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M. M. LEVY

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CONVEYORS

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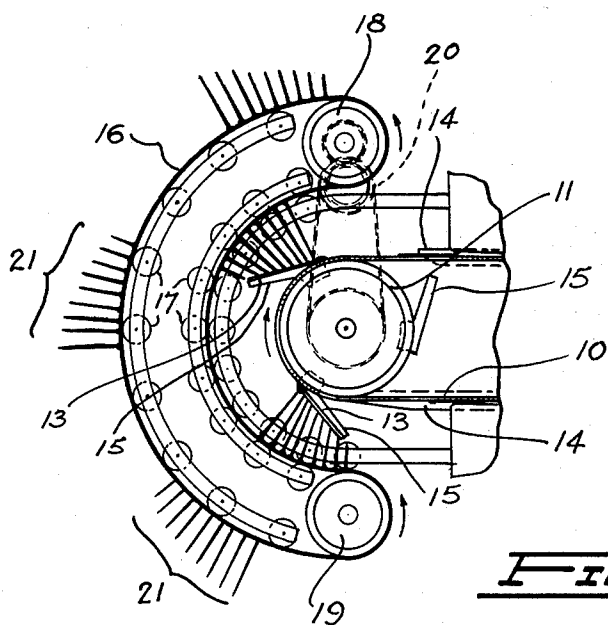


Fig. 1.

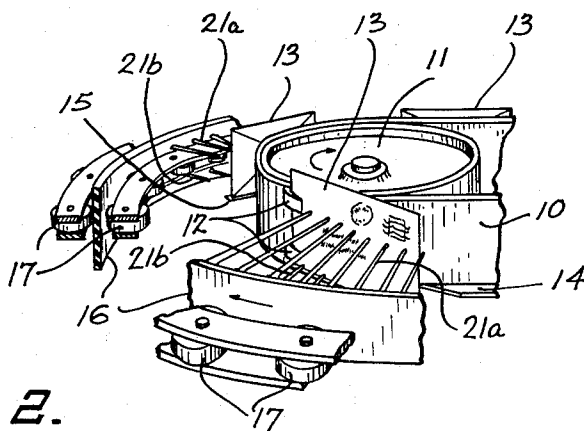


Fig. 2.

Inventor

Maurice M. Levy

By Steven Davis Miller & Mosher
Attorneys

1

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Maurice M. Levy, 208 Clemow Ave.,
Ottawa, Ontario, Canada
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This invention relates to improvements in apparatus for conveying letters, cards and other articles of generally flat rectangular shape.

Sorting systems have already been developed in which the addresses on pieces of letter mail or other data on record cards are first converted into binary or other code designations borne by the letters or cards. The letters or cards are then passed individually past an electronic reader which reads each set of code markings and determines from information stored in a file computer to which sortation outlet the letter or card in question should be conveyed. A compartment is provided at each outlet to receive the letters or cards diverted thereto and to form these letters or cards into a stack for subsequent handling. A plurality of such outlets is provided, to any one of which the system may selectively convey each letter, card or like flat article (hereinafter referred to simply as "articles").

When the number of such outlets becomes large, it is convenient to use both spans of a conveyor. Instead of arranging all the outlets along the outgoing span of the conveyor, the return span is also employed, thus halving the total length of the conveyor for a given number of outlets. Such an arrangement, however, involves reversing the direction of travel of many of the articles at the end of the conveyor, and this requirement has given rise to difficulties, especially as conveyor speeds have increased. The centrifugal forces exerted on the articles can become considerable.

The problem of making sure that the articles do not become detached from the conveyor as they turn the corner from the outgoing to the return span, without placing undesirable restrictions on conveyor speed, has been tackled in the past only by employing firmer and more powerful grippers to secure the articles to the conveyor. Not only does this expedient have the disadvantage of adding considerably to the complexity of construction of the grippers, but it fails to protect the articles against bending or tearing in those parts not positively held by the grippers. Normally such a gripper merely engages an edge of the article—usually the leading edge to pull the article along, although some systems use pusher elements. In either case, little or no real control is exercised on the parts of the articles not positively gripped, and no provision is made to restrain the generally disruptive effects of the centrifugal forces.

The object of the present invention is to provide an improved conveyor structure that will overcome these difficulties in a convenient and reliable manner.

This object is satisfied by the present invention by the provision of an auxiliary conveyor that extends adjacent to and equidistant from the main conveyor along the convex side of that portion of the main conveyor where the change of direction takes place. This auxiliary conveyor includes article-supporting means that project into engagement with an article on the main conveyor to support it against displacement due to centrifugal forces. The travel of the two conveyors will be coordinated, to cause such article-supporting means to travel synchronously with the article throughout the curved portion of the main conveyor.

The preferred form that the article-supporting means take is at least one set of individual fingers that project from the auxiliary conveyor towards the main conveyor.

2

Each set will conveniently include a plurality of spaced rows of fingers whereby to distribute the support over a substantial area of the surface of each flat article.

A further desirable feature of the finger construction is that the length of such fingers should be graded from front to rear on the conveyor so as to supply substantially equal support over the length of a flat article which projects tangentially from the main conveyor while travelling around the curved portion thereof.

These and other features of the invention will appear more clearly from the example illustrated in the accompanying drawings and described below.

In such drawings:

FIGURE 1 is a plan view of a conveyor end, modified in accordance with the invention; and

FIGURE 2 is a fragmentary side perspective of FIGURE 1.

The main conveyor 10 of a sorter or other article handling machine extends around a drum 11, which may be driven by power means not shown, or may be an idling drum, in which case the drum at the far end of the conveyor will be driven. At regularly spaced intervals, the conveyor 10 is provided with grippers 12 for gripping the leading edges of letters 13 to carry them along the conveyor. The specific construction of such grippers forms no part of the present invention and consequently will not be described in detail; suffice to say that such grippers include jaws capable of being opened to receive a letter at a loading station at the far end of the conveyor (not shown) and to deposit the letter at any selected one of a series of receiving stations distributed along both spans of the conveyor.

While travelling along the straight spans of the conveyor the letters are additionally supported on tracks 14. These tracks terminate just short of the drum 11 where their function is assumed by three support ledges 15 mounted on the lower part of the drum to project tangentially therefrom at three positions spaced equally around the drum.

An auxiliary conveyor 16 is mounted on idler rollers 17 in the shape of a crescent extending adjacent the convex side of the curved portion of the main conveyor 10 which travels around the drum 11. The span of the auxiliary conveyor 16 which is adjacent the main conveyor is arranged to be equidistant therefrom throughout the full length of the curved portion of the main conveyor. The auxiliary conveyor 16 extends at its ends around drums 18 and 19, the drum 18 being driven through drive 20 from drum 11 in order to synchronise the movements of the two conveyors. The conveyor 16 consists of a rubber belt provided with a plurality of sets of firm but resilient projecting, article-supporting fingers 21. As best seen in FIGURE 2 each such set of fingers 21 comprises a top row 21a to engage a letter 13 near its upper edge and a bottom row 21b to engage the letter near its lower edge. The lengths of the fingers in each row are graded from long at the front (in the direction of conveyor travel) to shorter at the rear, so as to support a letter substantially equally along its length while it projects tangentially from the curved portion of the main conveyor 10. This is clearly shown in FIGURE 1. The angular speeds of the conveyors are made equal and the positioning of the sets of fingers 21 is so arranged that each letter, as it enters the turn, finds a set of fingers waiting to support it, and to travel with it, the full distance around the curved portion.

As will be appreciated, the specific arrangement of the article-supporting fingers, as to positioning and relative length, may be varied as necessary to suit the requirements of any particular main conveyor. For instance, if the conveyor employs pusher elements that engage the rear edges of the articles, instead of the pulling grippers illus-

3

trated, so that the articles will travel around the turn of the conveyor with their leading rather than trailing edges projecting from the conveyor and requiring support, the shorter fingers will require to be in front of the longer fingers on the auxiliary conveyor.

The change of direction of travel need not necessarily take the form of an 180° turn, although this will be the most common example encountered. The invention is equally applicable to turns of a conveyor through any angle. Moreover, the arc through which the conveyor turns need not necessarily be a circular arc. What is essential is that the auxiliary conveyor should move in a similar arc, so as always to be equidistant from the curved portion of the conveyor. In other words, the two conveyors arcs will at any given angular position always be described about a common instantaneous centre, and their angular rather than their linear speeds will be equal.

I claim:

1. The combination of

(a) a main conveyor for flat articles, said conveyor having a portion at which the direction of travel of the conveyor is turned through a semi-circular arc, and said conveyor having means for conveying said articles in such a manner that said articles project tangentially from the convex side of said conveyor while travelling around said portion,

(b) and an auxiliary conveyor having a substantially semi-circularly extending span described about a common centre with the arcuate portion of the main conveyor, whereby to extend adjacent to and equidistant from said portion on the convex side thereof, said auxiliary conveyor including

(i) a plurality of sets of article-supporting fingers projecting from the surface of said auxiliary conveyor into engagement with a said article on the main conveyor to support the same against displacement due to centrifugal forces, the fingers of each said set being graded in length in the longitudinal direction of the auxiliary conveyor so as to supply substantially equal support over the length of a said article while projecting tangentially as aforesaid,

(ii) and means for coordinating the travel of said

4

conveyors to bring a said set of fingers into supporting engagement with an article as it enters the arcuate portion and to cause said set to travel synchronously with said article throughout the full extent of said portion.

2. The combination of claim 1, wherein said arcuate portion of the main conveyor extends around a drum, said drum being provided with a plurality of ledges each projecting tangentially from a lower portion of the drum and arranged to provide additional support for a said article traversing the arcuate portion of the conveyor.

3. The combination of

(a) a main conveyor for flat articles, said conveyor having a portion over which a change of direction of travel takes place with the result that said portion has a convex side,

(b) and an auxiliary conveyor having a span extending adjacent to and equidistant from said main conveyor along the convex side of said portion, said auxiliary conveyor including

(i) article-supporting means projecting into engagement with a flat article on said main conveyor to support the same against displacement due to centrifugal forces,

(ii) and means coordinating the travel of said conveyors to cause said article-supporting means to travel synchronously with said article throughout said portion,

(iii) said article-supporting means comprising at least one set of individual fingers that project from the side of the auxiliary conveyor towards the main conveyor,

(iv) the fingers of said set being graded in length in the longitudinal direction of the auxiliary conveyor so as to supply substantially equal support over the length of a flat article projecting tangentially from the main conveyor while travelling around said portion thereof.

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