Sept. 23, 1958 R. A. WHITBECK 2,853,048

SPRAY WASHER AND APPLICATOR

Filed June 25, 1956 4 Sheets-Sheet 1

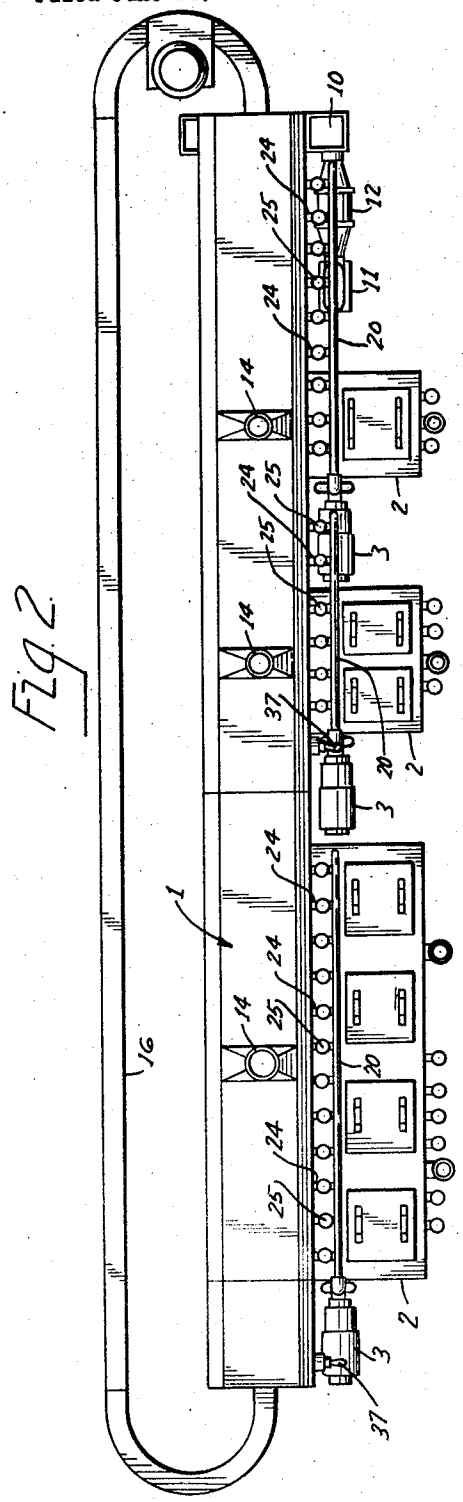


Fig. 2.

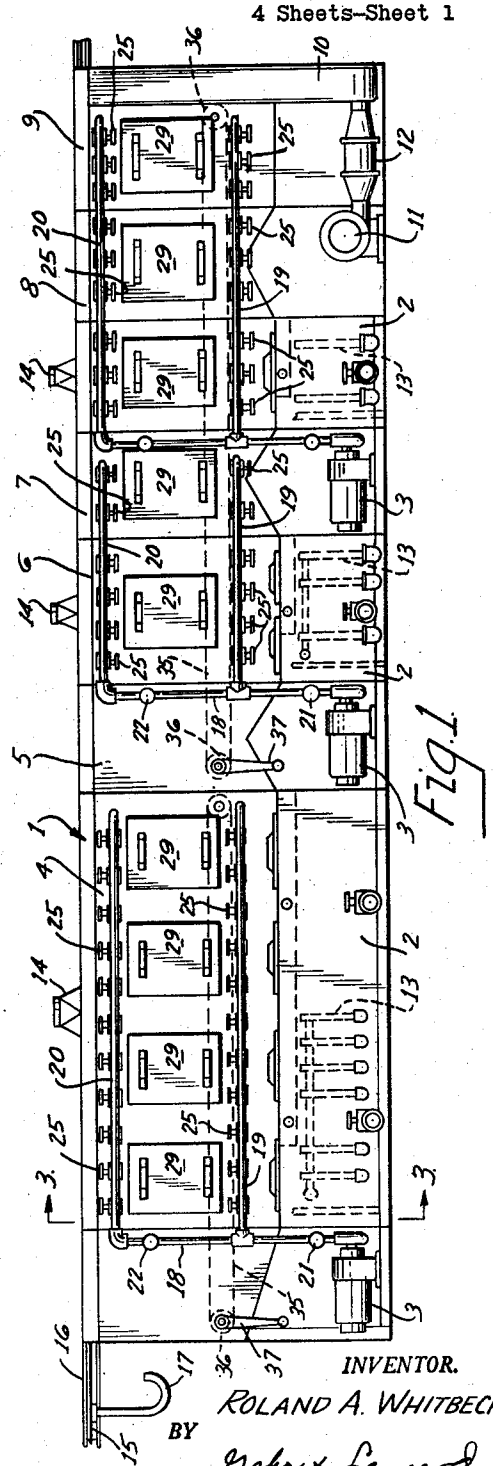


Fig. 1.

INVENTOR.
ROLAND A. WHITBECK
BY
Gehr & Leonard,
his ATTORNEYS.

Sept. 23, 1958 R. A. WHITBECK 2,853,048

SPRAY WASHER AND APPLICATOR

Filed June 25, 1956 4 Sheets-Sheet 2

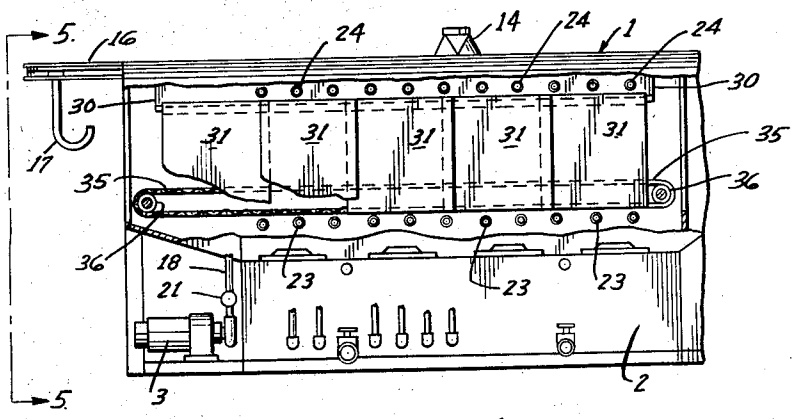


Fig. 4

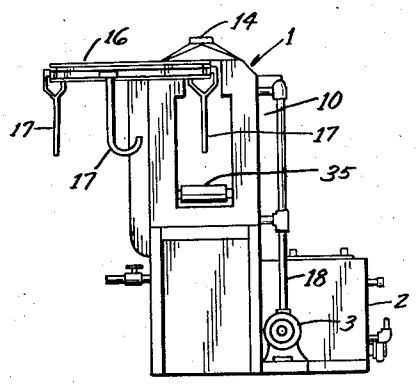


Fig. 5

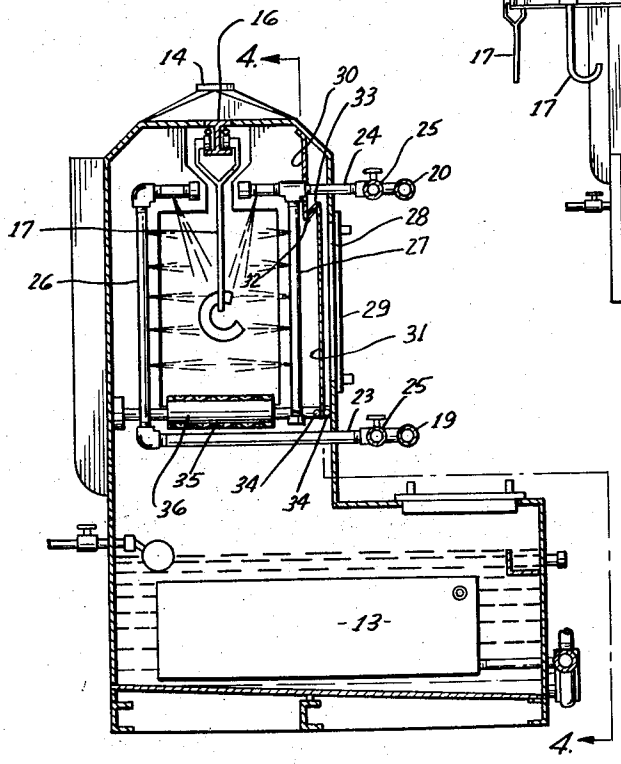


Fig. 3

INVENTOR.
ROLAND A. WHITBECK
BY
Dehr & Leonard,
His ATTORNEYS.

Sept. 23, 1958 R. A. WHITBECK 2,853,048

SPRAY WASHER AND APPLICATOR

Filed June 25, 1956 4 Sheets-Sheet 3

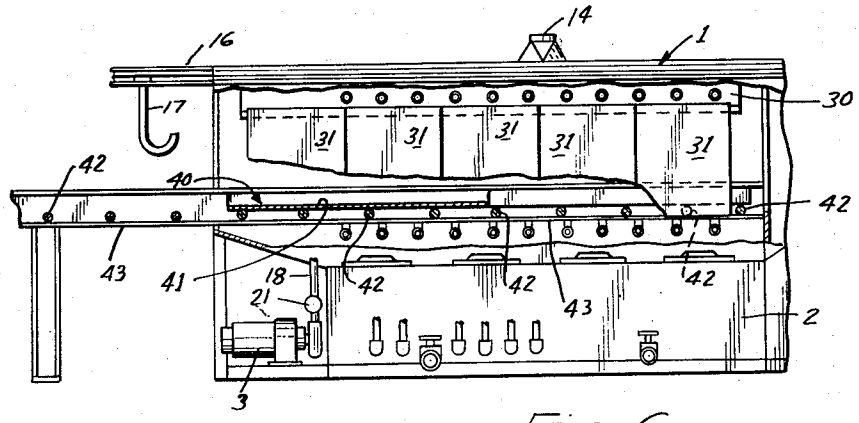


Fig. 6.

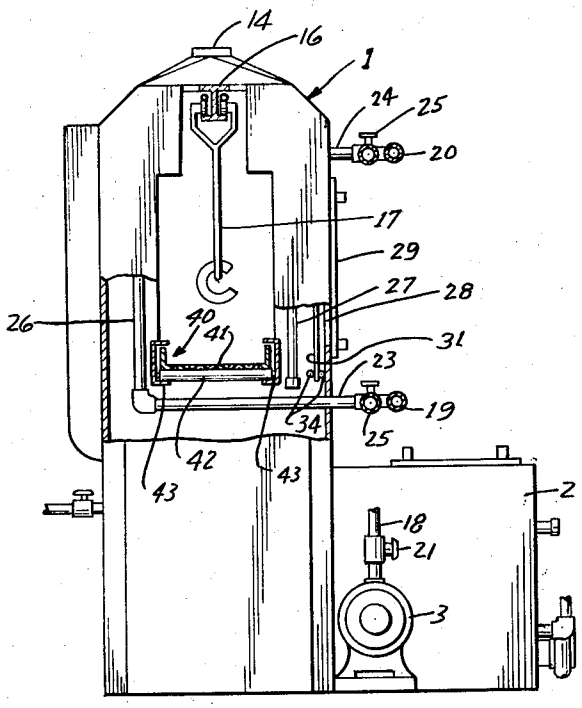


Fig. 7.

INVENTOR.
ROLAND A. WHITBECK
BY
Gehr & Leonard,
ATTORNEYS.

Sept. 23, 1958 R. A. WHITBECK 2,853,048

SPRAY WASHER AND APPLICATOR

Filed June 25, 1956 4 Sheets-Sheet 4

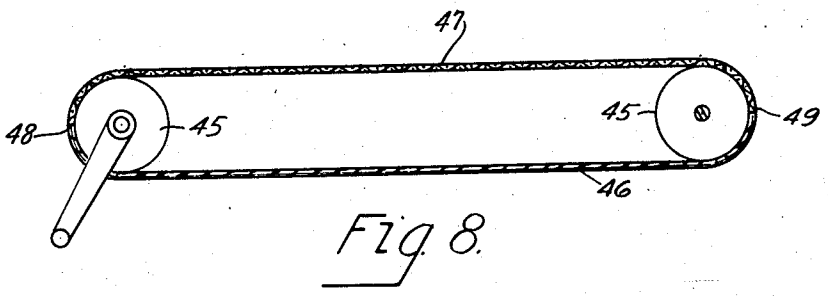


Fig. 8.

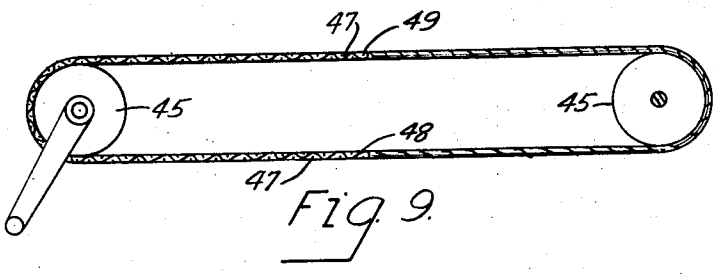


Fig. 9.

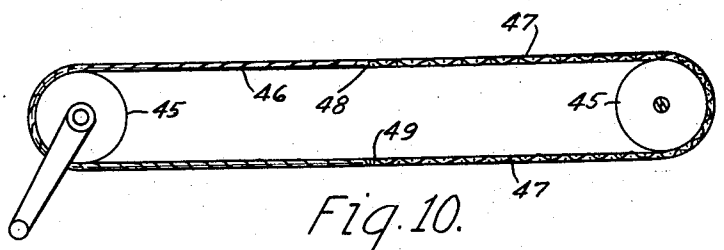


Fig. 10.

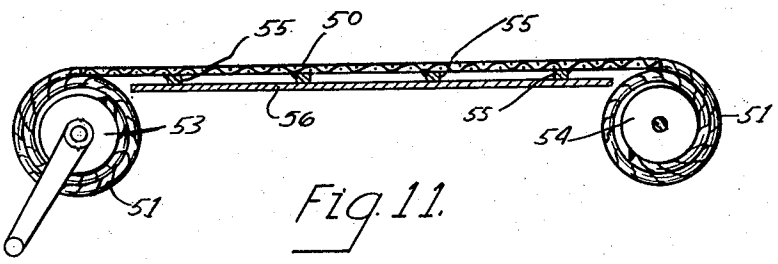


Fig. 11.

INVENTOR.
ROLAND A. WHITBECK
BY
Dehr & Leonard,
his ATTORNEYS.

United States Patent Office 2,853,048 Patented Sept. 23, 1958

2,853,048

SPRAY WASHER AND APPLICATOR

Roland A. Whitbeck, Lorain, Ohio, assignor to Pennsalt Chemicals Corporation, Philadelphia, Pa., a corporation of Pennsylvania

Application June 25, 1956, Serial No. 593,724

18 Claims. (Cl. 118—314)

This invention relates to a spray washing apparatus for spray washing, spray coating, and combinations thereof, and particularly to a spray washing and coating apparatus of the tunnel type in which the articles to be spray washed or coated are conveyed by a suitable conveyor through the tunnel past suitable spray nozzles.

Spray washing and coating apparatus of this general character is well known in the art as also are a number of disadvantages which are inherent in the prior structures. As examples, servicing the individual spray units is difficult and time consuming, removing articles which fall off of the conveyor while in the tunnel is time consuming and expensive, and preventing the escape of washing or coating solutions from the tunnel through the access or service doors onto the floor at the worksite is not possible.

More particularly, the spray units of the entire tunnel or spraying compartment of prior apparatus are controlled by a single valve so that all of the units in a compartment must be closed down if any one of them is to be serviced. Furthermore, when articles have fallen from the conveyor while in the tunnel, the entire line must be stopped and a large number of articles removed from the conveyor through the access doors along the sides of the tunnel so as to afford access such that a man can climb into the tunnel, or reach in with a suitable instrument, and remove the fallen articles through the service openings. Again, it is impossible to prevent the loss of coating material out of the access or service doors of the prior type. The sprayed material necessarily accumulates and runs down the side walls to the door openings as well as accumulates on the inner surfaces of the doors themselves when the doors are closed. Attempts to provide seals around the edges of the doors has not been satisfactory because the accumulation of sprayed material on the inside faces of the doors and on the seals themselves drips off of the open doors onto the floor and surrounding fixtures of the apparatus.

Seals adequate to prevent leakage when the doors are closed are very expensive and usually subject to rapid deterioration due to chemicals. The doors must be very carefully fitted.

In accordance with the present invention, these disadvantages are overcome by providing means whereby individual spray units may be shut off and serviced while the remaining units continue to operate; by arranging the apparatus so that articles accidentally displaced from the conveyor in the tunnel may be readily removed without stopping the operation of the apparatus or opening the service doors; by providing means whereby leakage of the spray material out of the doors and dripping thereof from the doors when the doors are open are eliminated. All of the advantages are accomplished by a very simple inexpensive apparatus.

Various other advantages will become apparent from the following description wherein reference is made to

the drawings illustrating a preferred embodiment of my invention, and in which:

Fig. 1 is a side elevation of an apparatus embodying the principles of the present invention;

Fig. 2 is a top plan view of the apparatus illustrated in Fig. 1;

Fig. 3 is an enlarged cross sectional view taken on the line 3—3 of Fig. 1;

Fig. 4 is a fragmentary side elevation of the left end of the apparatus illustrated in Fig. 1, part thereof being shown in section for clearness in illustration;

Fig. 5 is an end elevation of the apparatus, taken on the line 5—5 of Fig. 4;

Fig. 6 is a view similar to Fig. 4 and illustrates a modification of the invention;

Fig. 7 is an enlarged view similar to Fig. 3 illustrating the modified form of the invention shown in Fig. 6;

Fig. 8 is a diagrammatic illustration of a modified form of a conveyor for removing fallen articles from the apparatus;

Figs. 9 and 10 are diagrammatic illustrations of different operating positions of the conveyor illustrated in Fig. 8; and

Fig. 11 is a diagrammatic illustration of another modified conveyor for removing fallen articles from the apparatus.

Referring to the drawings, the apparatus comprises a tunnel 1 which is supported on suitable tanks 2 in which the solutions to be sprayed may be contained and from which it is pumped by suitable pumps, such as indicated at 3, to spray units distributed along the interior of the tunnel.

In the form illustrated, the tunnel is divided into a spray washing portion 4, a drain or blowoff portion 5, a rinsing compartment 6, a second draining compartment 7, a coating compartment 8 and a drying compartment 9, to the latter of which hot air is supplied through a suitable duct 10 by means of a blower 11.

The air is heated by a steam coil 12 interposed between the blower and duct 10. Suitable steam coils 13 may be provided in the tanks for maintaining the solutions therein at the proper temperatures. The tunnel is provided with exhaust flues 14 distributed along its length for removing various fumes, vapors and the like.

For conveying through the tunnel the articles to be sprayed, an endless conveyor 15 is provided. The conveyor illustrated is one which operates on an overhead track 16 and has depending therefrom suitable conveyor hooks 17 on which the articles to be sprayed are suspended so as to pass in proper position between the sprays of each spray unit, as best illustrated in Fig. 3.

The sprays of the various compartments are essentially the same in structure and arrangement and so only those in the compartment 4 will be described in detail. As illustrated, the solution from the tank 2 of the compartment 4 is pumped by a suitable pump 3 through a conduit 18 which in turn is connected to lateral supply lines 19 and 20, respectively. Control valves 21 and 22 are provided in the line 18 for controlling the discharge therefrom. The feed lines 19 and 20 extend along one side of the tunnel exteriorly thereof and are provided at spaced intervals along their lengths with suitable sets of take-off pipes 23 and 24, respectively, which lead to the interior of the tunnel. Each take-off pipe has interposed between it and its feed line a suitable control valve, such as indicated at 25.

In the form illustrated, each bottom take-off pipe 23 feeds one spray unit 26 under the control of its valve 25 and each upper take-off pipe 24 feeds one spray unit 27 under the control of its associated valve 25. Thus each spray unit may be controlled independently of each

of the others and may be shut off completely without changing the operation of the others.

As mentioned, it is desirable to provide for ready access to the interior of the tunnel from the side and accordingly a large number of access doorways **28**, each normally closed by a hinged door **29**, are provided along at least one side of the tunnel. The doors **29** need not be sealed inasmuch as provision is made to prevent the spray material from reaching the interior of the doors or the interior wall surfaces of the wall of the tunnel defining the doorways **28**.

In order to prevent the sprayed material from reaching the interior wall surfaces of the tunnel in which the doorways **28** are provided and from reaching the inside surface of the doors **29** themselves, baffle means are provided.

The baffle means includes a partition wall **30** which preferably extends downwardly from the roof of the tunnel alongside but spaced inwardly from the side wall of the tunnel in which the doorways **28** are provided. The partition wall **30** is imperforate and at its upper end is in sealed engagement with the roof of the tunnel so that no sprayed solution or material can escape and pass to the adjacent side wall of the tunnel except by passing under the lower edge of the partition wall **30**. The baffle means are so disposed laterally of the tunnel between the sprays and door openings as normally to block the passage of spray material to the doorways and the associated side wall of the tunnel. Further, the baffle means extend from the bottom of the partition wall **30** to a level substantially below the bottom of the doorways **28**. These baffle means are imperforate and in cooperation with the partition wall prevent the spray material from reaching the doors, doorways, and the side wall in which the doorways are provided. Thus they provide a deflecting curtain against which the spray material can impinge and down which it can drain to a level below the door openings **28**.

In the form illustrated, this baffle means comprises, in effect, a curtain which may be in the form of a plurality of rigid metal plates **31**.

As mentioned hereinbefore, it is desirable that the interior of the tunnel and the spray units be readily accessible through the door openings **28**. Accordingly, it is desirable to make the baffle means in a form in which they can be removed from in front of any one of the doorways, selectively, without being removed from in front of the other doorways. As best illustrated in Fig. 4, these plates are preferably of a width endwise of the tunnel greater than the width of the doorways and they are arranged so that the lateral margins of each overlaps the lateral margins of those adjacent to it in their normal operating positions.

A convenient manner of providing for this effect is illustrated in Fig. 3 in which the lower edge of the partition wall **30** has an exterior upturned flange **32** disposed at an acute angle to the plane of the wall **30**, thus forming a continuous hook ledge. Each plate **31**, in turn, has an inside downturned flange **33** which likewise is at an angle to the plane of its associated plate **31** so that it can hook over the flange or ledge **32** of the partition wall and thus suspend the plate therefrom. Also, with this arrangement, any one of the plates can be hooked in face to face relation with another plate and each plate can be slid independently of the others lengthwise of the ledge **32**. Accordingly, each of the plates **31** may be removed from in front of a doorway simply by sliding it lengthwise of the tunnel with its flange **33** in sliding engagement with the upper surface of the flange **33** on the next adjacent plate and with its face in juxtaposition with the next adjacent plate. Thus, without discontinuing the operation of the apparatus as a whole, any door **29** can be opened, the aligned baffle plate removed from in front of it so that the spray unit and interior of the tunnel is accessible without any escape of solution through the doorway. By virtue of the valves **24** and **25**, of course, the particular units next adjacent a particular doorway which are sufficiently close so that the spray therefrom could reach the doorway when the baffle is removed, can be turned off.

In order to retain the baffles in proper spaced position from the side wall of the tunnel, suitable guide rods **34** may be provided along the tunnel and engage the baffle plates **31** along their lower margins.

Another problem presented, however, is in the removal of articles which may fall from the conveyor within the tunnel due to the force of the sprays, blow-offs, or the like. In order to retrieve such pieces conveniently, an additional conveyor means is provided in the tunnel, this conveyor means being disposed below the level of the path of the articles being conveyed by the first conveyor and so arranged that articles falling from the first conveyor will be received on the additional conveyor means.

The additional conveyor means may be provided in all of the compartments and, in the form shown, the one in the spray washing compartment **4** is separate from the one in the remaining compartments. Since both additional conveyor means are the same in form and function, only that in the spray washing compartment **4** will be described in detail.

This additional conveyor means preferably is in the form of a screen belt **35** which passes around rotary drums **36**, one of which is connected to a crank **37**, as illustrated in Fig. 1. Thus any article falling on the additional belt **35** may be conveyed readily to the open end of the tunnel and there discharged by the operator merely by operation of the crank **37**.

This particular belt type conveyor **36** has an advantage in that it does not require additional floor space but in those instances in which floor space is not a factor, a less expensive form of additional conveyor means, such as illustrated in Figs. 6 and 7, may be employed. This form of additional conveyor means comprises an elongated tray **40**, the bottom **41** of which is in the form of a screen. Suitable supporting rollers **42** are provided in the tunnel for supporting the tray **40** so that it can readily be rolled out of the end of the tunnel. This requires, of course, a suitable track **43** on the outside of the tunnel. The arrangement shown in Fig. 6 has one advantage in that it can be completely removed from within the tunnels to afford access to any equipment therebeneath.

Another arrangement of additional conveyor means which affords ready access to the tunnel therebeneath is illustrated in Figs. 8 through 10. Instead of placing the belt entirely around the drums, as illustrated in Fig. 4, the drums **45** similar to the drums **36** may be provided and a pair of cables **46** passed around the drums. A screen **47** of a length to extend from one end of the spray zone to the other end of the spray zone of the compartment **4** is secured on the cables which are disposed at the margins of the screen. With the drums in one rotated position the screen **47** is disposed so that its ends **48** and **49** are at the right and left ends, respectively, of the associated compartment. If it is desired to gain access to something beneath the screen the drums **45** can be rotated to dispose the screen as illustrated in Fig. 9 in which case the whole right end half of the compartment is accessible at a level below the screen. If the left end half of the compartment is to be made accessible at the level below the screen, then the drums **45** may be rotated to dispose the screen in the position shown in Fig. 10, in which the entire left hand end of the compartment is accessible.

Another arrangement for the same general purpose is illustrated in Fig. 11 in which the screen **50** is connected at its ends to a pair of laterally spaced cables **51**, the cables being wound on drums **53** and **54**, respectively. By reeling the cables on one drum and unreeling them

from the other the screen **50** can be removed entirely from the tunnel and wrapped on the associated one of the drums.

If desired, the screen **50** may be provided with stiffeners, such as transverse rods **55**, which at their ends operate or slide along trackways, such as the track **56**.

In all cases the screen conveys articles thereon to an open end of the tunnel where the articles may be removed readily.

Thus in all of the arrangements described, additional conveyor means for ready removal of articles from the tunnel are provided but at the same time ready access is afforded to the interior of the tunnel at levels beneath the additional conveyor means.

Having thus described my invention, I claim:

1. In a spray apparatus, a tunnel, spray units distributed along the interior of the tunnel, conveyor means in the tunnel to convey articles therethrough and past the spray units, said tunnel having a generally upright side wall with a plurality of doorways therein arranged and shaped to afford ready access for workmen to the spray units and to the path along which articles are to be conveyed by the conveyor means, respectively, service doors respective to the doorways, generally upright movable baffle means in the tunnel and disposed between the spray units and doorways so as normally to block the passage of sprayed material to the doorways and doors, supporting means supporting the baffle means for movement of each baffle sufficiently out of alignment with its associated doorway, selectively, while the other baffles remain in alignment with their associated doorways, respectively, to afford ready access for workmen to the spray units and to the path along which the articles are to be conveyed by the conveyor means.

2. The apparatus according to claim 1 characterized in that the baffles are in the form of selectively, individually movable panels.

3. The apparatus according to claim 2 characterized in that the said supporting means and panels are adapted for supporting the panels by the supporting means in groups of at least two panels in overlapping face to face relation between said side wall and the spray units and individually in front of the doors, selectively.

4. A spray coating apparatus according to claim 2 characterized in that each panel is of such size and shape that if laid over its associated doorway it would overlie its associated doorway and completely cover the same and extend outwardly, in the plane of the doorway, beyond the entire peripheral limit of its associated doorway.

5. A spray coating apparatus according to claim 2 characterized in that said tunnel has an imperforate partition wall extending downwardly from a level above the spray units, the supporting means support the panels on the partition wall with the upper margin of the panels engaged with the partition wall so as to prevent passage therebetween of the material being sprayed.

6. Apparatus according to claim 5 characterized in that the supporting means comprise an upturned flange along the lower edge of the partition wall and a downturned flange along the upper edge of each panel and resting on said upturned flange.

7. The spray apparatus according to claim 1 characterized in that control valve means are connected to the spray units for turning off the units, selectively, whereby the units adjacent a doorway may be turned off for servicing while the remainder of the units continue in operation.

8. The apparatus according to claim 1 characterized in that additional conveyor means are provided in the tunnel and spaced below the level of the primary conveyor means and arranged to receive articles accidentally falling off of the primary conveyor means, and are operable independently of the operation of the primary conveyor means for conveying the fallen articles from the location at which they fall onto the additional conveyor means to a location at which they are readily accessible to an operator for removal.

9. In a spray apparatus, a tunnel, spray units distributed along the interior of the tunnel, primary conveyor means in the tunnel to convey articles therethrough and past the spray units in position for spraying thereby, said tunnel having a generally upright side wall with a plurality of doorways therein, each doorway being arranged and shaped to afford ready access for workmen to the spray units and to the path along which articles are to be conveyed by the conveyor means, service doors respective to the doorways, generally upright movable baffle means in the tunnel and disposed between the spray units and doorways so as normally to block the passage of sprayed material to the doorways and doors, supporting means supporting some of the baffle means for movement sufficiently out of alignment with each doorway, selectively to permit ready access by workmen through that doorway as to which the baffle means is out of alignment to the spray units and to the path along which the articles are to be conveyed by the conveyor means, while the other baffle means remain in alignment with the other doorways, control valves connected to the spray units for turning off the units, selectively, whereby the units adjacent any doorway may be turned off for servicing while the remainder continue in operation, additional conveyor means in the tunnel spaced below the level of the primary conveyor means and arranged to receive articles accidentally falling off of the primary conveyor means, and said additional conveyor means being operable independently of the operation of the primary conveyor means for conveying the fallen articles from the location at which they fall onto the additional conveyor means to a location at which they are readily accessible to an operator for removal.

10. In a spray apparatus, a tunnel, spray units distributed along the interior thereof, primary conveyor means in the tunnel for conveying articles therethrough past the spray units, additional conveyor means in the tunnel spaced below the level of the primary conveyor means and operable independently of the operation of the primary conveyor means and arranged to receive articles accidentally falling off of the primary conveyor means and operable for conveying the fallen articles from the location at which they fall onto the additional conveyor means to a location at which they are readily accessible to an operator for removal.

11. Apparatus according to claim 7 characterized in that said additional conveyor means is an endless belt conveyor with the belt disposed beneath the level of the primary conveyor means.

12. Apparatus according to claim 10 characterized in that said additional conveyor means is disposed beneath the primary conveyor means at least from the first spray unit to the last spray unit in the direction of travel of the primary conveyor means through the tunnel.

13. Apparatus according to claim 10 characterized in that said additional conveyor means is arranged to convey an article thereon out of an end of the tunnel.

14. Apparatus according to claim 10 characterized in that said additional conveyor means is a tray, and means are provided for supporting the tray for movement into and out of the tunnel endwise of the tunnel.

15. Apparatus according to claim 10 characterized in that said additional conveyor comprises a flexible tension means, a flexible supporting conveyor connected to the flexible tension means so as to be moved thereby endwise in the tunnel.

16. Apparatus according to claim 15 characterized in that spaced rotatable drums are provided and arranged to be driven rotatably, the flexible tension means passes around the drums for driving thereby to effect said movement of the flexible supporting conveyor, and the flexible supporting conveyor is arranged to pass around the drums.

17. The spray coating apparatus according to claim 16 characterized in that the flexible tension means are adapted to reel onto the drums, and the flexible supporting conveyor is arranged to be drawn onto the drum by winding the flexible tension means thereon and itself to be wound about the drum by continued rotation thereof.

18. Apparatus according to claim 10 characterized in that said additional conveyor comprises a flexible supporting conveyor, a rotatable drum, said conveyor being adapted to be wound on the drum, means to rotate the drum, and means to return the flexible supporting conveyor to unwound starting position.

References Cited in the file of this patent

UNITED STATES PATENTS

2,129,249	Trahey	Sept. 6, 1938
2,246,602	Schultz et al.	June 24, 1941
2,250,238	Smith	July 22, 1941
2,643,761	Wagner et al.	June 30, 1953
2,761,373	Owen	Sept. 4, 1956