Omni-Directional Conveyor System

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ABSTRACT:

In this modern competitive industrial word one can get a step ahead of competitors by selection of appropriate material handling equipment. Material handling process is overhead for the production. A conveyor system is a common technique of mechanical handling equipment that moves material from one location to another location, many kind of conveying system are available and are used according to the various needs of industries. The addition of omni directional capability and modularization to conveyor systems is an exciting and trending topic in current conveyor research. The implementation of omni directional modular conveyors is foreseen as mandatory in the future of conveyor technologies due to their flexibility and efficiency. The present invention relates to an omni directional conveyor system module, modular omni directional conveyor systems, and omni directional conveyor systems. The modular omni directional conveying and positioning system consists of small hexagonal modules in which there are specially arranged omni directional wheels, which are controlled individually and specifically. This allows us to move or position several objects simultaneously and independently of each other on any course.

Keywords: cellular conveyor, omni directional conveyor, Automation, Sortation Systems, Material Handling, Conveyor Platform.

I. INTRODUCTION

The development of manufacturing industries is dependent upon research in manufacturing process and innovation in new products. During processing, the raw material gets transformed into product. Generally, manufacturing industries keep manufacturing same models with little variation in height, color, weight, shape and thus sorting plays an important role here.

In old days it was possible to implement manual labour for sorting similar objects. But nowadays due to increased production and for minimizing the labour expenditure for such unskilled task, industries can't afford human errors for sorting these products. This forced industry to tend towards atomizing the sorting processes.

Industrial automation mainly focuses on developing automations having low maintenance, long durability and to make systems user friendly as possible.

The main objective of this project is to develop system that will enable convey targeted objects in each direction independently. Also to rotate and move objects at the same time or the direction of object has to be changed while moving. The modular conveying and positioning system consists of small hexagonal modules in which there are specially arranged omni directional wheels, which are controlled individually and specifically. This allows us to move or position several objects simultaneously and independently of each other on any course. As a result, complex material flow tasks, which are realized today over very large plants, can be carried out in a verysmall space.

II. CONVEYINGTECHNOLOGY

The present invention relates to an omni directional conveyor system module, modular omni directional conveyor system, and omni directional conveyor systems.

Omni directional conveyor systems are known in principle. They used when objects have to be moved and rotated at the same time, or when the direction of the objects such as packages, can be transported in different directions and rotated about the center axis of the conveyor system as shown if figure 1.

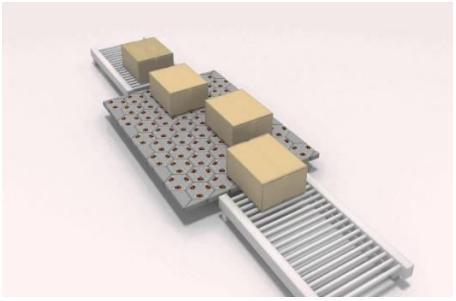


Figure 1

A. Design:

1) The conveyor system module comprises a carrier plate, on the underside of which the omni directional conveyor unit (s) is / are mounted such that the conveyor wheel or conveyor wheels' project upwards through one or a respective cutout in the carrier plate. The cutout may be, for example, a recess or a hole. However, instead of being attached to a support plate, the conveyor units can also be fastened elsewhere, for example, to vertically extending profiles. Conveniently, the conveyor system module comprises at least one ball roller mounted in the carrier plate and preferably a plurality of preferably evenly distributed such ball rollers as shown figure 2.

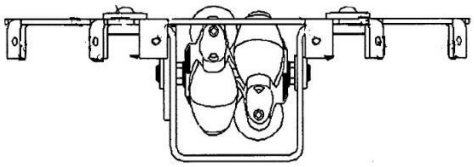


Figure 2

2) Conveniently, the conveyor wheels are arranged in the side centers of an equilateral triangle. The distances of the conveyor wheels from the center and their angle to each other but can also be different. In particular, it may be provided that the effective directions of the conveyor wheels extend at an angle of 0 ° to the sides of the triangle or at least one of the effective directions of the conveyor wheels at an angle not equal to 0 ° to the associated side of the triangle. The former alternative simplifies the math behind the controller driver. Alternatively, or additionally, the distances of the conveyor wheels may be different from the center as shown infigure 3.

3) Each drive motor can drive any speed profile. Due to the separate drive and controllability a targeted drive and energy saving is possible. This results from the fact that a path can be calculated per object (e.g. package) and then only those drive motors are required which are necessary for tracing the path as shown in figure 3.

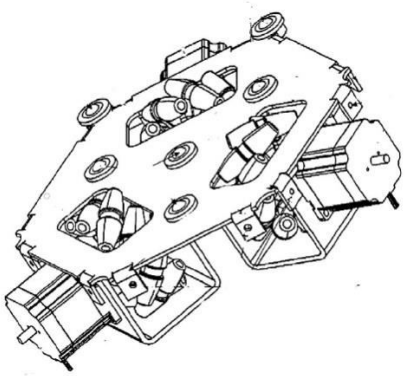


Figure 3

4) The invention is therefore based on the object, a targeted conveyance of objects, such as packages, in each direction in 2D independently allow each other.According to the invention, this object is achieved by an omni directional conveyor system module, comprising at least two omni directional conveyor units arranged side by side each of at least one omni directional conveyor wheel and a single associated drive motor for individually driving the at least one conveyor wheel, wherein the effective directions of the conveyor wheels of the conveyor units at an angle not equal to zero , It is a so-called power-driven or active omni directional conveyor system module. The feed wheel can also be referred to as a conveyor roller. It should also be pointed out that, depending on the type of conveying wheel, the direction of action can be orthogonal to the main axis of rotation of the conveying wheel, but also at a different angle as shown in figure 4.

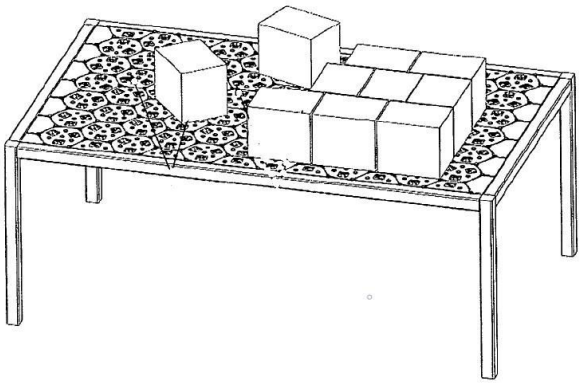


Figure 4

5) The conveyor system module exactly two omni directional conveyor units are provided side by side. This allows targeted conveying in any direction in 2D independently of each other. More specifically, this allows simultaneous conveyance of objects, such as parcels, with individual lanes. If the directions of action of the two conveyor axes would be parallel, no 2D movement, but only a single direction would be possible and also three omni directional conveyor units can be provided next to one another and the directions of action of the conveyor wheels of the three conveyor units to each other so that there are no parallel effective directions. In this way, a targeted conveyance of objects in each direction in 2D is possible independently of each other and additionally a rotation. Of course, however, more than three, such as four or five omni directional conveyor units may be provided as shown in figure 4.

B. Usage

1) The invention is based on the surprising finding that objects, such as parcels, can be conveyed independently of one another in each direction in 2D and 3D (transaction in longitudinal and transverse direction as well as rotation) as a result of the separate drive ability and controllability of the omni directional conveyor units. In other words, objects, such as packages, can be promoted simultaneously with individual webs. If at least three or exactly three omni directional conveyor units are provided, in addition, a rotation of the objects is possible, not only to very specific fixed points, but - technically - anywhere or at least almost anywhere. In addition, by appropriate alignment of directly adjacent conveyor wheels to each other, the Main requirement direction influenced, causes a more efficient power transmission and an optimal distribution of forces to the respective application can be realized as shown in figure 5.

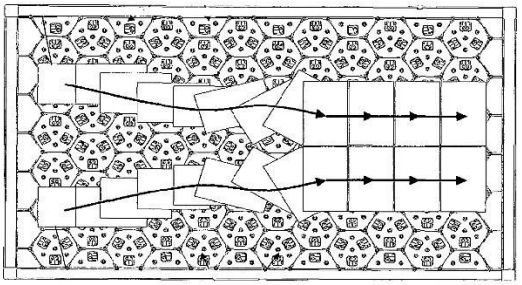


Figure 5

2) The omni directional conveyor wheels transmit forces in the direction of rotation to an object to be moved. In all other directions, the forces are absorbed by the freely rotating rollers, such as auxiliary wheels, and not transmitted to the object. The arrangement of the omni directional conveyor wheels, the properties of the conveyor system module or conveyor system can be influenced. Among other things, the distribution of the transferable forces can be changed, which can be represented as a vector with direction and size. The direction having the vector with the largest amplitude is referred to as the main conveying direction. Thus, depending on the arrangement of the conveyor wheels or conveyor unit's conveyor system modules or conveyor systems for conveying or positioning of objects can be constructed. For example, if there are three conveyor units in a non-orthogonal configuration with the conveyor units at 120 ° to each other, a more even distribution of the transmissible forces can be achieved so that objects can be moved very effectively in all directions. Such an arrangement is very suitable for tasks in which objects must be moved or rotated in all directions (positioning). As an example of such a task reference is made to palletizing systems in which package layers are created for automatic palletizing as shown in figure 6.

3) In general, with an arrangement of three drives, a much larger torque transfer to an object is possible. By any adjustment of the arrangement of the conveyor wheels or conveyor units, the force distribution can be optimally adapted to the particular application. This can save energy. Finally, a symmetrical force distribution can be realized by a non-orthogonal arrangement of three or more conveyor wheels or conveyor units as shown in fig 6.

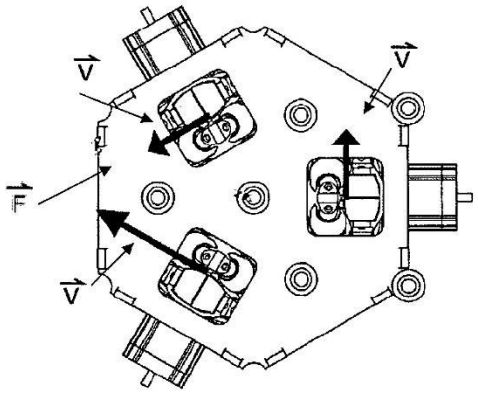


Figure 6

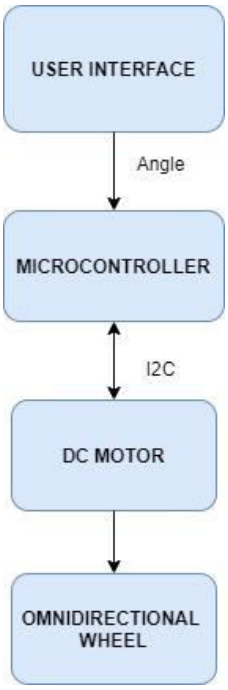
III. METHODOLOGY

As the world's population expands rapidly, and the demand for technology rises, manufacturers have larger orders to fill than ever before. Efficiency is the main concern; many are turning to modern automation system to improve their overall production rates. It's an excellent solution to a complex problem, but it's not without its fair share of challenges.Generally, manufacturing industries keep manufacturing same models with little variation in height, color, weight, shape. And here sorting plays an important role. In such cases industries can't bare human errors for sorting these products. Sorting is nothing but identify the object on conveyor system and diverting them to specific destination within an operation, such as different types of packing stations or parcel carrier doors.

Sorting is main concern in the industries to increase the efficiency and avoid human error so we looked different types of sorting method like Pneumatic based sorting, Robotic arm based sorting, conveyor system having a belt or multiple powered roller or wheels fitted between the wheels below the normal conveyor surface are unable convey the objects in all direction independently of one another. The main wrong about all these method is that they cannot sort in all direction at same time. This approach is used by omni directional conveyor sorting system developed by the cellumination and also by **Bremen Institute for Production andLogistics GmbH, 28359, Bremen, DE [DE 10 2012 014 181 A1]**

We studied the patent paper thoroughly and also system developed by cellumination from which we get that advantages of omni directional system over conventional sorting system. Takingall in consideration we developed this system.

IV. BLOCK DIAGRAM



V. WORKING

1) The user enters the direction in which the product should go.
2) According to the angles given by the user the controller decides the speed of each motor.
3) This speed is send to the motor using I2C protocol.
4) According to the speed and angles the omni directional wheels transmit forces in direction of rotation to an object to be moved.
5) This forces exerted by the omni directional wheels and motor will drive the object to its desired location.
6) To move the object to different direction or to move different object to another direction same above procedure follows.

VI. CONCLUSON

Taking into consideration all the points we propose the system which is user friendly, flexible, modular, multifunctional conveyor sorting system. We offer omni directional conveyor system which can move and rotate the object at same time, change the direction of object while moving and move the objects independently through different path.

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