATS GRAPHIQUES ET PHOTOGRAPHIQUES, EN PARTICULIER DE GRAND FORMAT

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Description

[0001] The present invention relates to a device for trimming and automatic cutting of a multiple or single images, obtained in particular by digital rendering on paper or other graphic or photographic supports wound in rolls or in the form of single sheets, especially of large size.

It is known from publication EP-A-0951973 (disclosing the preamble of claim 1), in the name of the same applicant, to provide an automatic cutting device which allows to separate one by one multiple copies in a rapid and precise manner according to the positioning as set by the software of the digital rendering system itself in the printing stage by previously inserting between the copies or prints, where the cutting is required, marks of optical reflection recognizing, easily detectable by continuous scanning. In this way the angular correction of the cut can be carried out either with respect to a mark, as it was made previously, at the edge of an opaque material being laminated onto a transparent material, or with respect to images printed not at right angles to the substrate. It was thus possible to obtain the cutting on substrates in the form of reels or as sheets, even if free from any guide system.

[0002] On the other hand it is known that more recently the market has shown the need of extending, up to doubling its value, the maximum size of the cutting units to be used with paper sheets having a width higher than one meter. In this case, some difficulties are met when introducing the substrate into the cutting unit, in both cases of a continuous reel or of single sheets, if the pair of feeding rollers extends throughout the cutting length. Due to the material flexibility and weight in fact the parallel and simultaneous introduction of the total sheet width cannot be ensured. If a corner of the sheet is introduced with some delay with respect to the remainder of the sheet itself or of the unwinding reel, the substrate would reach the cutting station in an incorrect position and, while trying to recover the error upon control of the optical sensors detecting the same, the feeding rollers would cause unacceptable wringlings of the substrate itself.

[0003] On the other hand, the substrate introduction steps which require excessive care in the alignment would involve too much labor being engaged, thus lengthening the time of production to become anti-economic to the detriment of the advantages which could be obtained with the above-mentioned prior art as described in the said EP publication. Therefore the solution is that of adopting a pair of feed rollers having reduced lengths with respect to the width to be cut, such as to occupy only the central zone of the support width. In this way, since the feeding rollers have more orientation freedom, there is no problem of perfect alignment at the paper introduction, which thereby requires less care and allows a speedier cutting execution. However there is a derived problem, consequent to the fact that, upon detecting the mark through both the sensors, the possible angle of deviation from a correct feed, the substrate with the associate mark is caused to be fed under the control of the microprocessor through a length corresponding to the distance between the reading system and the cutting line. When travelling along said feed length, also called "offset", the paper substrate must keep the same angle as initially detected by the cells. However, for reasons of weight and/or friction, being held only in a restricted central area, it cannot skid from the rollers nip and modify the feed angle with respect to the cutting station, once concluded the offset transportation.

[0004] Therefore it is an object of the present invention to overcome such possible drawback by providing a correction system for the cutting unit position corresponding to the possible error resulting from the paper substrate skidding, thus having again the cutting at a correct position even if the paper feed is provided free of any guide system.

[0005] These and additional objects of the present invention are achieved with a device having at least the features of claim 1.

[0006] According to another aspect of the present invention it is also proposed to avoid the inconveniences deriving from the use of only one motor, according to the prior art, for positioning the cutting unit with consequent excessive mechanical flexibility and the control sensibility being dependent in function of the working plane. To this effect a preferred embodiment of the present invention provides for two angular motors placed at the side ends of the cutting unit and synchronized by the microprocessor such as to simulate the central pivoting of the cutting blades in spite of their lateral guide.

[0007] Objects, advantages and features of the present invention will result more clearly from the following detailed description of a preferred embodiment thereof, even as a non-limiting example with reference to the annexed drawings in which:

Figure 1 shows a diagrammatic top view of a trimming and cutting device according to the present invention with the substrate of images correctly fed and the cutting unit being aligned with the feeding rollers; and

Figures 2 and 3 show the same device of figure 1 with the substrate of images inserted with two opposite angles with respect to the feed, at a right angle with respect to the cutting unit, before intervention of the foreseen means of automatic correction.

[0008] With reference to the drawings there is shown a device 1 according to the present invention for the automatic trimming and cutting of images 10a, 10b, 10c printed in a traditional way or obtained by digital rendering systems on a substrate 10 formed e.g. as a continuous paper reel but which could instead be formed of single sheets. The successive images 10a, 10b, 10c are separate by marks or boundary lines M which can be

detected optically by means of a pair of sensors 4, 4' along an ideal reading line that is perfectly transverse to the feed direction as indicated by the arrow F. The feed of substrate 10 is driven by at least a pair of rollers 2, of which only the one above the substrate 10 is visible. As already said before, the length of the feeding rollers 2, useful to hold the substrate 10, is reduced with respect to the total width of the mobile cutting device 7 and also to the width A of the working table of the device. They are in a central position with respect to the substrate 10 and are driven by a motor 3.

[0009] According to the present invention at the sides of the pair of rollers 2 there are provided to differential length meters 6, 6' or "encoders" having a mutual distance B which is larger than the length of rollers 2 and shorter than said width A. When the substrate 10 is perfectly introduced, as shown in figure 1, the optical sensors 4, 4' detect an angle zero and the two differential length meters 6, 6' detect a likely identical feed of the substrate 10 starting from the moment at which the mark M is detected by the optical sensor 4, 4' until the end of the feed movement or "offset" being controlled by a microprocessor, corresponding to the distance between the reading point or line as defined by the optical sensors 4, 4' and the working line of the cutting unit 7. If the feed is identically detected by the two "encoders" 6, 6', it means that there are no angular errors to be taken into account for the cutting and this will be accomplished under control of motor 9, along a line perfectly parallel to the separation mark M.

[0010] If instead, as it is likely that happens in situations as represented in figures 2 and 3, in addition to the initial angular error due to the imperfect feed of substrate 10, the two encoders 6, 6' detect different "offset" lengths during the shift automatically controlled by the microprocessor, this means that the nip of the rollers 2, which is of limited extension in the central zone and due in particular to the weight itself of the paper substrate, causes a skidding. In this way the angle shown by the mark M against the cutting units 7 after the "offset" feed will be modified and to correct the same the device of the present invention will be useful. In fact, the angular error will correspond to the feed difference as detected by the two encoders 6, 6' at the side of rollers 2. The relevant differential data are supplied to the microprocessor which causes its algebraic sum with the possible angle of entering error, whereby the control pulse to the two motors 5, 5' can correct the cutting position to the same extent as the error given by the skidding of material. The drive of the two motors 5, 5', which are placed at the end sides of the cutting unit 7, is synchronized by the microprocessor such as to simulate, with two lateral guides, a central pivoting of the cutting unit itself.

Claims

1. A device for trimming and automatically cutting of images (10a, 10b, 10c,.....) being printed on graphic and photographic substrates in the form of a reel or single sheets, in particular of large size, there being provided an optical recognizing mark (M) between two each successive images, the device at least comprising a pair of feed rollers (2) driven by a motor (3) and a movable cutting unit (7) the blades of which are operated by a motor (9), there been provided a pair of optical sensors (4, 4') placed between said pair of rollers (2) and said movable cutting unit (7) to detect said marks (M), **characterized by** the fact of further comprising, at the sides of said rollers (2), which accomplish their nip on a central area only of said substrate (10), having a length smaller than the width of the movable cutting unit (7) and than the width of the substrate of images (10), two length differential measuring devices (6, 6') for detecting different feed lengths of the substrate (10) upon passage of a mark line (M) from the optical sensors (4, 4') to the cutting line, and a microprocessor for processing the data from said measuring devices (6, 6') in combination with the error angle resulting from the reading of the two optical sensors (4, 4') to consequently control the operation of two motors (5, 5') for controlling the orientation of said movable cutting unit (7).

2. A device according to claim 1, **characterized by** the fact that said microprocessor carries out the algebraic sum of the angular error as detected by the two measuring devices (6, 6') as a consequence of a skid of substrate (10) in correspondence with the fixed transportation under control of the microprocessor itself, equal to the distance between the line of said optical sensors (4, 4'), and the active line of said cutting unit (7), added to the angular error as detected when reading the mark (M) by the optical sensors (4, 4'), whereby the movable cutting unit (7) is properly oriented through an action on said motors (5, 5').

3. A device according to claim 1 or 2, **characterized by** the fact that said feed difference measuring devices (6, 6') are placed at the sides of said pair of feed rollers (2) at a total distance (B) therebetween that is less than the width (A) of the working table of the device without lateral guides.

Patentansprüche

1. Vorrichtung zum Beschneiden und automatischen Schneiden von Bildern (10a, 10b, 10c...), die auf graphischen und photographischen Trägermaterialien in Form von Rollen oder einzelnen Bögen, insbesondere solchen von großem Format, aufgedruckt sind, wobei jeweils zwischen zwei aufeinanderfolgenden Bildern eine Markierung für die opti-

sche Erkennung (M) aufgebracht ist und die Vorrichtung mindestens ein Paar von Vorschubwalzen (2), die von einem Motor (3) angetrieben werden, und eine bewegliche Schneideeinheit (7), deren Messer von einem Motor (9) angetrieben werden, umfaßt und zwischen dem genannten Paar von Walzen (2) und der genannten beweglichen Schneideeinheit (7) ein Paar von optischen Sensoren (4, 4') angeordnet ist, um die genannten Markierungen (M) zu erkennen, **dadurch gekennzeichnet, daß** die Vorrichtung seitlich von den genannten Walzen (2), die ihren Berührungspunkt nur in einem mittleren Bereich des genannten Trägermaterials (10) erreichen, und deren Länge kürzer ist als die Breite der beweglichen Schneideeinheit (7) und als die Breite des Bilder-Trägermaterials (10), weiter zwei Längendifferenzmeßvorrichtungen (6, 6') zur Erkennung unterschiedlicher Vorschublängen des Trägermaterials (10) ab dem Punkt, an dem eine Markierungslinie (M) die optischen Sensoren (4, 4') passiert, bis zur Schnittlinie sowie einen Mikroprozessor umfaßt, zur Verarbeitung der Daten von den genannten Meßvorrichtungen (6, 6') in Verbindung mit dem Fehlerwinkel, der sich aus der Lesung durch die beiden optischen Sensoren (4, 4') ergibt, um den Betrieb von zwei Motoren (5, 5') zu steuern, welche die Ausrichtung der genannten beweglichen Schnitteinheit (7) steuern.

2. Vorrichtung nach Anspruch 1, **dadurch gekennzeichnet , daß** der genannte Mikroprozessor die algebraische Summe aus dem Winkelfehler, der von den beiden Meßvorrichtungen (6, 6') gemessen wird als Folge eines Verrutschens des Trägermaterials (10) während des vom Mikroprozessor gesteuerten festen Vorschubs, welcher dem Abstand zwischen der Linie der genannten optischen Sensoren (4, 4') und der aktiven Linie der genannten Schneideeinheit (7) entspricht, und dem Winkelfehler, der beim Lesen der Markierung (M) durch die optischen Sensoren (4, 4') erkannt wurde, berechnet, wodurch die bewegliche Schneideeinheit (7) durch eine Wirkung auf die genannten Motoren (5, 5') ordnungsgemäß ausgerichtet wird.

3. Vorrichtung nach Anspruch 1 oder 2, **dadurch gekennzeichnet ,daß** die genannten Vorschubdifferenz-Meßvorrichtungen (6, 6') an den Seiten des genannten Paars von Vorschubwalzen (2) in einem Gesamtabstand (B) voneinander angeordnet werden, der geringer ist als die Breite (A) des Arbeitstisches der Vorrichtung ohne Seitenführungen.

Revendications

1. Dispositif pour rogner ou couper automatiquement des images (10a, 10b, 10c,...) imprimées sur des substrats graphiques et photographiques sous la forme d'une bobine ou de feuilles simples, en particulier de grand format, une marque de reconnaissance optique (M) étant prévue entre chaque image successive, le dispositif comprenant au moins une paire de tambours d'alimentation (2) entraînée par un moteur (3) et une unité de coupage mobile (7) dont les lames sont actionnées par un moteur (9), une paire de capteurs optiques (4, 4') étant placées entre chaque paire de tambours (2) et ladite unité de coupage mobile (7) pour détecter lesdites marques (M), **caractérisé en ce qu'**il comprend en outre, sur les côtés desdits tambours (2), qui forment leurs points de contact sur une zone centrale uniquement dudit substrat (10), ayant une longueur inférieure à la largeur de l'unité de coupage mobile (7) et inférieure à la largeur du substrat d'image (10), deux dispositifs de mesure de différence de longueur (6, 6') pour détecter des longueurs d'alimentation différentes du substrat (10) après le passage d'une ligne de marque (M) à partir des capteurs optiques (4, 4') vers la ligne de coupage, et un microprocesseur pour traiter les données issues desdits dispositifs de mesure (6, 6') en combinaison avec l'angle d'erreur résultant de la lecture de deux capteurs optiques (4, 4') pour commander ensuite le fonctionnement des deux moteurs (5, 5') pour commander l'orientation de ladite unité de coupage mobile (7).

2. Dispositif selon la revendication 1, **caractérisé en ce que** ledit microprocesseur effectue la somme algébrique de l'erreur angulaire telle que détectée par les deux dispositifs de mesure (6, 6') en conséquence d'un glissement du substrat (10) en correspondance avec le transport fixe sous le contrôle du microprocesseur lui-même, égal à la distance entre la ligne desdits capteurs optiques (4, 4'), et la ligne active de ladite unité de coupage (7), ajoutée à l'erreur angulaire telle que détectée lorsque la marque (M) est lue par les capteurs optiques (4, 4'), l'unité de coupage mobile (7) étant orientée de manière appropriée par une action sur lesdits moteurs (5, 5').

3. Dispositif selon la revendication 1 ou 2, **caractérisé en ce que** lesdits dispositifs de mesure de différence d'alimentation (6, 6') sont placés sur les côtés de ladite paire de tambours d'alimentation (2) à une distance totale (B) entre eux qui est inférieure à la largeur (A) de la table de travail du dispositif sans les guides latéraux.

Fig. 1

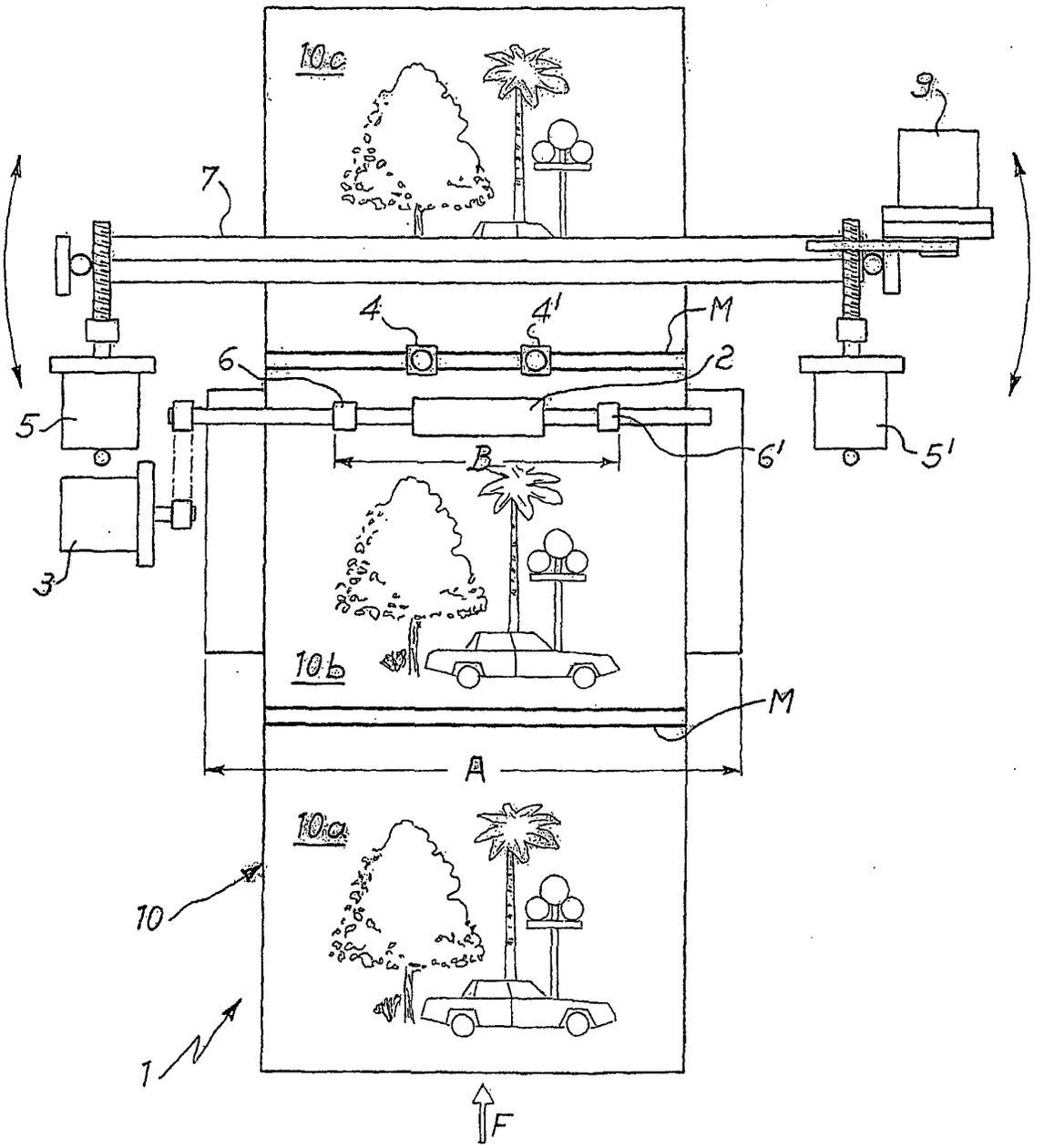

Fig.2

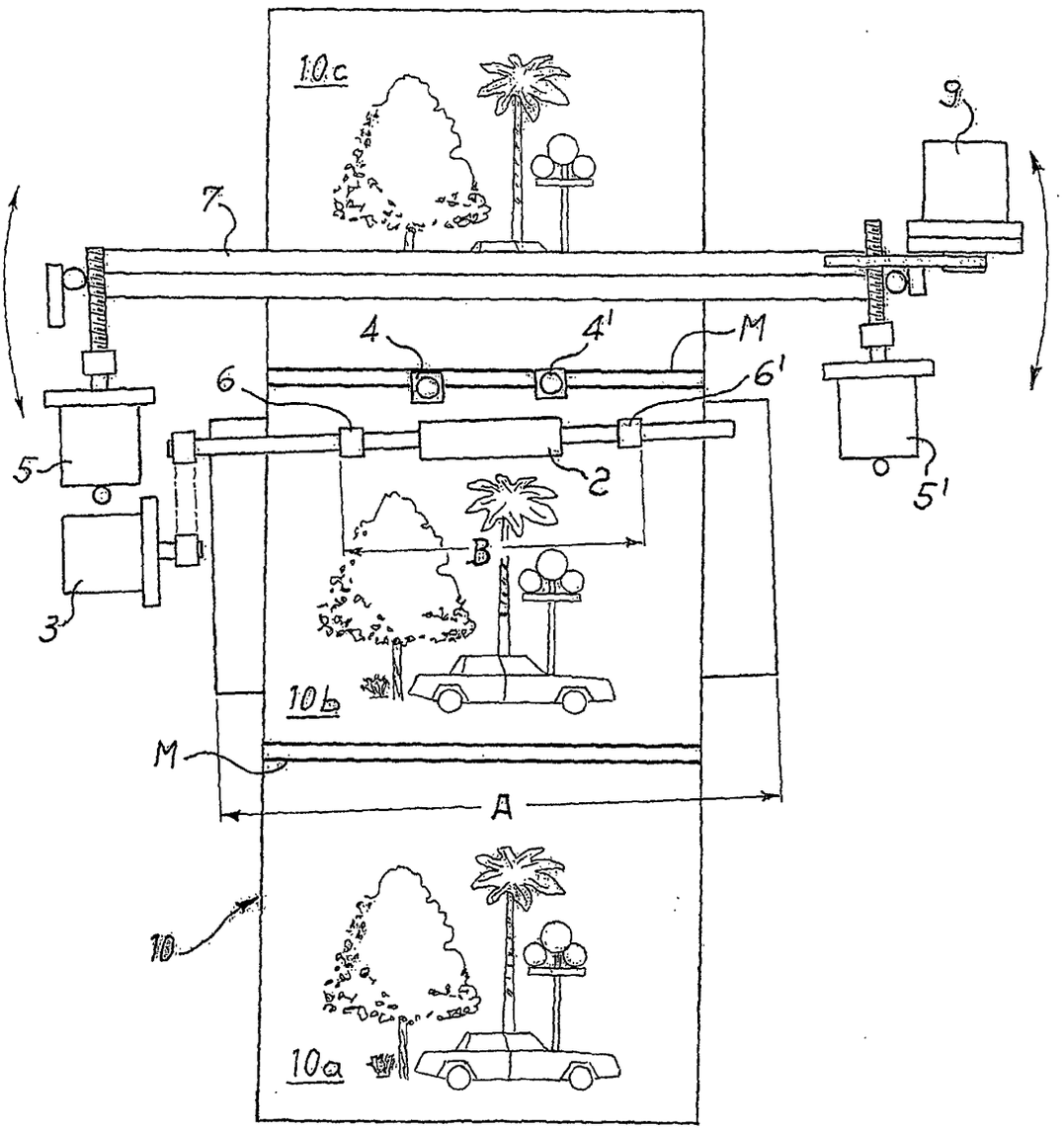

Fig. 3