

[54] METHOD AND APPARATUS FOR READING INFORMATION CARRIERS ON A MOVING ARTICLE

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[22] Filed: **Sept. 30, 1971**

[21] Appl. No.: **185,097**

[30] Foreign Application Priority Data

Oct. 21, 1970 Switzerland..... 15598/70

[52] U.S. Cl..... **235/61.11 E**, 235/91 L, 250/223 R

[51] Int. Cl..... **G06k 7/14**, G06k 7/015

[58] Field of Search..... 198/29, DIG. 16; 340/146.3 H; 250/223 R; 235/91 L, 61.11 E; 209/DIG. 1

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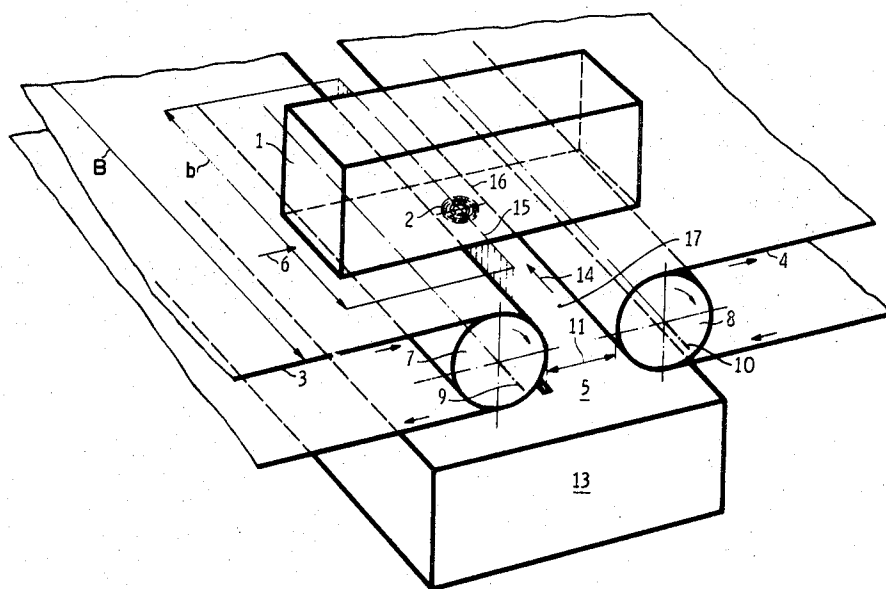
Attorney, Agent, or Firm—Hugh A. Chapin; Francis C. Hand

[57]

ABSTRACT

The reading unit is sized to read only over a portion of the conveyor while various types of guides are provided to guide the conveyed articles into the path of the reading zone. The guides can be of the spring biased type or stationary type. Also, the conveyor can be inclined laterally to cause the articles to move to the lower side.

6 Claims, 12 Drawing Figures



PATENTED FEB 12 1974

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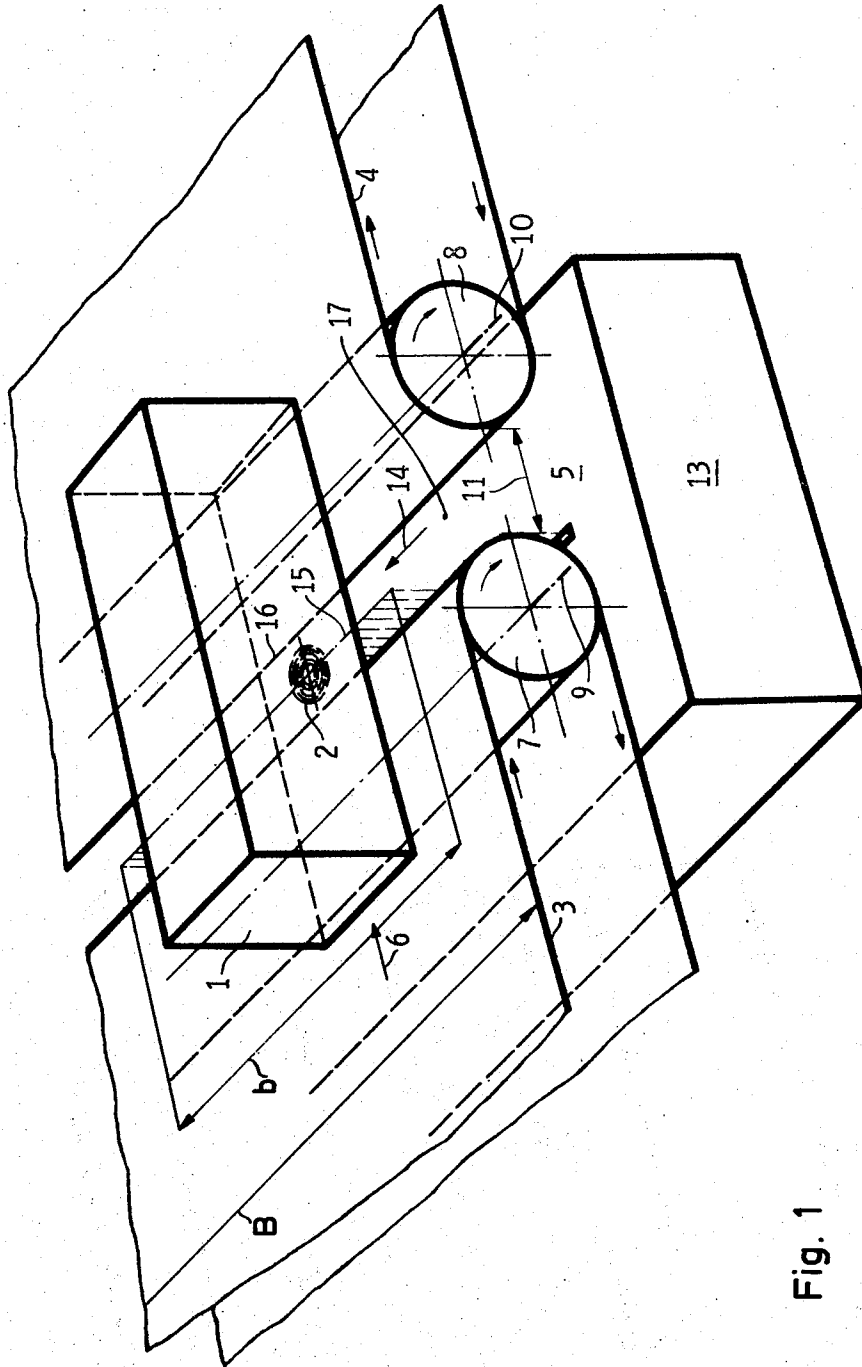


Fig. 1

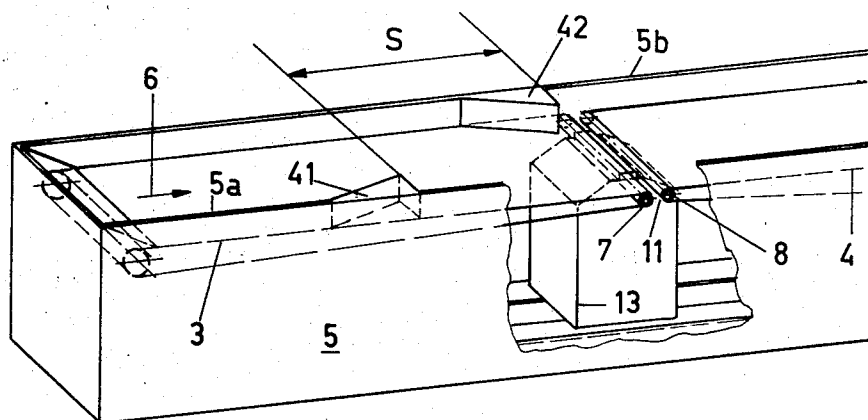


Fig. 3

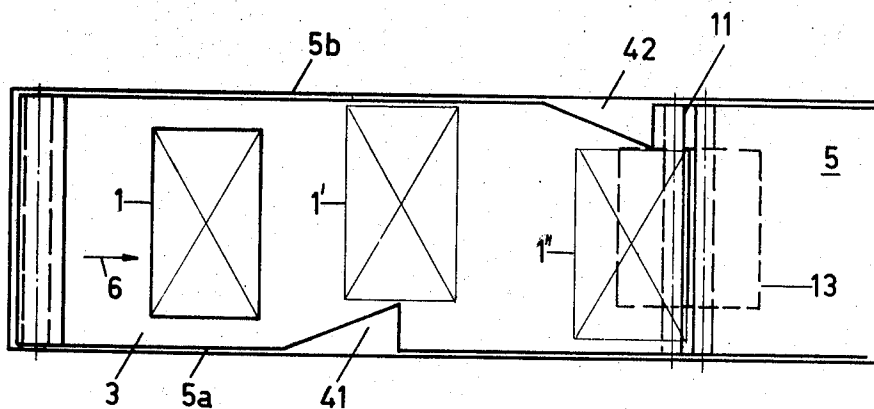


Fig. 4

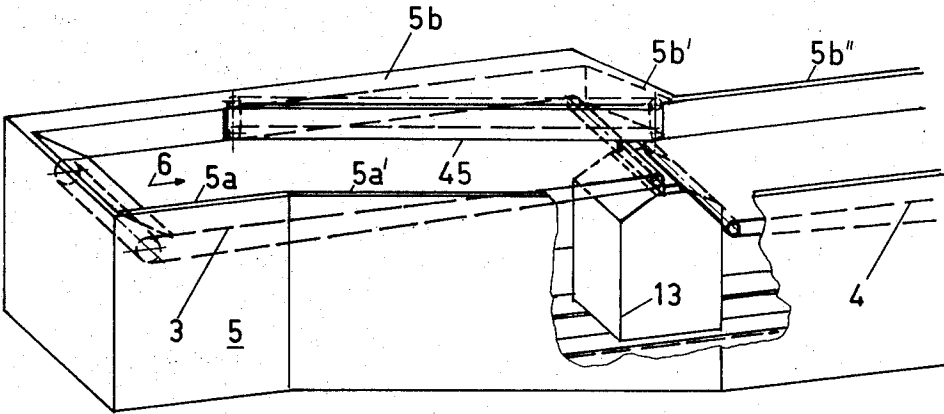


Fig. 5

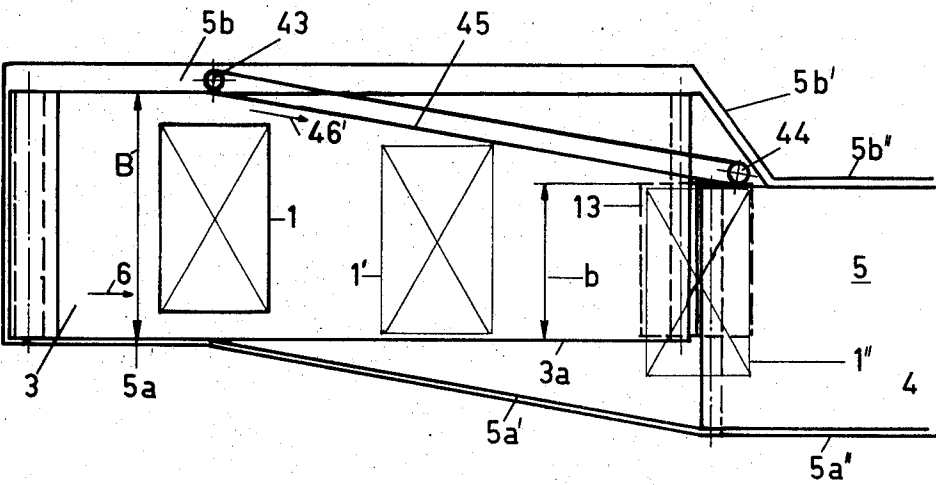


Fig. 6

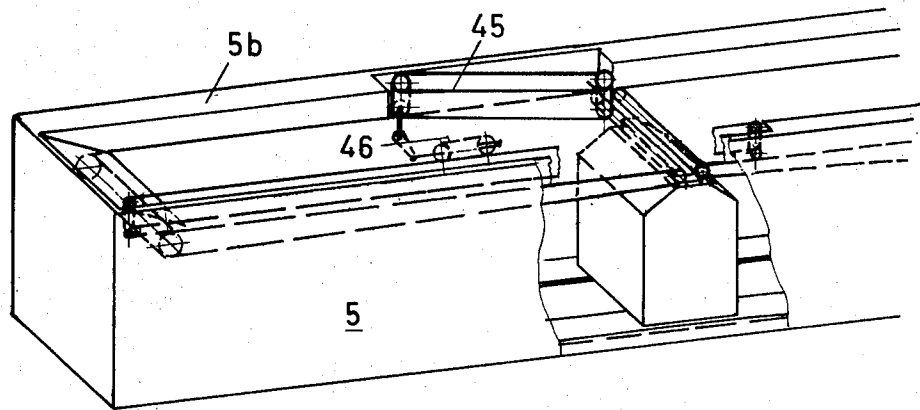


Fig. 7

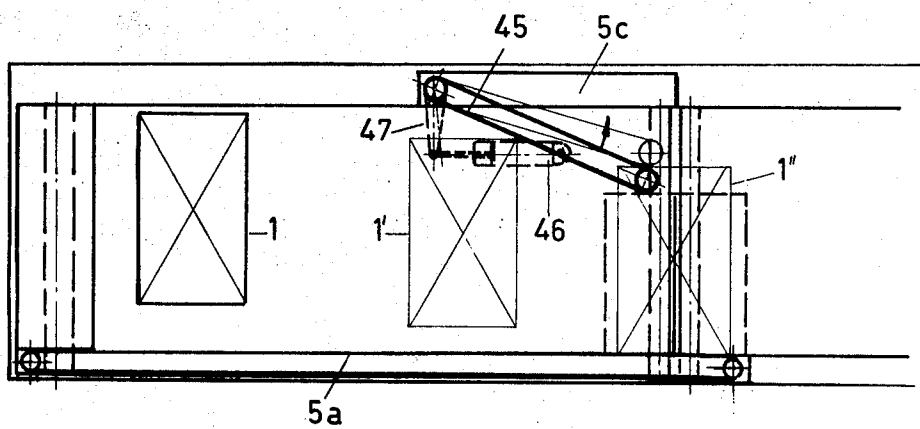


Fig. 8

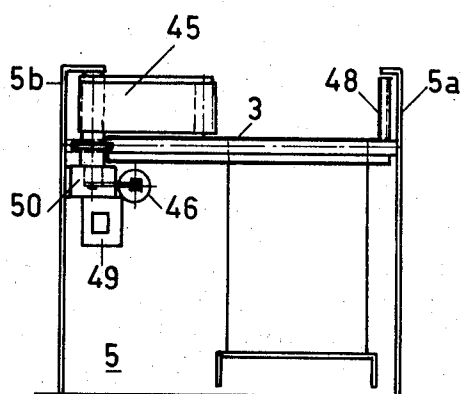


Fig. 9

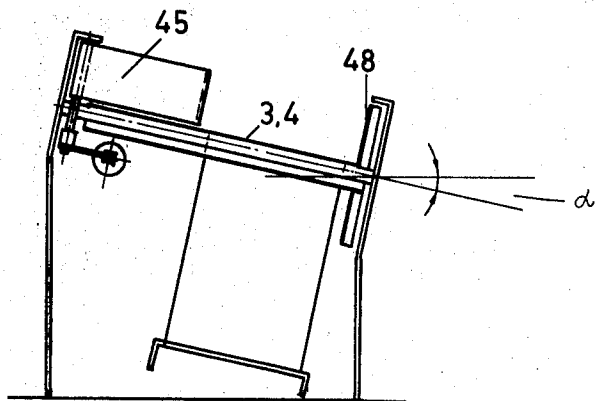


Fig. 10

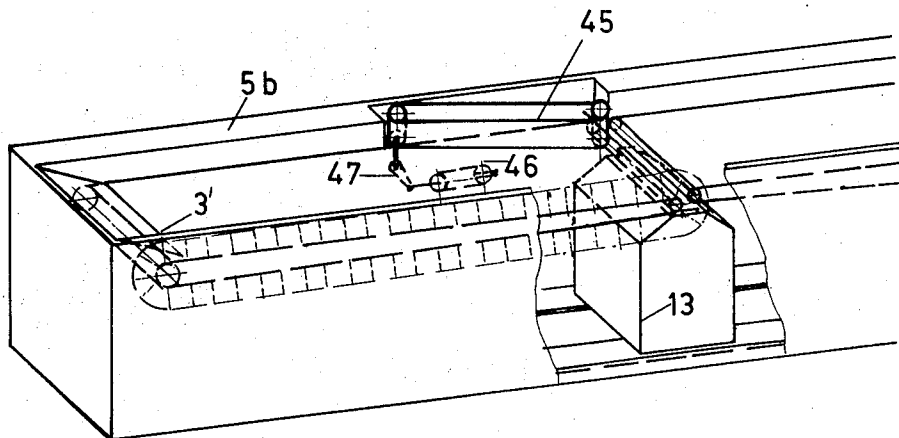


Fig. 11

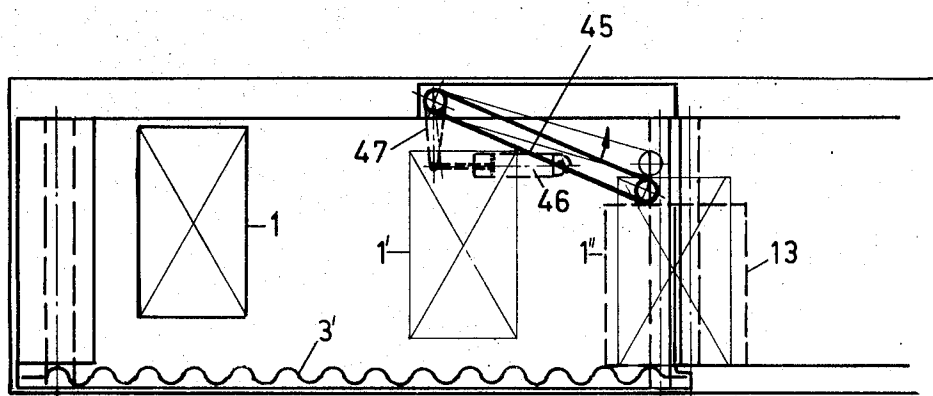


Fig. 12

METHOD AND APPARATUS FOR READING INFORMATION CARRIERS ON A MOVING ARTICLE

This invention relates to a method and apparatus for reading information carriers on moving articles.

In the automatic identification of different kinds of articles, it is often necessary to recognize at least one specific item of information on these articles by means of an information carrier applied thereon. For example, it may be necessary to recognize the article number of each individual article carried along by a conveyor. On the basis of the recognition of the article numbers, it is possible, for example, in an associated data-processing installation to determine prices and to make out delivery orders, invoices and to obtain turnover figures and the like. It is also possible to directly recognize the price to be charged for a given article from the information carrier.

However, in cases where the articles to be identified differ widely from one another in type, it has been extremely difficult to quickly and reliably read the information carrier or carriers which contain the required information on a given article, especially where the articles differ in shape and size from each other.

Heretofore, it has been known to pass a moving article having an information carrier thereon over a reader, such as an optical reader, so that the information carrier is exposed to the reader for read-out purposes. This has generally required the conveyed article to be moved past the reader in a position so that the information carrier is exposed to the reader at the read-out station. The reader has then scanned the article to read the information carrier and thereafter has transmitted the read information in a manner as is known for further processing.

The apparatus which has been used for this purpose has included a conveyor of a type having an interruption or gap at a read-out station below which the optical reader is positioned.

In these previous instances, as the articles lying on the conveyor have no particular orientation and as the minimum width of the conveyor is at least approximately fixed with respect to the dimension of the largest article to be identified, the readers have been constructed to scan the entire length of the interruption in the conveyor, i.e., the entire width of the conveyor. This has allowed the reader to read all articles up to and including those of the largest dimension without having individual articles pass through unidentified. However, as a result, the reader has been of relatively great cost.

Accordingly, it is an object of the invention to reduce the cost of reading information carriers on conveyed articles.

It is another object of the invention to reduce the reading zone in a conveyor to a fraction of the width of the conveyor.

It is another object of the invention to confine the reading zone to only a certain area of the width of the conveyor and to ensure that the information carrier on all the articles delivered to the conveyor is read.

Briefly, the invention provides a method for automatically reading at least one information carrier applied to a moving article on a conveyor wherein the article is passed through a reading zone occupying only a certain portion of the conveyor width. The method fur-

ther ensures that the position of the articles are influenced on the conveyor in such a way that the information carrier to be read actually passes through the reading zone.

The invention also provides an apparatus for reducing the reading zone in a conveyor having an interruption through which a reading unit acts on an information carrier to be read on a passing article. The apparatus is distinguished in effecting a reading zone which extends only over a certain area of the overall width of the conveyor and includes a guide means associated with the conveyor for imparting a movement component directed transversely of the conveying direction to the articles on the conveyor.

In one embodiment, the guide means is located along one side of a horizontal conveyor and is resiliently biased to push a passing article toward the opposite side. The guide means, thus, serves to locate all the conveyed articles with one side or surface in contact with a wall or other surface at the opposite side of the conveyor. The reader is then positioned to scan the interruption in the conveyor over a fractional length starting from a point adjacent the wall at this side of the conveyor.

In another embodiment, the conveyor is provided with fixed guide members on opposite sides which cooperate to shift an article into the center of the conveyor. The reader is then positioned centrally of the conveyor interruption to read the information carrier within a centralized reading zone.

In another embodiment, the conveyor is provided with a fixed guide member on one side to shift an article towards the opposite side while the conveyor runs on opposite sides of the conveyor interruption are laterally offset in similar manner. The reader, in this case, is situated centrally of the interruption so as to scan a fractional conveyor width extending from the edge of the guide means.

In another embodiment, the conveyor is tilted with respect to the horizontal so that the articles are caused to slide toward the lower side while being directed into the path of the reading zone.

These and other objects and advantages of the invention will become more apparent from the following detailed description and appended claims taken in conjunction with the accompanying drawings in which:

FIG. 1 illustrates an apparatus for reading an information carrier according to the invention;

FIG. 2 illustrates a diagrammatic plan view of a conveyor equipped with a displaceable guide means according to the invention;

FIG. 3 illustrates a perspective view of a conveyor having a stationary guide means according to the invention;

FIG. 4 illustrates a plan view of the apparatus of FIG. 3;

FIG. 5 illustrates a perspective view of a further embodiment according to the invention;

FIG. 6 illustrates a plan view of the apparatus of FIG. 5;

FIG. 7 illustrates a perspective view of a further displaceable guide means according to the invention;

FIG. 8 illustrates a plan view of the apparatus of FIG. 7;

FIG. 9 illustrates a further embodiment according to the invention;

FIG. 10 illustrates an end view of a conveyor tilted in accordance with the invention;

FIG. 11 illustrates a further embodiment of a guide means similar to FIGS. 7 and 8 having a corrugated conveying belt according to the invention; and

FIG. 12 illustrates a plan view of the apparatus of FIG. 11.

Referring to FIG. 1, one article 1 of a series of articles to be identified is provided, for example, on a supporting or bearing surface with an information carrier 2 in the form of a printed feature, i.e., a geometrical pattern of concentric circles. Circles of this kind can be printed, for example, in black and white ink on the wrapping of the article 1 and hence are particularly suitable for the binary illustration of figures. For example, a white circle can have the binary value 1 and a black circle the binary value 0.

The article 1 is carried in the direction indicated by the arrow 6 by a conveyor 5 composed of a pair of spaced aligned conveyor belts 3, 4. The feed conveyor belt 3 is mounted over a roller 7 so as to be returned in an endless path while the take-off conveyor belt 4 is similarly mounted over another roller 8. The rollers 7, 8 are mounted on suitable shafts 9, 10 and are spaced apart such that a gap or interruption 11 is formed in the conveyor 5 at a read-out station.

A reader 13, such as an optical reader, is positioned stationarily beneath the interruption 11 in the conveyor and uses a light beam to scan the surface of the article 1 for the geometric pattern, i.e., the information carrier 2 in known manner. This reader 13 is constructed so that the information carrier 2 is read within a fraction of the overall width of the conveyor 5 at the interruption 11. To this end, a vertical light beam from the reader 13 is moved in the direction indicated by the arrow 14 in a reading zone having a width b which is a fraction of the width of the conveyor 5; the conveyor having an overall width B . The width b of the reading zone is, for example, approximately half of B .

In order to ensure passage of the article 1 through the reading zone at the interruption, a guide means is provided as described below. Also, in the case of articles having a width of bearing surface, as measured transversely of the conveying direction indicated by arrow 6, greater than the width b of the reduced reading zone, the information carrier 2 is applied only within a limited local zone of the bearing surface.

Referring to FIG. 2, wherein like reference characters indicate like parts as above, a guide means 30 is provided on the conveyor 5 to shift the articles 1 delivered to the conveyor 5 on to the conveyor belt 3 in such a way that the information carrier 2 on the article 1, on crossing the interruption 11, passes through the reading zone width b . The guide means 30 consists, on the other hand, of a conveyor belt 31 which runs perpendicularly of the plane of the conveyor belt 3 and which is driven through rollers 32, 33 in the same direction as the conveyor belt 3 and, on the other hand, of a guide arm 34 which is mounted to pivot about a vertically arranged axis 35 on the opposite side of the conveyor from the belt 31. The guide arm 34 is biased in the direction indicated by arrow 36 to impart a movement component transversely of the direction of arrow 6 to the article 1 travelling past on the conveyor 3 in the direction of arrow 6 so as to push the article 1 towards and against the conveyor belt 31. In order to reduce friction between the article 1 and the guide arm 34, the guide arm

34 can be equipped, for example, with rollers 37. Alternatively, the guide arm 34 can be replaced by a pivotal conveyor belt. The guide means 30 is arranged anywhere along the conveyor belt 3 between the point at which the articles 1 are placed on the conveyor and the interruption 11.

As will be explained hereinafter with reference to FIG. 10, the guide means 30 can also be formed by a lateral inclination, i.e., lateral slope, of the conveyor belt 3 which is effected over a short distance at least.

As shown, a limited local zone 40 is provided on the article 1 within which the information carrier 2 must be arranged to ensure passage through the reading zone width b at the interruption 11. The reduced zone 40 applies, for example, to an article 1 assumed to have a circular bearing surface while a limited local zone 40' similarly applies to an article 1' with, for example, a rectangular bearing surface for application of an information carrier 2. The limited local zone 40 for the polygonal shaped article is determined as shown, by the width b as measured from the side walls or edges of the article opposite the guide means 30 so that no matter which side wall lies against the conveyor belt 31 the information carrier 2 can be read. The limited local zone for the circular bearing surface article is determined in a similar fashion.

Further embodiments of the guide means 30 are described below with reference to FIGS. 3 to 12 and corresponding components are provided with the same reference numerals.

Referring to FIG. 3, a particularly simple guide means consists of two stationary wedge-shaped guide members 41, 42. One guide member 41 is arranged on one side wall 5a of the conveyor 5 and the other guide member 42 on the opposite side wall 5b of the conveyor 5 in such a way that the sloping surfaces of these guide members 41, 42 are directed towards the middle of the conveyor belt 3. In addition, the guide members 41, 42 are arranged at a distance from one another in the direction of travel of the conveyor belt indicated by arrow 6.

Referring to FIG. 4, the guide members 41, 42 are sized so that during operation of the conveyor, an article 1 moving with the conveyor belt 3 in the direction of arrow 6 first comes into contact with the guide member 41. The article is then successively displaced towards the side wall 5b of the conveyor 5 into the position 1' as shown. In this position, the article is displaced by a distance corresponding to the full height of the wedge-shaped guide member 41. During further travel through the conveyor 5, the article moves past the guide member 42 and is displaced by the guide member 42 towards the side wall 5a into position 1'', as shown. The article then traverses the gap 11 through which the reading unit 13 acts, at the correct point, namely in the scanning or reading zone. As shown, the distance between the free ends of the guide members 41, 42 is equal to the reading zone width b so that all sizes of articles are ensured of passing through the zone b with at least one side edge coincident with one end of the zone b .

Referring to FIGS. 5 and 6, the conveyor 5 includes a conveyor belt 3 travelling in the direction of arrow 6 while the reading unit 13 is arranged laterally offset in the conveyor 5 in such a way that the reading zone with the width b begins at one edge 3a of the conveyor

belt 3. The width b is considerably smaller than the overall width B of the conveyor belt 3.

The guide means includes an inclined conveyor belt 45 which travels around stationary vertically directed rollers 43, 44 and runs along the side wall 5b of the conveyor 5. That part of the conveyor belt 45 facing the article 1 travels in the direction of arrow 6'.

As shown in FIG. 6, during operation, as soon as the article 1 touches the inclined conveyor belt 45, the article is displaced into position 1' laterally towards the edge 3a of the conveyor belt 3. The extent of this lateral deflection is selected in such a way that the article 1 is caused to correctly traverse the reading zone width b , as indicated by position 1''.

In order to adapt to the inclination of the conveyor belt 45, the side wall 5b of the conveyor 5 is laterally offset through an inclined middle section 5b' in such a way that, after the article 1 has passed through the reading zone b , the continuation 5b'' of this side wall again represents the lateral boundary of the conveyor 5. The conveyor belt 4 is also laterally offset with respect to the conveyor belt 3.

Referring to FIGS. 7 and 8, the guide means includes a lateral conveyor belt 45 which is used to bring the article from a displaced position 1' into a final position 1''. However, in contrast to the embodiment described in FIGS. 5 and 6, the lateral conveyor belt 45 is arranged in a recess 5c in the side wall 5b of the conveyor 5. In addition, the lateral conveyor belt 45 is displaceably mounted and provided with an adjustable tensioning mechanism 46. Under the effect of the tensioning mechanism 46, the lateral conveyor belt 45 is always tilted through a lever mechanism 47 in such a way that, irrespective of size, the article 1 passing through is pushed towards the side wall 5a of the conveyor 5. In this case, too, the lateral conveyor belt 45 acts as a deflecting conveyor. Deflecting conveyors of this kind are described, for example, in the Journal "Forden und Heben," Krausskopf-Verlag für Wirtschaft GmbH & Co., Kg, 65 Mainz, Lessingstrasse 12-14, Western Germany, No. 5, April 1970.

Referring to FIG. 9, the conveyor 5 has a guide means comprising two lateral conveyor belts, including one pivotal lateral conveyor belt 45 at one side wall 5b, as described above with reference to FIGS. 7 and 8, and another lateral conveyor belt 48 at the opposite side wall 5a of the conveyor. At least one of the lateral conveyor belts, for example, the conveyor belt 45, is driven, for example, by a motor 49 and an associated gear system 50. The other lateral conveyor belt 48 can either be driven or designed to run freely. The operation of this guide means is similar to the above.

Referring to FIG. 10, in order to facilitate lateral displacement of an article, the conveyor belts 3, 4, 45 and 46 are tilted laterally through an angle α . As shown, the conveyor belts 3, 4 run over rollers whose axes are laterally inclined at this angle. In such a laterally inclined arrangement, there is no need for the lateral conveyor belt(s) 45, (48) to be driven. Instead, it is even possible for the lateral conveyor belt 45 to be replaced by a pivotally arranged biased deflector plate.

Referring to FIGS. 11 and 12, the guide means is similar to that described in reference to FIGS. 7 and 8. In this case, however, the conveyor belt 3' has a lateral edge with a corrugated profile. Conveyor belts of this kind are illustrated and described in the aforementioned journal "Forden und Heben" No. 20, 1970, No.

5 on page A 77 in an advertisement by Messrs. Tegu GmbH, Moers, W. Germany.

One feature common to all the embodiments described is a guide means by which a movement component directed transversely of the direction of travel of the conveyor belt 3 is imparted to the conveyed articles 1 in order to ensure that the articles 1 correctly traverse the reading zone width b . As shown, each guide means serves to position one edge of an article in coincidence with one end of the reading zone.

What is claimed is:

1. In an apparatus for automatically reading an information carrier on a lower support surface of each moving article of a series of moving articles of different shapes and sizes,

a conveyor of predetermined width having an interruption to expose said lower support surface of each article;

an optical reader stationarily disposed under said interruption to define a reading zone within said interruption of a width less than the width of said conveyor, said reader being disposed for moving an upwardly directed light beam across said reading zone to scan each lower support surface of an article of said series positioned over said interruption; and

guide means upstream of said interruption for imparting a lateral movement component directed transversely of the conveying directional of said conveyor on each article being conveyed on said conveyor past said guide means to guide the articles into the path of said reading zone and over said reader, said guide means including a conveyor belt perpendicularly disposed to and projecting from the plane of said conveyor at one side thereof for moving in the same direction as said conveyor relative to an article on said conveyor and a pivotally mounted guide arm extending over at least part of said conveyor towards said conveyor belt.

2. An apparatus as set forth in claim 1 wherein said arm includes a plurality of rollers thereon for reducing friction between said arm and an article passing thereby.

3. An apparatus as set forth in claim 1 wherein said series of articles includes articles with said surface being of a width greater than the width of said reading zone with the information carrier thereon located in a limited local zone determined by the width of said reading zone as measured from an edge of the article opposite said guide means.

4. An apparatus as set forth in claim 1 wherein said conveyor includes a feed conveyor and a take-off conveyor disposed on opposite sides of said interruption in laterally off-set relation.

5. In an apparatus for automatically reading an information carrier on a lower support surface of each moving article of a series of moving articles of different shapes and sizes,

a conveyor of predetermined width having an interruption therein and means for conveying each article past said interruption to expose said lower support surface of each article;

an optical reader stationarily disposed under said interruption to define a reading zone within said interruption of a width less than the width of said conveyor, said reader being disposed for moving an upwardly directed light beam across said reading

zone to scan each lower support surface of an article of said series positioned over said interruption; and

guide means upstream of said interruption for imparting a lateral movement component directed transversely of the conveying direction of said conveyor on each article being conveyed on said conveyor past said guide means to guide the articles into the path of said reading zone and over said reader, said guide means including a pivotally mounted conveyor belt extending angularly across a part of said conveyor in perpendicular relation thereto, and tensioning means biasing said conveyor belt across said conveyor.

6. In an apparatus for automatically reading an information carrier on a lower support surface of each moving article of a series of moving articles of different shapes and sizes,

a conveyor of predetermined width having an interruption therein and including a feed conveyor belt for conveying each article past said interruption to expose said lower support surface of each article;

an optical reader stationarily disposed under said interruption to define a reading zone within said interruption of a width less than the width of said conveyor, said reader being disposed for moving an upwardly directed light beam across said reading zone to scan each lower support surface of an article of said series positioned over said interruption; and

guide means upstream of said interruption for imparting a lateral movement component directed transversely of the conveying direction of said conveyor on each article being conveyed on said conveyor past said guide means to guide the articles into the path of said reading zone and over said reader, said guide means including a pair of conveyor belts each positioned on an opposite side of said feed conveyor belt, at least one of said pair of conveyor belts being pivotally mounted to extend over said feed conveyor belt.

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