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Wright

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[54] **HIGH PRESSURE WATER IMPACT SPRAYING SYSTEM FOR MAGNETIC CAN HANGERS**

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[73] Assignee: **Crown Cork & Seal Company, Inc.,** Philadelphia, Pa.

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[52] **U.S. Cl.** ..... **15/302,** 15/306 B, 134/70, 134/104

[51] **Int. Cl.** **A47l 5/38**

[58] **Field of Search** ..... 15/302, 306 B, 316 R, 405; 134/62, 82, 165, 61, 63, 70, 104

[56] **References Cited**

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3,284,828	11/1966	Jennings et al.	15/21 D
3,355,324	11/1967	Catzen	134/102 X
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Attorney, Agent, or Firm—Woodcock, Washburn, Kurtz & Mackiewicz

[57] **ABSTRACT**

A means for automatically cleaning magnetic can hangers after they have been used to convey cans through a spray painting station. High pressure water without solvents is sprayed on the hangers from nozzles critically positioned with respect to the path of travel of the hangers through the cleaning station. The impact of the water spray as well as a follow-up application of high velocity air remove the paint deposits. A special covering for the hangers facilitates the paint removal and does not interfere with production runs as the hangers are conveyed through the cleaning station in essentially the same manner as through the painting station. The spray cleaning system utilizes a recirculation system and filtering system which aid the cleaning system in effectively reducing pollution in comparison with prior cleaning methods.

4 Claims, 7 Drawing Figures

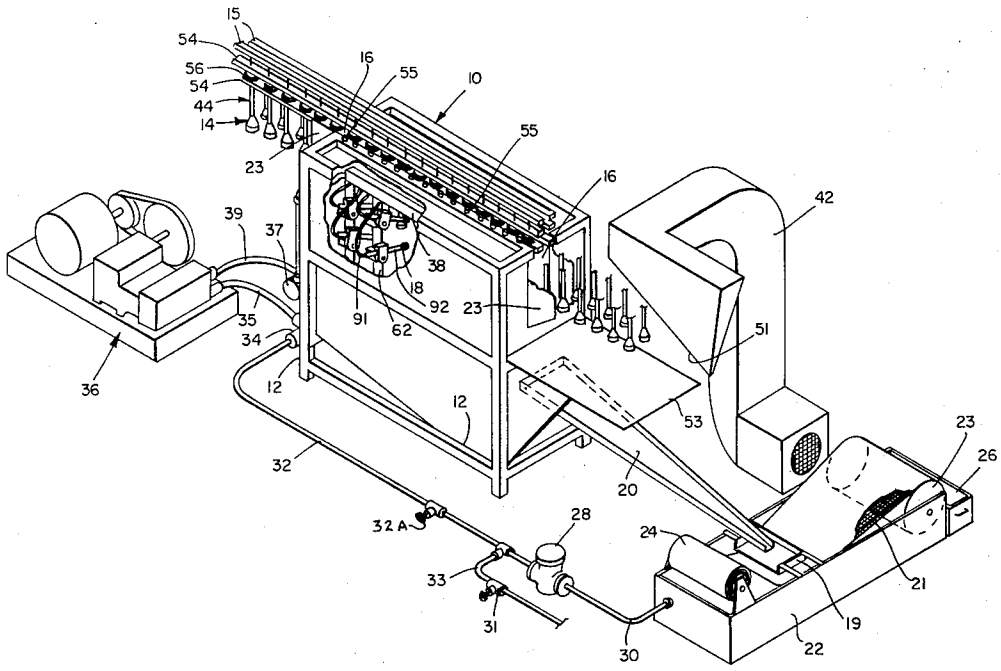
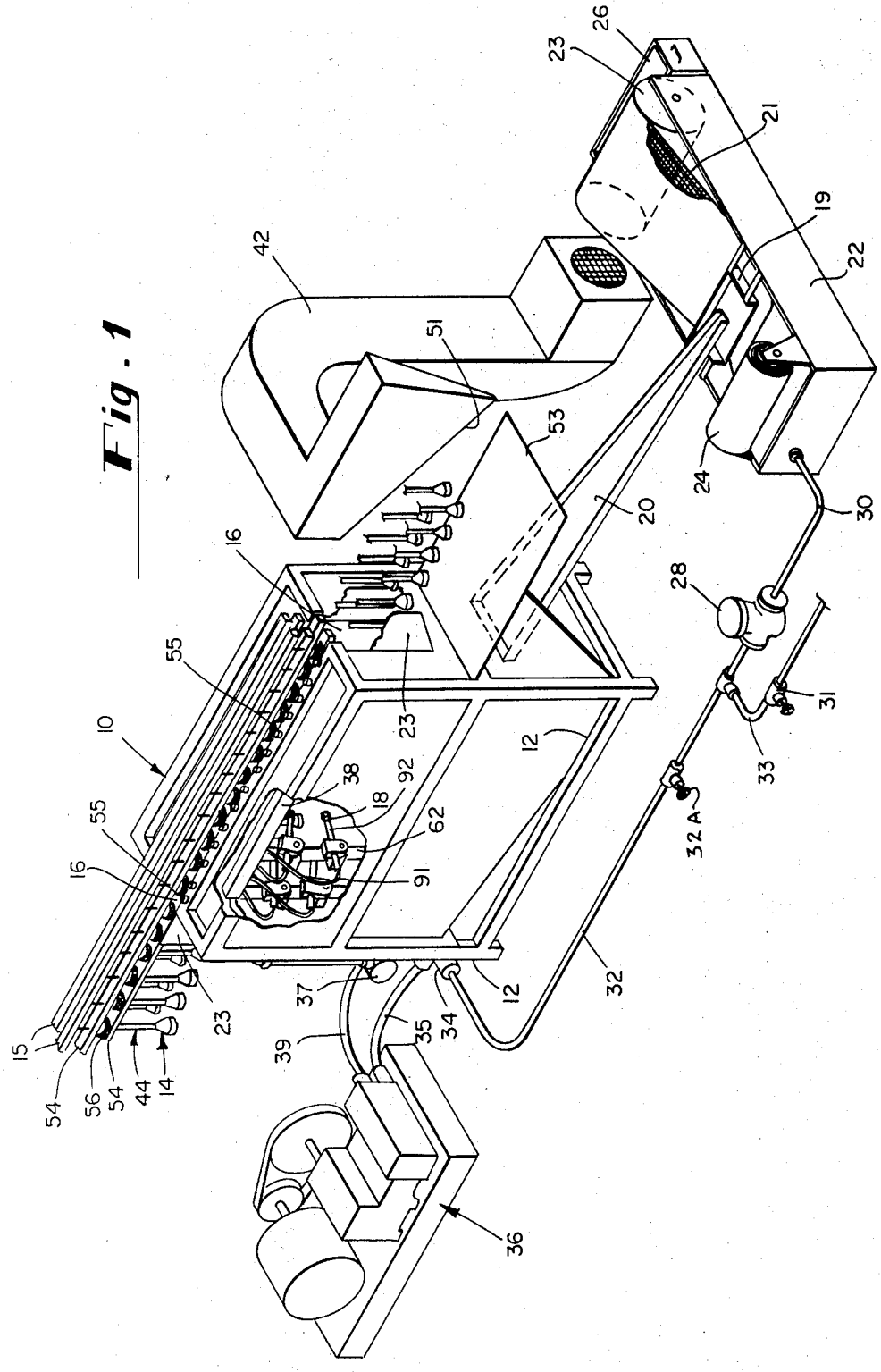


Fig. 1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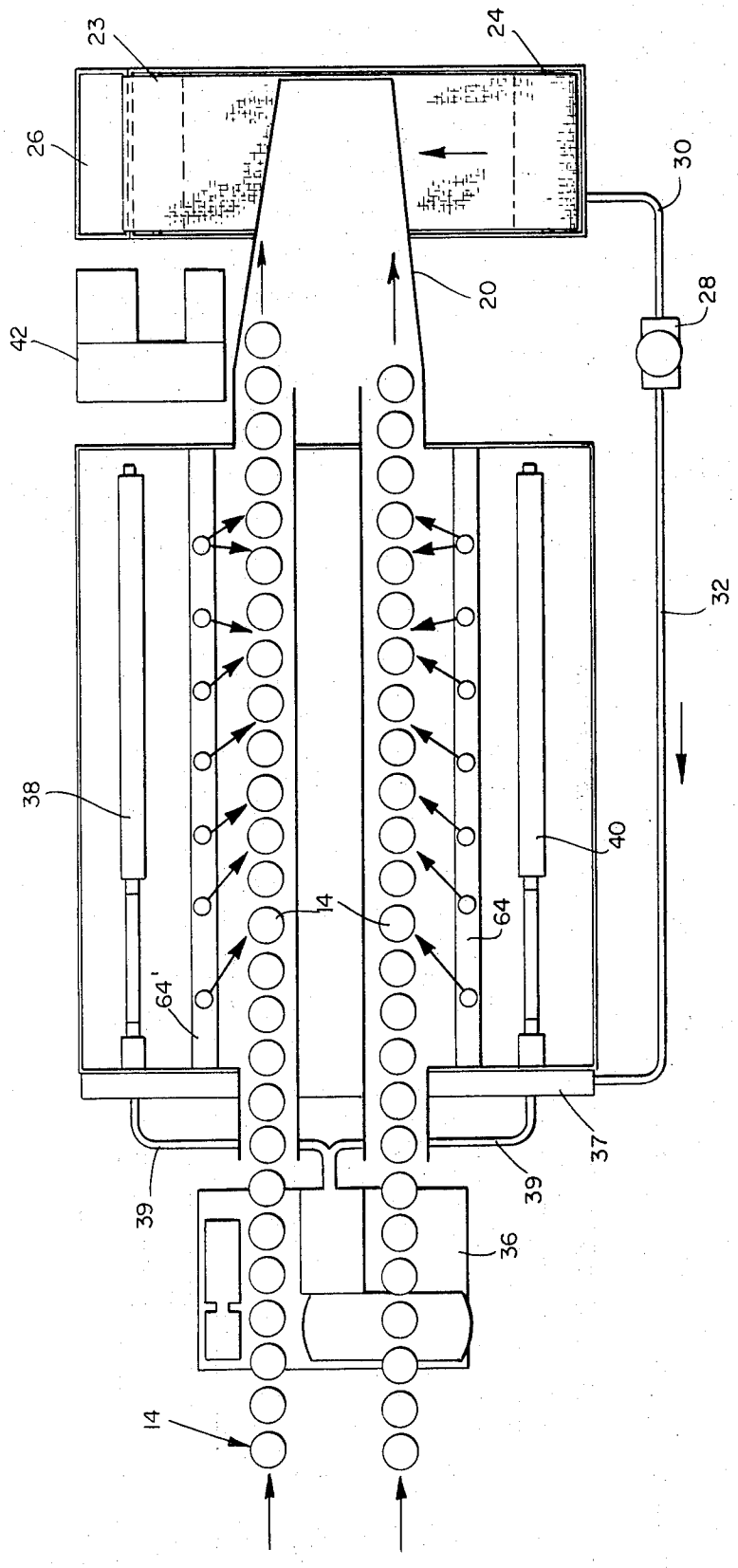

Fig. 2

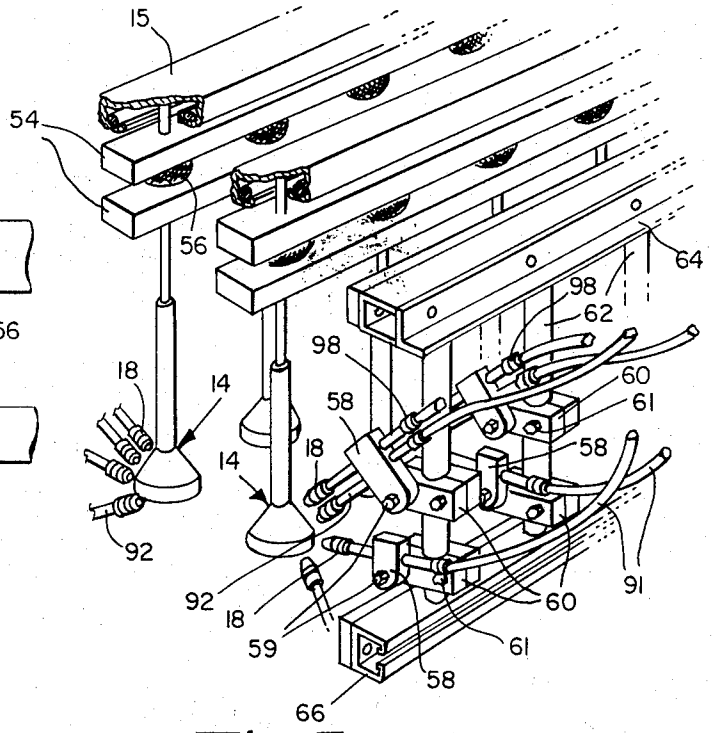

Fig. 3

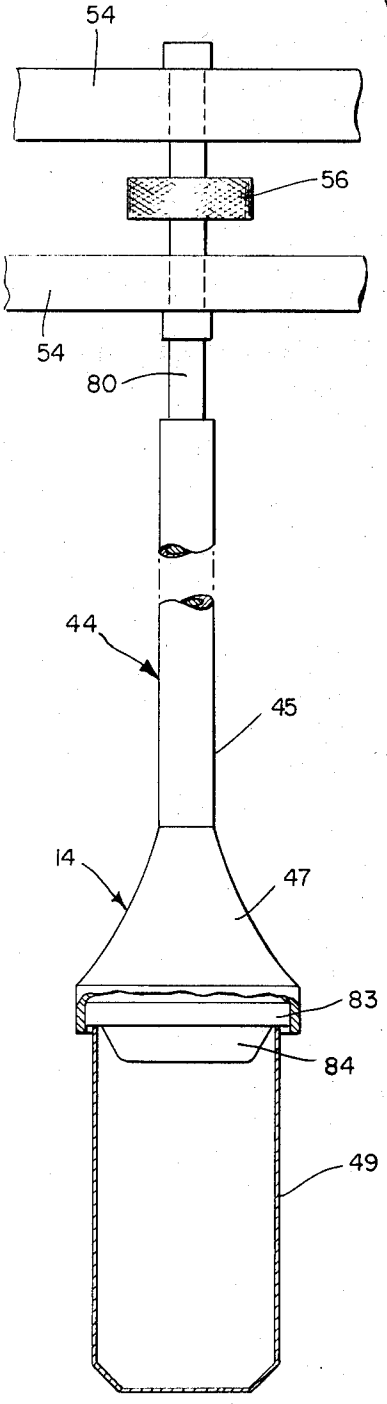

Fig. 5

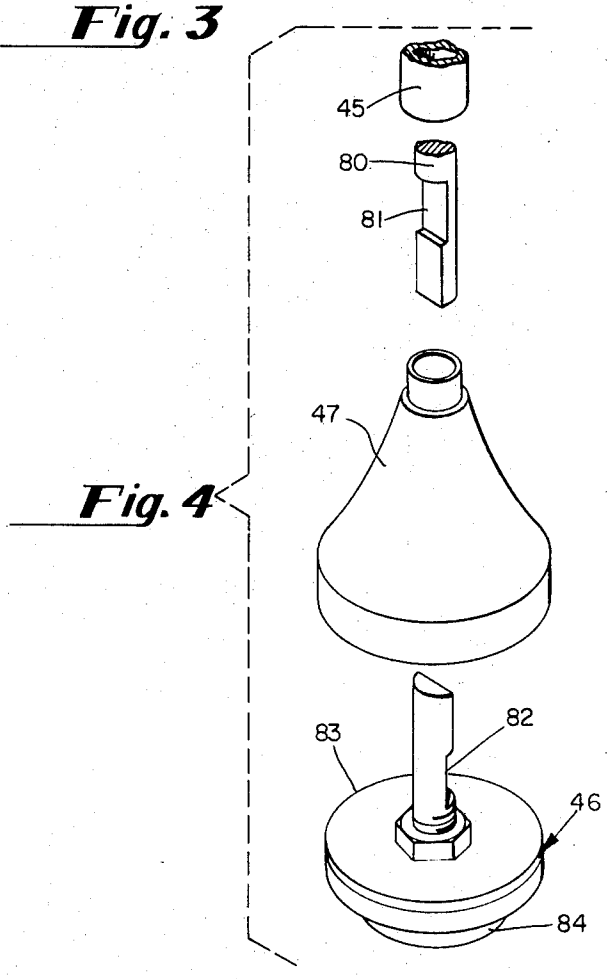

Fig. 4

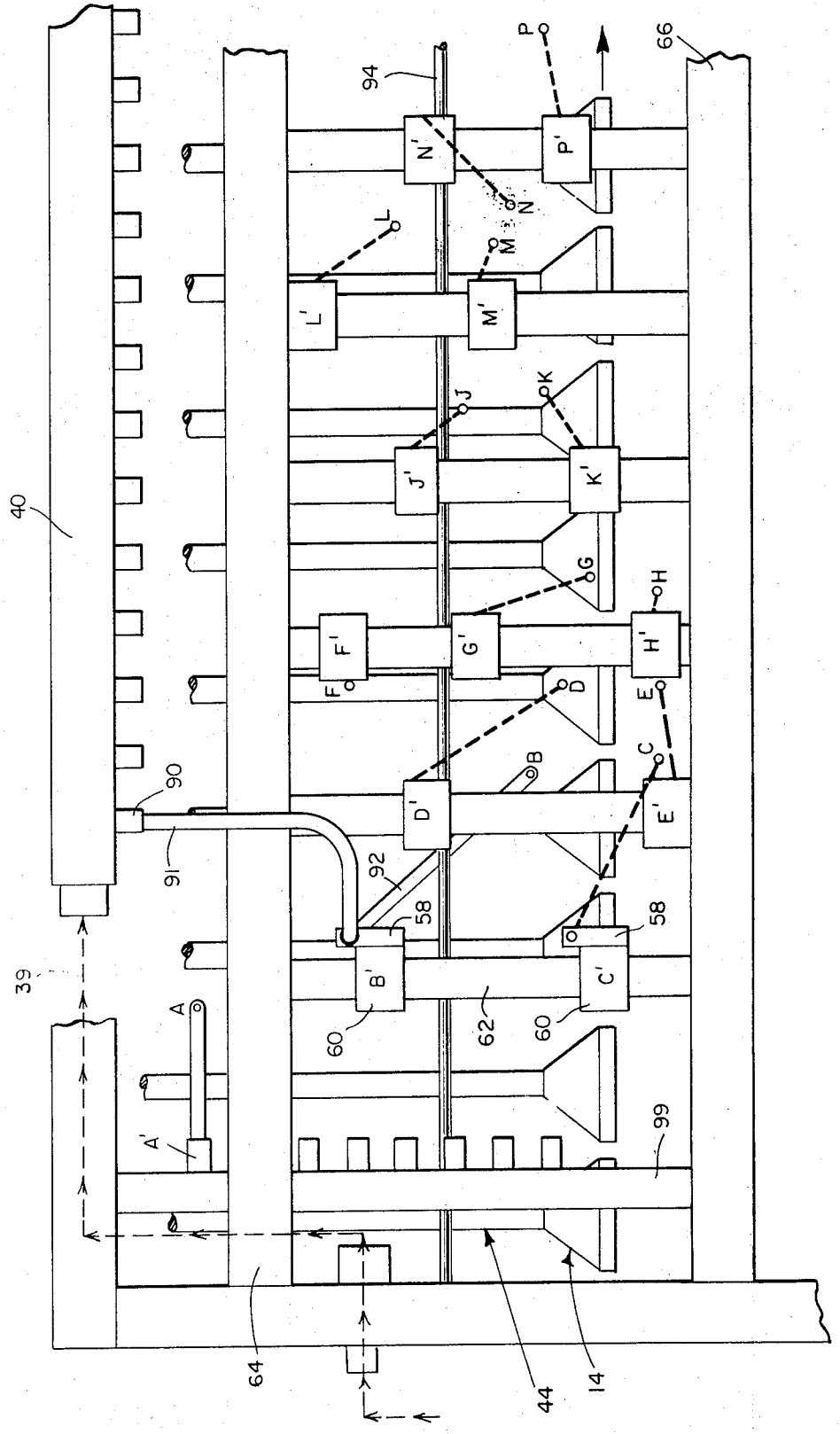
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Fig. 6

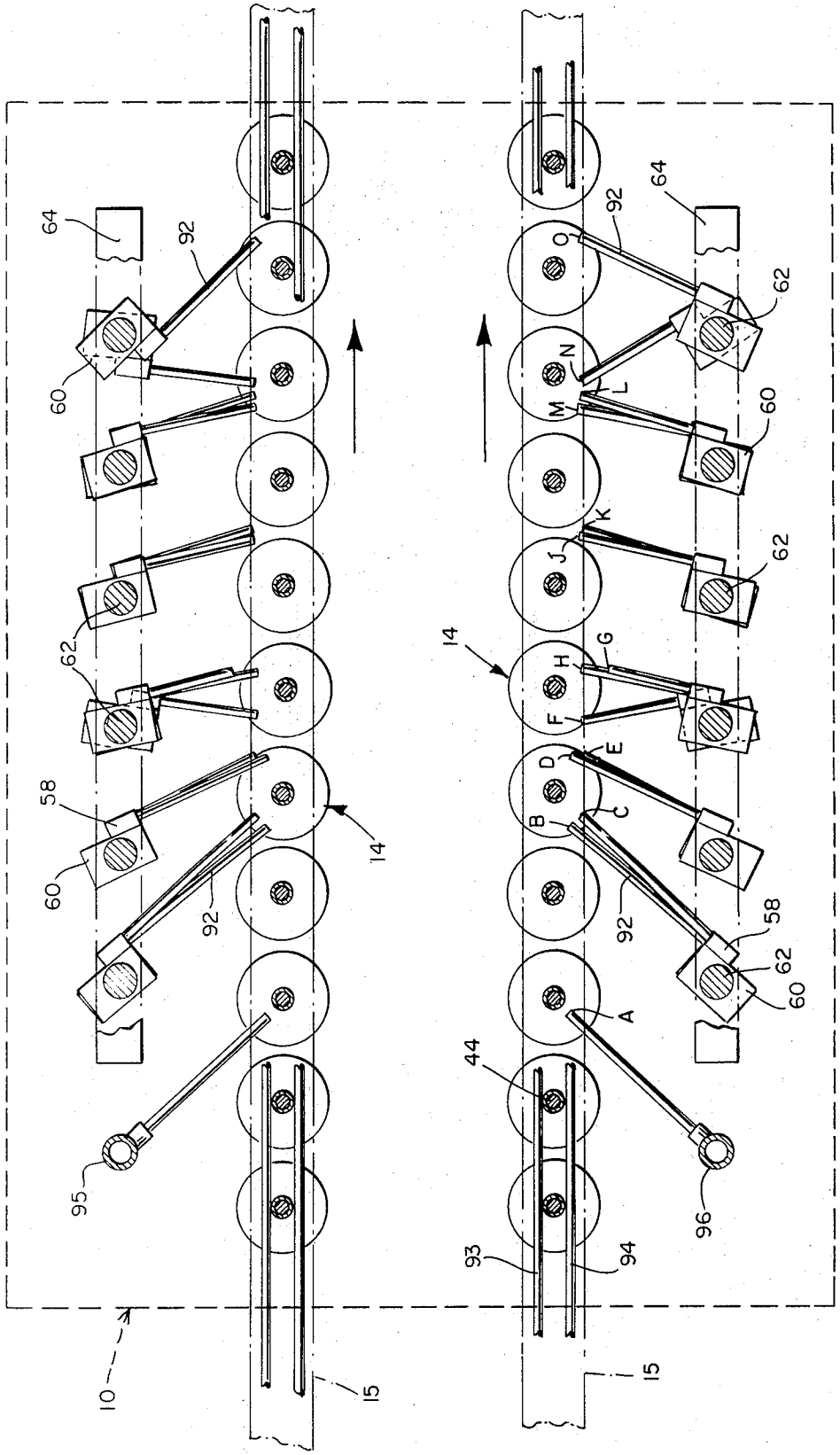

Fig. 7

HIGH PRESSURE WATER IMPACT SPRAYING SYSTEM FOR MAGNETIC CAN HANGERS

BACKGROUND OF THE INVENTION

1. Field of the Invention

The subject invention has utility for facilities where conveying implements are used to convey articles through a painting or coating process. The cleaning system is designed to utilize the same conveying system as used for painting operations, and thus may readily be adapted to the overall production layout.

The invention has particular utility where magnetic hangers are used to convey cans through a spray painting process in which the exterior of the cans are spray painted or varnished. Once the cans are removed from the hangers, the hangers may be cleaned expeditiously and thoroughly to prevent paint build-up and the operational difficulties which it will cause if not prevented.

2. Prior Art

In the past, various cleaning operations, in which paint is removed from conveying implements and the like, have required the use of vast quantities of chemical solvents. The use of such solvents which are usually applied by brushing methods is not only an expensive proposition, but also is a significant pollution factor since the cleaning residue must then be disposed of, for example, by burning off which contributes to air pollution. In addition a potential fire hazard is created by the storage and utilization of highly inflammable solvents.

Cleaning systems utilizing low pressure water spray such as disclosed in U.S. Pat. No. 3,355,324 which issued to R. W. Catzen on Nov. 28, 1967 and which discloses a method to remove ink from dies, are generally ineffective in removing paint from objects. For example, as is pertinent to the subject invention, when paint is sprayed onto steel, the release properties of the steel are not sufficient to enable the removal of paint by water impact even when subjected to relatively high pressures.

The use of water as disclosed in Catzen in the range of pressures of from 60 to 100 psi which is common for house outlets such as sink faucets will not by its impact force, remove paint with strong adhering properties from most surfaces. Further in the Catzen patent, since dies must be placed on a foraminous belt to be transported under a manifold having overhead spray nozzles and then removed from the belt, there is lacking a disclosure of a method by which implements may be cleaned without disruption as part of a fully automatic continually operating system, which can form an integral part of an overall process, such as the production of cans. Catzen further discloses the use of a cleaning agent and therefore does not rely on the impact of water alone to clean.

SUMMARY OF THE INVENTION

Accordingly, it is an object of the subject invention to provide a pollution-free system for cleaning implements used in conveying articles through a painting or coating station.

It is another object of the subject invention to provide a cleaning system which may be used as a part of an automatic conveying system for the purpose of cleaning relatively permanent implements of the conveying system.

It is a further object of the subject invention to provide a cleaning system for cleaning conveyor implements in which spray stations are individually and uniquely placed to provide optimum cleaning ability.

It is still another object of the subject invention to provide a cleaning system for cleaning conveyor implements in which spray stations are positioned at a distance from the path of travel of the objects to be cleaned which is determined as a function of the volume of cleaning water and the pressure at which it is applied.

It is yet another object of the subject invention to provide a cleaning system for cleaning conveyor implements which includes means for recycling the cleaning agent.

Another object of the subject invention is to provide a cleaning system for cleaning conveyor implements which depends on impact pressure cleaning and not the emulsification power of a solvent.

Yet another object of the subject invention is to provide a cleaning system for cleaning conveyor implements which utilizes impact air cleaning in combination with impact water cleaning.

In accordance with the subject invention, a cleaning booth is positioned to enclose a section of the path of travel of magnetic hangers which have been used to convey cans through a painting station. The hangers travel by an overhead monorail conveying system and are rotated as they pass through the cleaning booth. Teflon or other suitable coatings are used to cover the hangers and serve to facilitate removal of paint deposits which occur during the painting process.

As the hangers pass through the cleaning booth at the operational speed in which they travel through their production cycle, they receive a high pressure spray from a number of nozzles positioned throughout the cleaning booth and arranged to spray all portions of the spinning hangers. Each nozzle is positioned at a specified distance from the path of travel of the hangers, the distance being dependent in part on the volume of spray water to be used and the pressure applied in its application. For example, the nozzle orifices may be placed approximately ½ inch from the hangers for a water spray pressure of approximately 6,000 psi and a volume application of 32 gal. per min.

After spraying, the water which at this point includes paint residue washed from the hangers, is drained through a disposable filter paper media and then recycled. Thus, to a certain extent the water in the system need not be replenished except for that which is carried off on the hangers and that which evaporates. The filter paper may be rolled up and conveniently disposed of and in view of the water usage, the pollution of past methods involving solvent brushing and the like are eliminated.

As the hangers pass out of the cleaning booth they are subjected to a blast of high velocity air which further cleans the hangers by causing additional paint deposits to flake off as well as reduces moisture vapor in the area.

The hangers are now free from paint deposits which would otherwise eventually interfere with the operational efficiency of the can painting or varnishing process and thereby hamper production.

BRIEF DESCRIPTION OF THE DRAWINGS

For a more detailed understanding of the invention, reference is made in the following description to the accompanying drawings in which:

FIG. 1 is a partial cutaway isometric view showing the cleaning booth, blow-off fan and the water recirculation system;

FIG. 2 is a plan view of the cleaning booth showing hangers being transported therethrough;

FIG. 3 is an isometric detailed view showing the hangers and their conveying system in relation to the spray nozzles of the cleaning booth;

FIG. 4 is an exploded isometric view showing a hanger with teflon cover removed;

FIG. 5 is an elevational view showing a covered hanger with a can attached;

FIG. 6 is an elevational schematic showing the positioning of the spray nozzles within the cleaning booth; and

FIG. 7 is a schematic plan view showing the nozzles in relation to the hanger assemblies.

DESCRIPTION OF A PREFERRED EMBODIMENT

With reference to FIG. 1, the high pressure water cleaning booth **10**, which is supported by legs and supporting structure **12**, is positioned along the path of travel of magnetic hangers **14**. The hangers **14** are suspended from a conveying means housed in member **15** and pass through cleaning booth **10** from the left after they have been used to convey metallic cans through a spray painting or varnishing station. Booth **10** has a channel opening **16** extending through its top surfaces to allow the hangers **14** which are supported from above by hanger rod portion **44** to pass through. On the inside of cleaning booth **10**, numerous spray stations utilizing spray nozzles **92** with spray heads **18** are located in a manner as will be described. As the hangers **14** pass through cleaning booth **10**, the spray nozzles **92** which receive water through manifolds **38, 40** on each side of booth **10** as seen in FIG. **2**, spray hangers **14** with high pressure water sprays, the impact of which causes the removal of paint from hangers **14**. After spraying the water flows from the cleaning booth bottom (not shown) down drainage ramp **20** to water storage tank **22** via sediment collection basin or tray **19**. Water shields **23** positioned on each side of the hanger path of travel at the entry and exit ends of booth **10** assist in preventing spray from leaving booth **10**.

A disposable filter media roll **24** is placed at one end of water storage tank **22** and the filter material which may be any standard commercial filter media is extended across tank **22** to intercept the flow of water from drainage ramp **20** and basin **19**. The roll material may be supported as well as transported by an endless mesh belt **21** which extends between a roller **23** and other means not shown. Paint deposits are carried to tote box **26** by the filter material where they are collected and then disposed of. The filter material may be advanced by any suitable means such as auxilliary rollers used in conjunction with the conveying system for mesh belt **21** and conveniently disposed of in tote box **26** or by other means. Water which collects in tank **22** is drawn from tank **22** through pipe line **30** by means of suction pump **28** which may be any standard type. The water is then recirculated back through the system by means of pipe line **32**, through which the rate of flow is controlled by valve **32A**, where it is drawn to suction header **34**. High pressure water pump **36** draws the water through line **35** and pumps it into pressure header **37** by means of line **39** and then through manifolds **38** and **40** (see FIG. **2**). The type of pump is not critical, however, a 3-stage plunger triplex type pump with a capability of pumping 32 gallons of water per minute at 6,000 psi may be used. Each of the manifolds **38** and **40** may have approximately 13 spray stations comprising the spray nozzles **18** shown in FIG. **1** which receive water through the high pressure lines **91** fluidly connected with either of manifolds **38** or **40**. Pipe line **33** may be used to drain the water from the system by the opening of valve **31** when desired.

A high velocity blow-off fan apparatus **42** is positioned adjacent cleaning booth **10** and the application of a jet of high velocity air through nozzle structure **51** onto hangers **14** will cause additional paint deposits which may have been loosened by the spray impact to flake and will also dry the hangers **14** as they pass from cleaning booth **10**. They may then be conveyed immediately back to the painting station to be used in subsequent painting operations if desired. A tray **53** may be used to collect the additional paint flakes and peelings removed by air from hangers **14**.

The hangers **14** are conveyed through the plant painting station (not shown) and the cleaning station by means of a monorail conveying system (not shown) which is housed in the support member **15**. The hangers **14** are attached to the monorail conveyor by means of rod members **44** and any standard connecting means. Customarily, facilities for transporting two rows of hangers **14**, side by side, are used as shown in FIG. **1**. Near the top of rods **44** horizontal guide bars **54** are positioned to the top and bottom of knurled roller **56** as best seen in FIG. **3**. As rods **44** and associated hangers **44** are conveyed, the rollers **56** will be engaged by vertical bearing posts **55** (see FIG. **1**) or other means placed adjacent each row of hangers **14** which will cause rollers **56** to rotate thereby spinning hangers **44** as they pass through cleaning booth **10**. As rollers **56** impact with bearing posts **55**, the guide bars **54** serve to keep hangers **14** from tipping to the right or left by passing closely to stationary stabilizing horizontal bars **93, 94** (see FIG. **7**) disposed to the right and left of the path of the guide bars **54** through the cleaning booth **10**.

Spray nozzles **92** with nozzle head **18** as shown in FIG. **3** are supported in spraying position by pivotal locking members **58** which may be secured to connecting supports **60** which are positioned along cylindrical uprights **62**. Bolts **59** are used to secure members **58** and as can be seen from FIG. **3** the angle of approach of nozzles **92** and the distance of nozzle heads **18** from hangers **14** may be adjusted. Supports **60**, each separable in half, are adjustable by means of bolts **61** and bolts **59** which extend through members **58**, and may be placed at any height along uprights **62** to set the nozzle location, i.e., height, distance from hanger and angle of spray. Uprights **62** are secured between top and bottom frame members **64** and **66** respectively which are secured in parallel relationship to the path of travel of the hangers **14** through booth **10**. Flexible hoses **91** leading from manifolds **38** and **40** connect at connection **98** to the extended nozzle structure **92**,

which extends through pivotal member **58**, and supply the high pressure water.

As previously described, each hanger **14** suspends by means of hanger rod member **44**. As seen in FIG. **4**, the rod member **44** comprises an inner steel member **80** which connects at its base to magnetic body member **46** by any suitable connecting means such as by the clamping of rod groove member **81** and magnet grooved member **82**. The greatest part of steel rod **80** is covered by teflon sleeve **45** as best seen in FIG. **5**. The magnetic body member **46** has an upper portion **83** and a lower portion **84**, the lower portion comprising the actual magnetic surface. The upper portion **83** of magnetic body member **46**, the base of steel rod **80** and the connecting parts **81** and **82** are protected from paint by a conical teflon cover **47** which may be slipped in place while magnetic member **46** is detached. As seen in FIG. **5**, the magnetic surfaces **84** are not covered by the teflon cover **47** and may engage the upper inner cylindrical surface of a metallic can **49** for the painting process. It will be noted from FIG. **5** that by means of teflon sleeve **45** and teflon cover **47**, all of the hanger **14** including most of rod member **44** is covered with the exception of the magnetic portion **84**. As can be seen from FIG. **5**, however, magnetic portion **84** is protected in large measure from paint by the can **49** during the painting process. Prior to the cleaning step, the cans **49** are removed by a detent means onto a conveyor belt or will otherwise be detached from the magnetic hangers **14** which are then transported through the cleaning booth **10** without the cans **49**.

The teflon sleeve **45** and cover **47** greatly facilitate the paint removing process. It has been found that paint adheres to steel in such a manner that it is very difficult to remove it by the impact of water alone without the use of solvents heretofore applied by brushing. The conical shape of cover **47** is so designed to provide the best shape for facilitating the removal of paint by pressure means.

The positioning of the spray nozzles **92** in cleaning booth **10** is critical in the sense that the spray heads **18** must be placed a precise distance from the path of travel of hangers **14**. The teflon sleeve **45** and cover **47**, while necessary to facilitate removal of paint residue from the hangers **14** by the high pressure water, will nevertheless erode if the water pressure is too great; on the other hand, if the nozzle heads **18** are positioned at too great a distance, the impact force will not be sufficient to remove the paint. Thus, the relationship of nozzle distance from the hangers versus pressure of water used is a critical one and must be established for optimum conditions. A further factor is also the volume of water which is sprayed on the hangers from the nozzles. As an example, one such optimum condition has been the utilization of a water pressure of 6,000 psi pumped at the rate of 32 gal/min in combination with the positioning of the nozzles **18** approximate ½ inch from the path of travel of the hanger surfaces.

With reference to FIG. **6**, the inflow of water through pipes **39** schematically shown, supplies manifold **40**. From there, the water is pumped through one of the series of manifold outlets **90** into hose member **91** which may be a flexible, rubber hose. It is to be understood that the additional twelve manifold outlets all have hoses like member **91** connected to the various spray stations. The hoses **91** feed into the nozzle head structure best shown in FIG. **3**, as previously described.

While each of the hoses extend to a nozzle extension **92** at a connecting block **58**, only one such connection is shown in FIG. **6**. A full set of vertical hold blocks **60** are shown, however, in a range of positions as illustrated by B', C', D', E', F', G', H', J', K', L', M', N' and P'. The positions of the corresponding spray nozzle heads **18** are shown schematically by the letters, B, C, D, E, F, G, H, J, K, L, M, N, and P. The general positions of the extensions **92** are shown by the dotted lines, for example, the dotted line from block D' to spray station D.

Structure **99** in FIG. **6** schematically shows an auxiliary manifold which may be used along the end of the spray booth **10**. Two such manifolds may be used, one for each of the rows of hangers. As shown, manifold outlet A' can be connected with spraying means, the spray nozzle of which might be set at position A.

Along with the criticality of the distance placement of the nozzles from the hangers, it is important to position the nozzles so that all the surface areas of the hangers are covered. For example, with reference to FIG. **5** the conical teflon cover area **67** and the surrounding base area collect more paint than the teflon sleeve portion **45** and should, of course, receive substantially more impact spray. This is controlled by placing more nozzles **18** in position to cover this portion of the hangers. For example, with reference to FIG. **6**, the nozzle heads C, D, E, G, H, K, M, N, and P, are all positioned to spray in part or totally the lower surfaces of hangers **14**. The direction of spray may be further controlled by the positioning of the nozzle **92**; either vertically by adjusting member **58** and support **60** as previously described, or horizontally by turning support **60** to right or left before tightening bolt **61** to set the lateral direction of nozzle extensions **92** as best seen in FIG. **7**.

Also, with further reference to FIG. **7** the auxiliary spray stations as alluded to in the FIG. **6** description are shown with their respective nozzle extensions extending physically from columns **95** and **96**.

The positioning of the nozzles as shown should not be considered limiting, but reflects a necessity for controlling the positioning of the nozzle heads **18**, as well as, the direction of the flow so that all of the hanger surface areas will be sprayed. The hangers **14** will be spinning as they pass through the cleaning stations and this factor must be taken into consideration in the placement of the nozzles **92**.

An empirical approach may be used in the placement of nozzles **92** or an optimum placement chart derived from mathematical data including the speed of travel of hangers and the spin data as controlled by the placement of bearing posts **55**.

While various embodiments of the invention have been shown and described, it will be understood that various modifications may be made. The appended claims are, therefore, intended to define the true scope of the invention.

I claim:

1. Cleaning apparatus for cleaning hangers used in conveying articles through a painting station comprising:

a housing structure;

pumping means to pump water at high pressure;

spraying means including spray nozzles optimally positioned within said housing structure to spray high pressure water from the pumping means onto the hangers to remove painting deposits from said

hangers by the impact force of the water, said spray nozzles being positioned at a distance from the path of travel of the hangers, said distance being determined as a function of the pressure to be used;

means to convey the hangers through the housing structure;

means adjacent said housing structure to apply high velocity air onto the hangers; and

recirculation means adjacent said housing structure for recirculating the spray water through said pumping means and spraying means including drainage facilities having filter means.

2. The cleaning apparatus of claim **1** wherein the spray nozzles are positioned approximately ½ inch from the path of the hangers and the water is sprayed at 6,000 psi.

3. The cleaning apparatus of claim **1** wherein said spray nozzles are positioned so that direct spray will impact against the hangers from the top, side and bottom of said hangers.

4. The cleaning apparatus of claim **1** including means to spin the hangers as they are conveyed through the housing structure.

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