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(54) **An automation system**

Automatisierungssystem

Système d'automatisation

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Description

Technical field

[0001] This invention relates to a system which reads the "Cylinder Information Card" on LPG cylinders, fills these cylinders automatically and removes the defective cylinders by pushing them from the conveyor line prior to filling.

Prior art

[0002] In order to continue to compete with the opportunities provided by new technologies on the international market, it is a must to rapidly complete the research & development, design & preparation for manufacturing and manufacturing processes. In order for the companies to keep up with this race, they have to apply modern methods such as computer assisted engineering, design and manufacturing. With the use of computers in the production lines, manufacturing technology has evolved and developed rapidly.

[0003] Computer technologies play a great role in the development of manufacturing technologies. Computers are made use of in many basic areas such as planning in manufacturing, design, manufacturing, shipping and management. However the development of new techniques and technologies are also made via computers. Enterprises have to display the necessary and sufficient effort in order not fall behind of this rapid change. Computer assisted design, computer assisted manufacturing, and computer integrated manufacturing, cellular manufacturing systems, flexible manufacturing systems and robots are the in the forefront among these new technologies. Although this technology is high-cost enterprises are adapting to these technologies in their plans for the future

[0004] As with industrial establishments in various sectors, industrial establishments in cylinder filling and distribution also develop and implement computer assisted production technologies. Thus, unnecessary procedures and processes leading to waste have been tried to be eliminated.

[0005] In the state of the art embodiment, tare information in the "Cylinder Information Card", which is placed on the valves and located on the LPG cylinders, is entered to the electronic scale by the filling staff and the filling is started manually by the same staff.

[0006] However in this system which is applied for rapid filling, the fact that tare information is entered manually by the filling staff slows down the system and decreases efficiency. Moreover; on the condition that the tare information on the filling information card is misread or this tare information is not entered correctly to the filling scale, too much or less gas is filled into the cylinders.

[0007] In the state of the art in Japanese patent application no. JP5026398, a device which verifies the tare weight during filling in order to prevent the wrong tare

information, which may be entered by filling staff and lead to too much or less filling, is described.

[0008] In the state of the art in another Japanese Patent application no. JP55074663, it is disclosed that prior to filling, filling information is read from a barcode placed on the cylinder via a manual POS device and this information is stored.

[0009] In the state of the art in another German Patent Application no. DE3214629, it is disclosed that under fill gas bottles are separated via an automation system which uses a computer system.

[0010] Moreover; in the European patent document no. EP0813022, it is disclosed that the empty cylinder is weighed prior to filling and the required quantity of gas is filled under the control of a computer. The flow meter on the tip of the filling hose transmits the quantity of the filled gas to the central control unit with a signal and this unit controls the opening and closure of the gas stop valves. In this system, the tare of the empty cylinder is weighed and the necessary gas quantity is calculated under the control of a computer and after filling, the cylinder is reweighed and controlled, and if the required weight is not reached it is pushed out of the conveyor line.

Brief description of the invention

[0011] The purpose of this invention is to produce an automation system which reads the tare information from a "Cylinder Information Card" using a camera system, operated without any staff under the control of a computer, transmits the cylinder's tare to the filling scale through electronic software and which performs the filling under the control of a computer.

[0012] Another purpose of this invention is to produce an automation system which enables the sensing of the cylinders without a "cylinder information card" or invalid cylinders by a computer via camera, and which pushes these cylinders from the conveyor line to the separation basket prior to filling.

Detailed description of the invention

[0013] An automation system for reaching the objectives of this invention is shown in the appended drawings, and

Figure 1 - is the schematic image of the automation system of the invention.

[0014] The parts illustrated in the Figures are numbered and the corresponding names of these numbers are given below:

1. Automation system
2. Reading Station
3. Camera
4. Separation piston
5. 51, 52, 53, 54 Sensor
6. Communication Circuit
7. Computer

8. Stopper
9. Separation Basket
10. Carousel
11. Conveyor
12. System panel
13. Lighting
14. Filling Scale
15. Driving Piston
16. Cylinder
17. Signal

[0015] The automation system (1) of the invention comprises basically: at least one specially illuminated (13) reading station (2), at least one camera (3) to read the "Cylinder Information Card", at least one separation piston (4) which pushes the cylinders not having a "Cylinder Information Card" or the invalid cylinders out of the conveyor line (11), sensors (5, 51, 52, 53, and 54) that control the system, at least one communication circuit to transmit the information received from the sensors (5, 51, 52, 53, and 54) to the computer, at least one system computer (7) which stores all the filling information, at least one software which enables the system to run without any errors and is installed in the system computer (7).

[0016] When the cylinder (16) moving on the conveyor line reaches reading station (2), the software senses, through the signal (17) received from sensors-1, that the cylinder (16) is under the camera (3). System stoppers (8) stop the cylinder at an exact point in this chamber where the camera can see the cylinder (16) and the "Cylinder Information Card" on it. Thanks to specific illumination (13) and adequate lighting in this station, the image of the tare information on "Cylinder Information Card" is taken by the camera (3) and the information can be read by the software installed in the system computer (7) using the image taken.

[0017] In similar dangerous sites containing explosive gas (LPG), explosion proof electric lamps are used for special lighting (13). Hence, fire or explosion that may stem from a spark from short circuit is prevented. Moreover, all the electrical components and the camera (3) also has to operate without being flammable.

[0018] "Cylinder information card" is an information storage and transmission card comprising tare information and is fixed on the valve on the cylinder (16) or on any point on the outer surface of the cylinder. In the reading station (2), information obtained as a result of reading is stored in the system computer (7).

[0019] With the signal (17) received from sensor-2 (51), it is understood that the cylinder has left the reading station (2) and has come to the area where the cylinder separation basket (9) is present. Since the cylinders (16) without cylinder information cards or with invalid cards (16) can not be read by the camera (3) despite the signal (17) coming from sensor-1 (5), the software classifies the cylinder (16) as defective, and pushes the defective cylinder to the cylinder separation basket (9) when it comes to the cylinder separation (9) part of the conveyor line

(11) via the signal (17) sent to the cylinder separation piston.

[0020] After the cylinders (16) which are not found to be defective as a result of the "Cylinder Information Card" reading pass the cylinder separation basket (9), sensor-3 (52) sends a signal (17) to the system computer (7). With the signal (17) received, the system software senses that the cylinder (16) is put on the relevant scale (14) on the revolving carousel (10) using cylinder driving piston (15). Moreover, with the signals (17) received from sensor-4 (53) and sensor-5, the filling scale (14) number upon which the cylinder (16) is put is determined and the tare and filling information of the relevant cylinder (16) is sent to this filling scale (16) automatically by the software. With the signal (17) sent to the filling scale (16), filling starts for the relevant cylinder (16).

[0021] The automation system (2) working without any defect depends on the software installed in the system computer (7). Reading of the cylinder (16) tare information, detection of the cylinder (16) flow, separation of inappropriate cylinders (16) and cylinders with invalid cards from the line, detection of the carousel (10) filling scale (14) number, starting filling and all the coherence is controlled by this software. Moreover, all the relevant photos, tare and filling information is stored in the system computer (7) by this software.

[0022] In one embodiment of the invention, in order to enable the communication circuit (6) between system computer (7) and sensors (5, 51, 52, 53 and 54), and the signals (17) received from filling line to be sensed by the system computer (7), voltage information is converted into RS-232 format. In order for the cylinder separation piston (4) and carousel cylinder driving piston (15) to operate, the information sent by the software is converted into voltage and sent to solenoid valves thus enabling the flow of air to the pistons (4 and 15).

[0023] Since the LCD screen used for the follow up of all the information related to automation system (1), the key pad placed for the control of the system and also the solenoid valves used for the control of piston movements (4 and 15) in the automation system, pressure switch and system panel (12) including photocell amplifiers are also explosion proof, the possibility of fire stemming from the short circuit in these parts is prevented.

[0024] Within this general concept, it is possible to develop many variation of the automation system (1) of the invention, and the invention is just like as described in the claims and can not be restricted with the examples explained here.

Claims

1. An automation system comprising at least one reading station (2), sensors (5, 51, 52, 53, and 54) which through signals, send the cylinder flow at various points in the system to the system computer and thus control the system, at least one communication cir-

cuit (6) which transmits the signals (17) received from sensors (5, 51, 52, 53, and 54) to the system computer (7), at least one system computer (7) which stores all the information related to filling, at least one software installed on the system computer which enables the system to work without any errors and controls the system; and **characterized in that** at least one camera (3), which is used for the detection of cylinder tare information obtained as a result of the "Cylinder Information Card" reading, and at least one separation piston used for separation of the cylinders (16) not having "Cylinder Information Card" or invalid cylinders (16) from the conveyor line (11) to the cylinder separation basket prior to filling.

2. An automation system (1) according to Claim 1, including an exproof camera (3) which is placed in any point in the station in such a way that it can see the "Cylinder Information Card" which may either be fixed on the valve of the cylinder (16) or may be at any point on the cylinder (16) in the reading station (2).
3. An automation system (1) according to Claim 1, having a special illuminated (13) reading station (2) including exproof lamps and light filters adjusting the light amount which prevents reflection on the "Cylinder Information Card"
4. An automation system according to one of the above mentioned claims, having a reading station (2) including the mechanism which senses that the cylinder (16) is below the camera (3) with the signal (17) received from sensor-1 (5), and which enables the cylinder (16) to stop, via stopper (8), at a point from where it can be seen by the camera (3).
5. An automation system (1) according to one of the abovementioned claims, which detects that the cylinder (16) is defective, via the software, on condition that the cylinder (16) coming to the reading station (2) with the signal (17) received from sensor-1 (5), does not have a "Cylinder Information Card" or on condition that it has an invalid card (16).
6. An automation system according to one of the abovementioned claims, in which the information that the cylinder (16) is driven to the carousel (10) with the signal received from sensor-3 (7), and that the cylinder (16) is driven to the relevant balance (14) on the revolving carousel (10) by the carousel cylinder driver piston (15) is detected by the software.
7. An automation system (1) according to one of the abovementioned claims, including the software installed on the system computer (7) which sends the tare and filling information of the relevant cylinder

(16) to the filling scale (14) automatically by detecting the filling scale (14) number upon which the cylinder (16) is placed, thus performing the filling automatically.

8. An automation system (1) according to one of the abovementioned claims, including an exproof system panel (12) collecting hardware regarding the system, having a LCD screen and a key pad which enables the device to be controlled by an operator and the operator to be informed, solenoid valves used under the control of the movements of piston (4 and 15), pressure switch and photocell amplifiers.

Patentansprüche

1. Ein Automatisierungssystem umfassend mindestens eine Lesestation (2), Sensoren (5, 51, 52, 53 und 54), , die den Durchfluss von Gaszylindern an verschiedenen Stellen des Systems durch Signale an den Systemcomputer weiterleiten und somit das System kontrollieren"mindestens einen Schaltkreis zur Datenübertragung (6), der die aus den Sensoren (5, 51, 52, 53 und 54) erhaltenen Signale (17) an den Systemcomputer (7) übermittelt, mindestens einen Systemcomputer (7), der die sämtliche Informationen bezüglich der Auffüllung speichert, sowie mindestens eine Software, die für die fehlerfreie Funktion des Systems am Systemcomputer (7) angeordnet ist und das System kontrolliert; und **gekennzeichnet durch** mindestens eine Kamera (3), die zur Erkennung des Leergewichts von Gaszylindern dient, das **durch** die Ablesung der "Zylinder Datenkarte" erhalten wird, und **durch** einen Trennkolben, der die Gaszylinder (16), die keine "Zylinder Datenkarte" haben oder die ungültigen Zylinder (16), bereits vor der Auffüllung aus dem Förderband (11) in den Trennmagazin aussortiert.
2. Ein Automatisierungssystem (1) umfassend eine feuerbeständige Kamera, die in der Lesestation an einer beliebigen Stelle angeordnet wird, so dass sie die "Zylinder Daten Karte"erkennen kann, welche entweder auf das Zylinderventil (16) fixiert oder in der Lesestation (2) auf einem Zylinder an einer beliebigen Stelle sein kann.
3. Ein Automatisierungssystem (1) umfassend eine Lesestation (2), die eine spezielle Beleuchtung (13) mit feuerfester Lampen sowie Lichtfilter hat, das die Lichtmenge regelt, die die Spiegelung auf der "Zylinder Daten Karte" verhindert..
4. Ein Automatisierungssystem (1) nach einem der vorstehend angegebenen Ansprüchen, umfassend eine Lesestation (2) mit einem Mechanismus, der durch den Signal (17), der von dem Sensor 1 (5)

erhalten wird, erkennt dass sich der Zylinder (16) unter der Kamera (3) befindet und der mittels einer Bremse (8) gewährleistet, den Zylinder (16), an einem Punkt zu halten, wo er von der Kamera (3) gesehen werden kann.

5. Ein Automatisierungssystem (1) nach einem der vorstehend angegebenen Ansprüchen, wobei es mittels der Software erkennt, dass der Zylinder (16) fehlerhaft ist und zwar mit der Voraussetzung, dass der zur Lesestation beförderte Zylinder (16) mit dem Signal (17), das von dem Sensor-1 (5) erhalten wurde, keine "Zylinder Datenkarte" hat oder mit der Voraussetzung dass es eine ungültige Karte (16) besitzt..
6. Ein Automatisierungssystem (1) nach einem der vorstehend angegebenen Ansprüchen, wobei die Information, dass der Zylinder (16) mit dem von dem Sensor-3 (7) erhaltenen Signal zum Umlaufförderer (10) gefahren ist und dass der Zylinder (16) auf dem rotierenden Umlaufförderer durch den Antriebskolben (15) des Umlaufförderers (10) zur nächsten Waage (14) geführt ist, durch die Software festgestellt wird.
7. Ein Automatisierungssystem (1) nach einem der vorstehend angegebenen Ansprüchen, umfassend eine Software, die im Systemcomputer (7) installiert ist und durch automatische Feststellung der Anzahl der Auffüllwaagen (14), auf dem der Zylinder (16) angeordnet ist, Daten zum Leergewicht und für die Auffüllung des betreffenden Zylinders (16) zur Auffüllwaage liefert und **dadurch** Füllung automatisch durchführt.
8. Ein Automatisierungssystem (1) nach einem der vorstehend angegebenen Ansprüchen, umfassend ein feuerfestes System Panel (12), welches die Ausrüstung hinsichtlich des Systems sowie ein LCD Display und eine Tastatur, wodurch gewährleistet ist, dass das Gerät von einer Bedienperson zu bedienen ist und zu ihrer Information dient und Solenoid Ventile" die bei der Kontrolle der Bewegungen des Kolben (4 und 15) verwendet werden sowie einen Druckschalter und Photozellen-Verstärker enthält..

Revendications

1. Système d'automation comportant au moins une stations de lecture (2), au moins un logiciel assurant l'opération sans faute dudit système et commandant ledit système en l'installant dans l'ordinateur de système, et au moins un ordinateur de système (7) mémorisant toutes les informations concernant le remplissage, au moins un circuit de communication (6) conduisant les signaux (17) reçus des senseurs (5, 51, 52, 53, et 54), lesdits senseurs (5, 51, 52, 53, et 54) contrôlant le système en communiquant les flux

de cylindre dans certaines points du système à l'ordinateur de système par voie des signaux, **caractérisé en ce que** ledit système comporte un piston de séparation utilisé pour séparer au moins une caméra (3) utilisée afin de percevoir l'information de tare de cylindre obtenue en lisant « la carte de données de cylindre » et les cylindres (16) n'ayant pas « la carte de données de cylindre », c'est-à-dire les cylindres invalides (16) de la ligne de convoyeur (11) à la corbeille de séparation avant le remplissage.

2. Un système d'automation (1) selon la revendication 1, **caractérisé en ce qu'il** comporte une camera incombustible (3) qui pourrait être trouvée dans un point quelconque sur le cylindre (16) dans la station de lecture (2) ou qui pourrait être fixée à la valve de cylindre (16), située dans une manière de pouvoir voir « la carte de données de cylindre ».
3. Un système d'automation (1) selon la revendication 1, **caractérisé en ce qu'il** comporte une station de lecture (2) avec l'éclairage spécial (13) possédant les lampes incombustibles et les filtres de lumière utilisés pour régler la quantité de lumière, empêchant le réfléchissement sur « la carte de données de cylindre. »
4. Un système d'automation selon l'une des revendications indiquées ci-dessus, **caractérisé en ce qu'il** comporte une station de lecture (2) possédant un mécanisme percevant que le cylindre (16) se trouve sous la camera (3) à l'aide de signal (17) reçu du senseur 1 (5) et assurant l'arrêt du cylindre (16) dans un point qui pourrait être vu par camera (3) à travers d'un frein (8).
5. Un système d'automation (1) selon l'une des revendications indiquées ci-dessus, **caractérisé en ce qu'il** détermine le fait que le cylindre (16) est endommagé par voie de logiciel à condition que le cylindre (16) arrivant à la station de lecture (2) et dont le signal (17) est reçu par senseur 1 (5) ne possède pas une « carte de données de cylindre » ou possède une carte invalide (16).
6. Un système d'automation selon l'une des revendications indiquées ci-dessus, **caractérisé en ce qu'il** est perçu ici par logiciel que le cylindre (16) est conduit à la pyramide rotative par le signal reçu du senseur 3 (7) et que le cylindre (16) est mis en équilibre intéressé (14) dans la pyramide rotative (10) par piston de pilote de cylindre de pyramide rotative (15).
7. Un système d'automation (1) selon l'une des revendications indiquées ci-dessus, **caractérisé en ce qu'il** comporte un logiciel envoyant l'information de tare et remplissage du cylindre concerné (16) à la

balance de remplissage (14) en percevant automatiquement le nombre de la balance de remplissage (14) se trouvant installée dans l'ordinateur de système et sur laquelle est mis en place le cylindre et donc réalisant l'opération de remplissage.

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8. Un système d'automation (1) selon l'une des revendications indiquées ci-dessus, **caractérisé en ce qu'il** comporte un panneau incombustible de système (12) sur lequel se trouvent un écran LCD et son clavier assurant l'administration du dispositif par opérateur et l'avertissement de l'opérateur, le maintien du système et de l'équipement intéressé ensemble, valves solénoïdes utilisées sous le contrôle des mouvements de piston (4 et 15), interrupteur de pression et amplificateurs photocellules.

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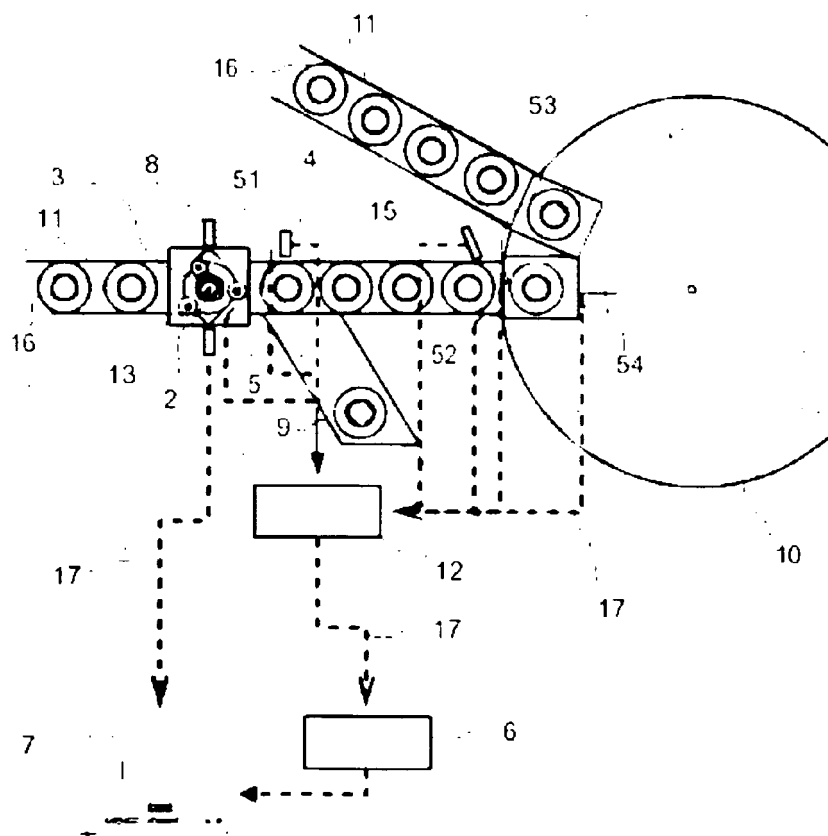
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FIGURE 1



REFERENCES CITED IN THE DESCRIPTION

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