PATENT SPECIFICATION

DRAWINGS ATTACHED

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COMPLETE SPECIFICATION

Gas Container-Filling Apparatus

We, CALOR GAS (DISTRIBUTING) COMPANY LIMITED, a British Company of Coombelands, Addlestone, Weybridge, Surrey, do hereby declare the invention for which we pray that a patent may be granted to us, and the method by which it is to be performed to be particularly described in and by the following statement:—

This invention relates to apparatus for filling containers and is concerned potentially with apparatus for facilitating and accelerating the filling of gas storage cylinders by increasing the flow of storage cylinders to and from a series of cylinder filling machines.

In accordance with the invention there is provided an apparatus for filling containers comprising a plurality of filling stations arranged in an arc about a central position, a radial conveyor pivoted adjacent one end thereof for pivotal movement about said central position and adapted to register at the other end thereof with any one of said filling stations, means for assembling empty containers in the vicinity of said central position, and means for moving an empty container from the vicinity of central position onto said radial conveyor, whereby an empty container may be conveyed to any one of said filling stations in dependence upon the pivotal position of the radial conveyor.

In order that the invention may be more clearly understood one embodiment thereof will now be described, by way of example, with reference to the accompanying drawings, in which:—

Figure 1 shows a plan view of the embodiment;

Figure 2 shows a side elevation, to an enlarged scale, of a filling machine as viewed in the direction of arrow A of Figure 1;

Figure 3 shows, to an enlarged scale, a side elevation of the turntable and radial conveyor of Figure 1;

Figure 4 shows an end view of Figure 3; and

Figure 5 shows a plan view of a modification of a part of the embodiment.

Referring to Figure 1, the apparatus comprises an input conveyor 1 along which empty gas storage cylinders 2 are driven towards a turntable 3. An intermediate radial conveyor 4 connects the turntable with a selected one of six filling position conveyors 5, in a manner to be described in greater detail. Each filling position conveyor is associated with a gas-cylinder filling machine 6 (see also Fig. 2), the combination constituting a filling station, and each conveyor leads onto an arcuate chain conveyor 7 which is arranged to convey filled cylinders to a roller output conveyor 8.

As shown in Figures 3 and 4, the turntable 3 has a central boss 20 which engages one end of a vertical shaft 9 for rotation of the turntable about said shaft. A continuous chain 10, driven by a motor (not shown), passes around the rim of the turntable for rotating the latter. Shaft 9 is supported in a stand 11 and carries, on a bearing 12 located beneath the turntable, one end of a girder structure 13 for supporting the radial conveyor 4. The other end of the structure 13 is supported by a pair of wheels 14 resting on the floor surface beneath the structure, the plane of rotation of the wheels being such as to permit the structure to be pivoted about the shaft 9. The radial conveyor 4, mounted on the structure 13, is inclined to the horizontal sufficiently to cause a gas cylinder at the turntable end thereof to gravitate towards the other end 15, which end 15 extends a short distance beyond the structure 13. The turntable end of the radial conveyor is shaped to fit closely the rim of the turntable and, furthermore, the conveyor is provided with guide-rails 16, one of which extends at 17 over the surface of the turntable towards the rim of boss 20.

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Extending downwards from the structure 13 and situated between the wheels 14 is a latch 18 which is adapted to run over the floor as the structure is pivoted and to engage, under bias of a spring 19, recesses 21 in the floor surface, one such recess being located in front of each filling position conveyor 5 and positioned so as to register the radial conveyor 4 with the appropriate filling position conveyor. The latch 18 may be lifted from a recess 21 by means of a suitable linkage controlled by a lever 22 mounted at the side of the radial conveyor.

As will be appreciated, the turntable 3 serves to convey gas cylinders from the input conveyor 1 to the radial conveyor 4 regardless of the pivotal position of the latter. Thus, the turntable is so dimensioned that the distance from the rim of boss 20 to the edge of the turntable is sufficient to support a cylinder. Furthermore, an ejector arm 23 is provided for ejecting cylinders from the turntable onto the radial conveyor. Said ejector arm pivots about a pivot 24, supported by guide-rail extension 17, and is operated by a pneumatic ram 25 the piston of which is connected to one end of the ejector arm. The other end of the ejector arm is normally biassed against the rim of boss 20 and moves towards the radial conveyor on operation of the pneumatic ram. The ram is operated through any known means by any one of foot-actuated press switches 26, one of which is located adjacent each filling machine 6.

In order to control the flow of cylinders from the input conveyor 1 onto the turntable, a vertically extending stop member 27 is provided at the turntable end of the input conveyor. This stop member is movable vertically either to engage an oncoming cylinder, as shown in Figure 1, or, in its retracted position, to lie below the surface of the conveyor so as to allow a cylinder to pass onto the turntable. Movement of the stop member is effected by any suitable known means controlled by any one of the press switches 26. Thus, actuation of a press switch 26 simultaneously effects pivoting of ejector arm 23 and movement of stop member 27.

The arcuate conveyor 7 is arranged on the perimeter of a circle centred on the shaft 9 and the filling machines 6 are equally spaced along the conveyor. Each filling machine comprises an attachment 28 for connecting a gas cylinder with a gas supply and may be of any suitable known form. Each conveyor 5 is positioned to receive a cylinder from the radial conveyor 4 and serves to convey said cylinder to the filling position and then onto the arcuate conveyor 7. A check and weighing apparatus 29 is situated along the output conveyor 8.

It will be understood that the invention is not limited to apparatus including just six filling machines as, of course, any number of machines may be included within the limits of convenience and practicability. However, with six machines it has been found convenient to arrange these approximately 13 feet from the turntable and spaced at 30° intervals along an arc of 120°.

In operation, an operator stands at the end 15 of the radial conveyor which is registered with the first filling position conveyor 5. Empty cylinders are conveyed along the input conveyor 1 and held by the stop member 27. The operator operates the appropriate press switch 26 to release a cylinder pass stop member 27 onto the continuously rotating turntable 3. Although arm 23 pivots at the time the switch 26 is operated, the arm is able to return to its normal position against the rim of hub 20 without fouling the oncoming cylinder.

The turntable moves the cylinder up against ejector arm 23, and guide-rail extension 17, and the operator again operates the switch 26. This causes arm 23 to eject the first cylinder off the turntable onto the inclined radial conveyor and this cylinder runs down onto the conveyor 5 and into the filling position. In the meantime, stop member 27 has moved to pass a second cylinder onto the turntable which cylinder is moved up against the ejector arm.

The operator connects the filling attachment 28 of the first filling machine to the first cylinder and sets the appropriate controls of the filling machine so as to cause the cylinder to be filled with gas. The operator then operates lever 22 to withdraw latch 18 from its recess 21 and propels the structure 13 round to the second filling machine. Latch 18 automatically engages the corresponding recess 21 to register the radial conveyor. The second cylinder is conveyed and connected to the second filling machine in the manner aforedescribed and the operator repeats the various operations until a sixth cylinder has been connected to the sixth filling machine.

The structure 13 is then returned to register with the first filling position conveyor 5 by which lapse of time the first cylinder has filled and automatically cut off the gas supply. The operator pushes this cylinder down the conveyor 5 onto the continuously-running arcuate conveyor 7, after which he commences to feed on a further empty cylinder and progresses to the next and subsequent filling positions repeating the operations. Meanwhile the first and subsequent filled cylinders are conveyed in order along the arcuate conveyor and onto the output conveyor 8.

In order to obtain maximum output from the apparatus, the time elapsing between connecting one empty cylinder to a filling machine and connecting the next cylinder to that machine is substantially equal to the time taken to fill a cylinder with gas.

By means of the present invention, a high rate of output can be achieved, under conditions where the actual speed of gas transfer is comparatively slow, with the minimum of

labour and full occupation of the operator's time.

In the modification shown in Figure 5, the turntable is dispensed with and a circular length of roller conveyor 30 is arranged with one end connected to the output end of conveyor 1 and centred about the pivot of the radial conveyor. The input end of the radial conveyor 4 abuts the outer periphery of the conveyor 30 and carries an arcuate guide rail 31 which extends part way around conveyor 30 and moves with the structure 13. Also, a fixed guide rail 32 extends around the inner periphery of conveyor 30 and extends at 33 across the end of the latter. Furthermore, ejector arm 23 and ram 25 are replaced by a ram 34, the piston of which pushes directly against the side of a cylinder towards the radial conveyor 4.

Although the operation of the modified embodiment is self evident, it will be noted that stop member 27 is not required with this arrangement, empty cylinders being held by guide-rail 33 and ram 34 ejecting the particular cylinder selected by pivoting the structure 13.

WHAT WE CLAIM IS:—

1. An apparatus for filling containers comprising a plurality of filling stations arranged in an arc about a central position, a radial conveyor pivoted adjacent one end thereof for pivotal movement about said central position and adapted to register at the other end thereof with any one of said filling stations, means for assembling empty containers in the vicinity of said central position, and means for moving an empty container from the vicinity of said central position onto said radial conveyor, whereby an empty container may be conveyed to any one of said filling stations in dependence upon the pivotal position of the radial conveyor.

2. An apparatus as claimed in claim 1, wherein the means for assembling empty containers comprises a turntable located at the central position, said one end of the radial conveyor being adjacent to and rotatable around the periphery of the turntable.

3. An apparatus as claimed in claim 1, wherein the means for assembling empty containers comprises a circular conveyor centred about said central position, said one end of the radial conveyor being adjacent to and rotatable around the outer periphery of the circular conveyor.

4. An apparatus as claimed in claim 2, wherein the means for moving an empty container comprises a pivotally mounted ejector arm extending over part of said turntable and operable to sweep a container from said turntable onto the radial conveyor.

5. An apparatus as claimed in claim 4, comprising a fluid actuated ram for operating said ejector arm.

6. An apparatus as claimed in claim 3, wherein the means for moving an empty container comprises ejector means located within the inner periphery of the circular conveyor and mounted on the radial conveyor or the supporting structure thereof, said ejector means being movable towards said one end of the radial conveyor and operable to push a container off the circular conveyor onto the radial conveyor.

7. An apparatus as claimed in claim 6, comprising a fluid actuated ram for operating said ejector means.

8. An apparatus as claimed in claim 5 or 7, wherein the fluid actuated ram is a pneumatic ram.

9. An apparatus as claimed in any one of claims 5, 7 or 8, wherein operation of the ram is controllable from the vicinity of any one of said filling stations.

10. An apparatus as claimed in claim 9, wherein the means for controlling the operation of the ram is a foot-operated switch.

11. An apparatus as claimed in any one of the previous claims, wherein the means for assembling empty containers includes an input conveyor.

12. An apparatus as claimed in claim 11 as appendant to claim 2 and claim 11 as appendant to any claim appendant to claim 2, comprising a movable stop member located at the output end of said input conveyor and operable to engage and stop a container passing along the input conveyor.

13. An apparatus as claimed in claim 12, wherein operation of said stop member is controllable from the vicinity of any one of said filling stations.

14. An apparatus as claimed in claims 10 and 13, wherein the means for controlling the operation of the stop member is said foot-operated switch.

15. An apparatus as claimed in any one of the previous claims, wherein said other end of the radial conveyor is supported on wheels resting on the floor surface.

16. An apparatus as claimed in any one of the preceding claims, including a latch located on said radial conveyor or the supporting structure thereof adapted to engage any one of a plurality of recesses in the floor surface, one recess being associated with each one of said filling stations, whereby the radial conveyor may be registered and maintained in register with a filling station.

17. An apparatus as claimed in any one of the preceding claims, wherein each filling station includes a filling position conveyor each of which is arranged to form an extension of the radial conveyor when the latter is in register with the corresponding filling station.

18. An apparatus as claimed in claim 17, including an arcuate conveyor centred on said central position and linking each of said filling position conveyors, whereby filled containers may be conveyed away from said filling sta-

labour and full occupation of the operator's time.

In the modification shown in Figure 5, the turntable is dispensed with and a circular length of roller conveyor 30 is arranged with one end connected to the output end of conveyor 1 and centred about the pivot of the radial conveyor. The input end of the radial conveyor 4 abuts the outer periphery of the conveyor 30 and carries an arcuate guide rail 31 which extends part way around conveyor 30 and moves with the structure 13. Also, a fixed guide rail 32 extends around the inner periphery of conveyor 30 and extends at 33 across the end of the latter. Furthermore, ejector arm 23 and ram 25 are replaced by a ram 34, the piston of which pushes directly against the side of a cylinder towards the radial conveyor 4.

Although the operation of the modified embodiment is self evident, it will be noted that stop member 27 is not required with this arrangement, empty cylinders being held by guide-rail 33 and ram 34 ejecting the particular cylinder selected by pivoting the structure 13.

WHAT WE CLAIM IS:—

1. An apparatus for filling containers comprising a plurality of filling stations arranged in an arc about a central position, a radial conveyor pivoted adjacent one end thereof for pivotal movement about said central position and adapted to register at the other end thereof with any one of said filling stations, means for assembling empty containers in the vicinity of said central position, and means for moving an empty container from the vicinity of said central position onto said radial conveyor, whereby an empty container may be conveyed to any one of said filling stations in dependence upon the pivotal position of the radial conveyor.

2. An apparatus as claimed in claim 1, wherein the means for assembling empty containers comprises a turntable located at the central position, said one end of the radial conveyor being adjacent to and rotatable around the periphery of the turntable.

3. An apparatus as claimed in claim 1, wherein the means for assembling empty containers comprises a circular conveyor centred about said central position, said one end of the radial conveyor being adjacent to and rotatable around the outer periphery of the circular conveyor.

4. An apparatus as claimed in claim 2, wherein the means for moving an empty container comprises a pivotally mounted ejector arm extending over part of said turntable and operable to sweep a container from said turntable onto the radial conveyor.

5. An apparatus as claimed in claim 4, comprising a fluid actuated ram for operating said ejector arm.

6. An apparatus as claimed in claim 3, wherein the means for moving an empty container comprises ejector means located within the inner periphery of the circular conveyor and mounted on the radial conveyor or the supporting structure thereof, said ejector means being movable towards said one end of the radial conveyor and operable to push a container off the circular conveyor onto the radial conveyor.

7. An apparatus as claimed in claim 6, comprising a fluid actuated ram for operating said ejector means.

8. An apparatus as claimed in claim 5 or 7, wherein the fluid actuated ram is a pneumatic ram.

9. An apparatus as claimed in any one of claims 5, 7 or 8, wherein operation of the ram is controllable from the vicinity of any one of said filling stations.

10. An apparatus as claimed in claim 9, wherein the means for controlling the operation of the ram is a foot-operated switch.

11. An apparatus as claimed in any one of the previous claims, wherein the means for assembling empty containers includes an input conveyor.

12. An apparatus as claimed in claim 11 as appendant to claim 2 and claim 11 as appendant to any claim appendant to claim 2, comprising a movable stop member located at the output end of said input conveyor and operable to engage and stop a container passing along the input conveyor.

13. An apparatus as claimed in claim 12, wherein operation of said stop member is controllable from the vicinity of any one of said filling stations.

14. An apparatus as claimed in claims 10 and 13, wherein the means for controlling the operation of the stop member is said foot-operated switch.

15. An apparatus as claimed in any one of the previous claims, wherein said other end of the radial conveyor is supported on wheels resting on the floor surface.

16. An apparatus as claimed in any one of the preceding claims, including a latch located on said radial conveyor or the supporting structure thereof adapted to engage any one of a plurality of recesses in the floor surface, one recess being associated with each one of said filling stations, whereby the radial conveyor may be registered and maintained in register with a filling station.

17. An apparatus as claimed in any one of the preceding claims, wherein each filling station includes a filling position conveyor each of which is arranged to form an extension of the radial conveyor when the latter is in register with the corresponding filling station.

18. An apparatus as claimed in claim 17, including an arcuate conveyor centred on said central position and linking each of said filling position conveyors, whereby filled containers may be conveyed away from said filling sta-

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tions.

19. An apparatus as claimed in claim 18, including checking and weighing apparatus to which filled containers are conveyed by said arcuate conveyor.

20. Apparatus for filling containers arranged constructed and adapted to operate substantially as herein described with reference to the accompanying drawings.

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PROVISIONAL SPECIFICATION

Gas Container-Filling Apparatus

We, CALOR GAS (DISTRIBUTING) COMPANY LIMITED, a British Company of Coombelands, Addlestone, Weybridge, Surrey, do hereby declare this invention to be described in the following statement:—

This invention relates to an installation for filling cylinders or other containers and is concerned more particularly with an installation for facilitating and accelerating the filling of gas storage cylinders by increasing the flow of storage cylinders to and from a series of cylinders filling machines.

The invention consists broadly of an installation comprising a turntable, a feed conveyor for feeding empty cylinders onto said turntable, an intermediate conveyor for feeding the empty cylinders from said turntable to each of a series of filling stations arranged in an arc, and an arcuate outlet conveyor for conveying the filled cylinders from said filling stations to a cylinder weighing station at a discharge point of the installation, said intermediate conveyor being movable in an arc about the axis of the turntable to bring it into alignment or register with each of said filling stations successively.

In order that the invention may be more clearly understood one particular embodiment thereof will now be described in greater detail.

The installation comprises a turntable rotatably mounted on a vertical column or axle and driven continuously by a chain drive from a feed conveyor for feeding cylinders to be filled substantially tangentially onto one side of said turntable. Extending radially from said turntable is an intermediate conveyor for feeding the empty cylinders successively to a series of cylinder filling stations arranged in an arc at predetermined spaced intervals. The intermediate conveyor is in the form of a gravity roller conveyor and is pivoted at its inlet end to the column or axle on which the turntable is mounted. At its outlet end the intermediate conveyor is supported on rollers or wheels whereby it can be moved in an arc about its pivot to bring the outlet end thereof into alignment or register with each of the filling stations successively. Below the outlet end of said intermediate conveyor is a spring loaded latch which is adapted to engage a suitable stop in front of each of said filling stations to insure that said conveyor is held in correct alignment or register with each of the respective filling stations. A suitably located release lever or the like is provided for manually releasing the latch from each of the stops when the conveyor is to be moved from one filling station to the next mounted on the frame structure of the intermediate conveyor is a pneumatically operated means for transferring the empty cylinders individually from the turntable to the intermediate conveyor. This means comprises pneumatic ram mounted at the inlet end of the intermediate conveyor and connected with one end of a pivoted lever which when operated by said ram, moves about its pivot to push a gas storage cylinder from the turntable onto the conveyor. The pneumatic ram is operated by a foot pedal or the like arranged at the outlet end of the conveyor and said foot pedal or the like is also arranged to control a stop on the feed conveyor so that operation of the foot pedal not only controls the feed of the gas cylinders from the turntable to the intermediate conveyor but also controls the feed of said cylinder from the feed conveyor to the turntable.

The filling stations, as above described, arranged in equally spaced relationship in an arc of a circle and are of any suitable known construction. In a preferred arrangement six filling stations are arranged at about 13 feet from the turntable in an arc of about 120°. Around the outside of the filling stations is an arcuate chain conveyor onto which the cylinders, when filled, are moved from the filling station and by which the filled cylinders are conveyed to a check and weighing station at the discharge point of the conveyor.

In operation an operative stands at the outlet end of the intermediate conveyor adjacent the first filling station. He then operates the pneumatic ram whereby an empty cylinder is moved from the turntable onto the intermediate gravity conveyor along which it moves to the filling station. The operative then connects the cylinder with the filling means at said filling station and moves the intermediate conveyor on to the next filling station where another cylinder is connected up at the second filling station. This operation is repeated until there is a cylinder at each filling station. The operator then moves the intermediate conveyor back to the first filling station when he removes the then filled cylinder from that station onto the outlet conveyor and connects another empty cylinder at said first filling station and so on. It will be understood that the timing is such that by the time the operative has dealt with

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the empty cylinder at the last of the filling stations and returned to the first filling station the cylinder at the first filling station will be filled and can be removed onto the outlet conveyor.

It will also be understood that by means of the present invention a high rate of output can be achieved with the minimum of labour.

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