

ON-LINE STEAM SANITIZATION SYSTEMBACKGROUND OF THE INVENTION1. Field of the Invention

The present invention relates generally to an on-line steam sanitization system and method. More particularly, the subject invention pertains to an on-line steam sanitization system and method for sanitizing a production plant deionized water supply system, such as in a plant for manufacturing and packaging contact lenses.

The present invention relates to sanitization processes, which are related to sterilization processes. Sterilization is a process by which objects, materials or environments may be rendered sterile, which refers to the condition of an object, or an environment, which is free of all living cells, all viable spores (and other resistant and disseminative forms), and all viruses and subviral agents capable of replication. An effective sterilization process must therefore irreversibly inactivate all organisms. For most practical purposes the main criterion of sterility is satisfied by the failure to detect viable cells, spores, viruses, etc. on or in a given object, material or environment.

Methods of sterilization include physical methods such as heat, including dry heat and moist heat, radiation, pulsed energy such as light waves, filtration, ultrasonication, chemical methods, and also combined physical and chemical methods.

1           The present invention employs and relates to  
an on-line sanitization process and method, which in a  
contact lens manufacturing and packaging plant makes the  
equipment as clean as possible, eliminating microbes.  
5   However, in this environment the validation effort  
required to guarantee sterility is not economically  
viable, and accordingly the process is referred to as a  
sanitization process rather than a sterilization  
process. A target bioburden is below 1000 organisms per  
10 cubic liter.

10           2. Discussion of the Prior Art

Some plant production lines, such as those for  
the production and packaging of contact lenses, have a  
separate deionized water supply system with deionized  
water pumps, supply lines, and related equipment which  
15 supply deionized water to various areas of the plant  
which require deionized water for the operations being  
performed thereat.

Deionized water is generally distilled water  
which has all minerals and chemical additives removed  
20 therefrom, and is particularly suitable for immersing  
contact lenses therein during manufacturing to allow  
chemicals therein to leach out, and also for  
transferring lenses from one processing step to the  
next. The deionized water and an added surfactant allow  
25 the lenses to equilibrate rapidly, reach an equilibrium  
state in which the parameters of the lens do not change,  
as is desirable for lens transfer and lens inspection.

Unfortunately, the deionized water supply does  
30 not inhibit normal microbe buildup resultant from, among

1 other factors, the open air assembly of the parts of the  
deionized water supply, and the added surfactant which  
supports the life of the microbes. Accordingly, the  
system has to be sanitized periodically, such as once  
5 every several weeks. Sanitization entailed, inter alia,  
disassembling the deionized water supply system positive  
displacement pumps, which typically dispense microliter  
dosages of deionized water, and replacing tubing,  
filters, etc. which typically might take four persons,  
10 each working 12-20 hours, for a total of 48-80 man  
hours. During this operation, the disassembled  
equipment which is returned to the deionized water  
supply system is sanitized in a sterilizer, which could  
be a steam and air mixture in an autoclave, or any  
15 suitable sterilizer. Equipment such as pumps,  
reservoirs and filters were sanitized in a sterilizer in  
which steam was injected into the equipment without  
disassembly of the equipment.

One disadvantage of the prior art approach to  
sanitizing the deionized water supply system was the  
20 possible contamination of the sanitized components by  
contact with the operator's hands and other unclean  
surfaces during assembly, and also necessary down time  
for the production line, which was down during the  
approximately 12-20 hour period, while the sanitizing  
25 operation was being performed, and this on a production  
line normally running 24 hours a day.

#### SUMMARY OF THE INVENTION

Accordingly, it is a primary object of the  
present invention to provide an on-line steam  
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1 sanitization system and method for a deionized water  
supply system.

5 A further object of the subject invention is  
the provision of a sanitizing operation which is  
performed through all of the deionized water supply  
system while the deionized water supply system is  
closed, rather than disassembled and open to possible  
recontamination as in the prior art sanitization  
process, which provides a much more effective  
sanitization operation than in the prior art, and also  
10 substantially reduces the down time for the plant  
production line.

15 It would be desirable to sanitize the  
deionized water supply system on a production line in an  
on-line manner by using steam directed therethrough,  
rather than having to disassemble the equipment,  
sanitize the disassembled equipment, and then reinstall  
it as in the prior art. The use of steam in an on-line  
sanitizing operation in the existing deionized water  
supply system required that the production line  
20 equipment be modified to withstand the pressure and heat  
of the steam sanitizing operation. One such  
modification entailed the removal of reservoirs, which  
could not withstand the pressure of sanitization, and  
their replacement with pressure regulators. The  
25 pressure regulators reduce the pressure of the  
sanitizing clean steam from approximately 40 psi to  
approximately 15 psi, which the positive displacement  
pumps can handle during the sanitization procedure.  
30 During normal operations, the pressure regulators reduce

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1 the pressure of the deionized water from approximately  
10 psi to approximately 1-3 psi which the positive  
displacement pumps can handle.

5 The plant production line has a deionized  
water supply system available therein, and also has  
house steam available therein. House steam contains  
chemical additives which make it unsuitable for an on-  
line steam sanitization operation. Instead, pursuant to  
10 the present invention, the house steam is used to heat  
deionized water from the deionized water supply to  
generate a clean steam therefrom which is suitable for  
the sanitization operation on the deionized water supply  
system.

15 One major advantage of the present invention  
is that the sanitizing operation is performed through  
all of the deionized water supply system while the  
deionized water supply system is closed, rather than  
disassembled and open to possible recontamination as in  
the prior art sanitization process. The result is a  
much more effective sanitization. With the prior art  
20 open sanitization approach, the deionized water supply  
system sometimes repopulated with microbes within 72  
hours, as evidenced by the bioburden thereof. With the  
closed sanitization approach of the present invention,  
sometimes the deionized water supply system evidences no  
25 repopulation with microbes between periodic maintenance  
sanitization operations.

30 A preventative maintenance sanitization  
operation pursuant to the present invention reduces the  
down time for the plant production line to approximately

1 2 hours, compared to 12-20 hours as in the prior art,  
and performs a much more effective sanitization  
operation than in the prior art, often with no microbe  
repopulation between periodic maintenance sanitization  
5 operations, as evidenced by the bioburden thereof.

The present invention introduces pressure  
regulation into the deionized water supply system, and  
also utilizes a new manifold design. The old prior art  
manifold used 16 tubes, one to each pump. The new  
10 manifold has a symmetrical design with an equal number  
of fixtures leading to each of the 16 pumps. The pumps  
have also been changed from Kynar pump bodies to  
stainless steel pump bodies to withstand the heat and  
pressure associated with steam.

15 In accordance with the teachings herein, the  
present invention provides an on-line steam sanitizing  
system and method for a production plant deionized water  
supply system, which includes deionized water pumps,  
supply lines, and related equipment for supplying  
20 deionized water to various areas of the production plant  
which require deionized water for the operations being  
performed thereat. The deionized water supply is  
sanitized by an on-line steam sanitization procedure in  
which steam is introduced into and through the deionized  
25 water supply, without disassembly thereof for a minimum  
sanitization period, after which the production plant  
returns to normal operation.

In greater detail, the on-line steam  
sanitizing system and method was developed for a plant  
30 for the production and packaging of contact lenses. The

1 plant includes a predose facility wherein predoses of  
deionized water are supplied to packages making them  
ready to accept lenses to be deposited therein, and to a  
lens transfer facility wherein measured doses of  
5 deionized water are supplied to nozzles on robotic arms  
for transferring lenses from one processing step to the  
next.

The plant production line also has house steam  
available therein, which contains chemical additives  
which make it unsuitable for an on-line steam  
10 sanitization operation. Accordingly, the house steam is  
used to heat deionized water from the deionized water  
supply to generate a clean steam therefrom which is  
suitable for the sanitization operation.

15 The use of steam in a sanitization operation  
in an existing plant deionized water supply system  
required that the production line equipment be modified  
to withstand the pressure and heat of the steam  
sanitizing operation. The modifications included  
removing reservoirs, which provided an open environment  
20 and also could not withstand the pressure and heat of  
sanitization, and replacing the reservoirs with pressure  
regulators. The pressure regulators reduce the pressure  
of the sanitizing clean steam from approximately 40 psi  
to approximately 15 psi during the sanitization  
25 procedure, which the positive displacement pumps can  
handle. During normal operations, the pressure  
regulators reduce the pressure of the deionized water  
from approximately 10 psi to approximately 1-3 psi which  
the positive displacement pumps can handle. The  
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1 modifications further include utilizing a new manifold  
design which has a symmetrical design with an equal  
number of fixtures leading to each of the plurality of  
pumps, and utilizing Kynar tubes and Kynar fixtures.

5 The deionized water is introduced into the  
deionized water supply system through a shut-off valve,  
which is closed during the steam sanitization operation,  
and opened thereafter. The clean steam is also  
introduced into the deionized water supply through a  
10 shut-off valve, which is opened during the steam  
sanitization operation, and is closed thereafter.

#### BRIEF DESCRIPTION OF THE DRAWINGS

The foregoing objects and advantages of the  
present invention for an on-line steam sanitization  
system and method may be more readily understood by one  
15 skilled in the art with reference being had to the  
following detailed description of several preferred  
embodiments thereof, taken in conjunction with the  
accompanying drawings wherein like elements are  
designated by identical reference numerals throughout  
20 the several views, and in which:

Figure 1 illustrates a piping schematic  
diagram for the deionized water supply of a plant  
production line for the production and packaging of  
contact lenses.

25 Figure 2 is a more detailed piping schematic  
of the deionized water supply for a plant production  
line for the production and packaging of contact lenses;

Figure 3 is a detailed piping diagram for the  
deionized water supply of a predose facility; and  
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1           Figure 4 is a detailed piping diagram for the  
deionized water supply of a lens transfer facility.

DETAILED DESCRIPTION OF THE DRAWINGS

5           Referring to the drawings in detail, Figure 1  
illustrates a piping schematic diagram for the deionized  
water supply for a plant production line for the  
production and packaging of contact lenses. The plant  
production line is normally supplied with deionized (DI)  
water at 10. Deionized water is generally distilled  
10 water which has all minerals and chemical additives  
removed therefrom, and is particularly suitable with an  
added surfactant for immersing contact lenses therein  
during manufacturing to allow chemicals therein to leach  
out and equilibrate quickly, and for transferring lenses  
15 from one processing step to the next. The deionized  
water allows the lenses to equilibrate, reach an  
equilibrium state in which the parameters of the lens do  
not change, as is desirable for lens transfer and lens  
inspection.

20           The plant production line is also normally  
supplied with house steam at 16 through a ball valve 18  
and check valve 20. Unfortunately, house steam contains  
chemical additives which make it unsuitable for an on-  
line steam sanitization operation. Instead, pursuant to  
25 the present invention, the house steam is used in a DI  
steam generating vessel 22 to heat deionized water from  
the deionized water supply to generate a clean steam  
therefrom at 24 which is suitable for a sanitization  
operation on the deionized water supply system. The DI

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1 clean steam 24 is supplied at approximately 121°C at 15  
psi gage.

5 The plant production line illustrated in  
Figure 1 is for the production and packaging of contact  
lenses, and includes three facilities 26, 28 and 30  
which require deionized water in their operations. A  
predose facility 26 supplies predoses of deionized water  
to packages making them ready to accept lenses to be  
deposited therein. The lens transfer facilities 28 and  
10 30 supply deionized water to nozzles on robotic arms for  
transferring lenses from one processing step to the next  
in operations performed between hydration and packaging  
in post hydration.

15 During normal operation of the plant  
production line, the predose facility 26 and the lens  
transfer facilities 28 and 30 are supplied with  
deionized water from the house deionized water supply 10  
through a valve 32, which must be sanitized  
periodically, such as once every several weeks.

20 Accordingly, periodically such as every three  
weeks, the plant production line is shut down, and the  
production plant deionized water supply is sanitized by  
an on-line steam sanitization system as illustrated in  
Figure 1. Then, the house deionized water supply is  
shut off by valve 32, and clean steam is introduced, by  
25 opening valve 34, into and through the deionized water  
supply systems of the predose and lens transfer  
facilities 26, 28 and 30. The clean steam should flow  
through and sanitize the equipment for a minimum  
predetermined sanitization period, such as 30 minutes,  
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1 and the entire operation of converting from production  
to sanitization and back to production takes one man  
approximately 2 hours, compared to 12-20 hours as in the  
prior art. Thus, the present invention results in a  
5 substantial decrease in lost production time of the  
plant.

Another advantage of the present invention is  
that the sanitizing operation is much cleaner and more  
effective as it is performed through all of the  
10 deionized water supply system while it is closed, rather  
than disassembled and open to possible recontamination  
as in the prior art sanitization process. The result is  
a much more effective sanitization process. With the  
prior art open sanitization approach, the deionized  
15 water supply system is sometimes repopulated with  
microbes within 72 hours, as evidenced by the bioburden  
thereof. With the closed sanitization approach of the  
present invention, sometimes the deionized water supply  
system evidences no repopulation with microbes between  
20 periodic maintenance sanitization operations.

Figure 2 is a more detailed piping schematic  
of the deionized water supply for a plant production  
line for the production and packaging of contact lenses.  
During a sanitization operation, clean steam from a  
sterilizer as shown in Figure 1 is introduced at the  
25 upper left at 40, with condensate collecting in a steam  
trap 42. The clean steam flows through a ball valve 44,  
through steam pressure regulator 46, by pressure gage  
48, through ball valve 50, through a T fitting 52, in  
30 one leg 54 downwardly to a further T fitting 56, in one

1 leg 58 to the left, through an adaptor 60, 3/8" comp. to  
1/2" sanitary, pressure regulator 62, by a pressure gage  
64, through an adaptor 66, 3/8" comp to 1/2" sanitary,  
to a predose facility 68 which feeds 16 predose nozzles  
5 or needles 70. Returning to T 56, the right leg 72  
leads to an adaptor 74, 3/8" comp to 1/2" sanitary,  
pressure regulator 76, gage 78, an adaptor 80, 3/8" comp  
to 1/2" sanitary, to a Kynar T 82, and then to both lens  
transfer facilities 84, each of which feeds 16 transfer  
10 nozzles 85. Returning to T 52, the right leg 86 flows  
to a pressure relief valve 88, a check valve 90, and a  
degasser 92, which is a vacuum vessel to degas the  
deionized water during normal production, up to a ball  
valve 96. The vacuum degasser is supplied with a vacuum  
15 by a vacuum pump 98, operating through a vacuum relief  
valve 100, and a pressure gage 102.

Figure 3 is a piping detail diagram for the  
deionized water supply of a predose facility. In Figure  
3, all fittings and tubing are Kynar, and all fittings  
have steel grippers. Fluid (either deionized water  
20 during normal operation or clean steam during a  
sanitizing operation) flows through a central tube 110,  
Kynar tubing 3/8" OD x 1/4" ID, to a 3/8" Kynar T 112,  
and then divides to the left to one additional 3/8"  
Kynar T 114, and one additional 3/8" Kynar L 115, and  
25 also divides to the right to one additional 3/8" Kynar T  
114, and one additional 3/8" Kynar L 115.

The arrangement includes four symmetrical legs  
116, 118, 120 and 122, one leg depending from each T 114  
or L 115. Only the left-most leg 116 of the four  
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1 symmetrical legs 116 is illustrated in detail in Figure  
3, and it will be explained in detail with the  
understanding that the other three legs 118, 120 and 122  
are substantially identical. Fluid flows through the  
5 3/8" L 115 to a 3/8"-1/4" reducer 124 and then to three  
successive 1/4" Ts 126 and a last 1/4" L 128. Fluid  
then flows to the right (in Figure 3) in four  
substantially identical legs 130, 132, 134 and 136.  
Each leg includes a 1/4" tube 138, a union 140, a  
10 positive displacement pump 142, the output of which  
flows through a 1/4" L 144, through a 1/4" OD x 1/8" ID  
Kynar tube 145, through locks 146 (manufactured by  
Luer), which are essentially medical fittings, to Teflon  
or stainless steel nozzles or needles 148, through which  
15 a dosage of deionized water is injected into a package  
or container for handling a contact lens therein.

Figure 4 is a piping detail diagram of the  
deionized water supply of a lens transfer facility. In  
Figure 3, all fittings and tubing are Kynar, and all  
fittings have steel grippers. Fluid (either deionized  
20 water during normal operation or clean steam during a  
sanitizing operation) flows into a central tube 210,  
Kynar tubing 3/8" OD x 1/4" ID, to a 3/8" Kynar T 212,  
and then divides to the left to one additional 3/8"  
Kynar T 214, and one additional 3/8" Kynar L 215, and  
25 also divides to the right to one additional 3/8" Kynar T  
214, and one additional 3/8" Kynar L 215. The  
arrangement includes four symmetrical legs 216, 218, 220  
and 222, one leg depending from each L 215 or T 214.  
Only the left-most 216 of the four symmetrical legs is  
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1 illustrated in detail in Figure 3, and it will be  
explained in detail with the understanding that the  
other three legs 218, 220 and 222 are substantially  
identical. Fluid flows through the 3/8" L 215 to a  
5 3/8"-1/4" reducer 224 and then to three successive 1/4"  
Ts 226 and a last 1/4" L 228. Fluid then flows to the  
right (in Figure 4) in four substantially identical legs  
230, 232, 234 and 236. Each leg includes a 1/4" tube  
238, a union 240, a positive displacement pump 242, the  
10 output of which flows through a 1/4" x 1/8" reducer 244,  
through a 1/8" OD x 1/16" ID tube 246, to lens transfer  
nozzles 248, through which a dosage of deionized water  
is injected into a package or container for transferring  
lenses from one processing step to the next.

15 While several embodiments and variations of  
the present invention for an on-line steam sanitization  
system and method are described in detail herein, it  
should be apparent that the disclosure and teachings of  
the present invention will suggest many alternative  
20 designs to those skilled in the art.

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1 WHAT IS CLAIMED IS:

1. An on-line steam sanitizing method which comprises, supplying deionized water through a production plant deionized water supply system, which includes deionized water pumps, supply lines, and  
5 related equipment, to supply deionized water to various areas of the production plant which require deionized water for the operations being performed thereat, and sanitizing the production plant deionized water supply  
10 by an on-line steam sanitization procedure in which steam is introduced into and through the deionized water supply, without disassembling the deionized water supply system, for a predetermined sanitization period, after which the production plant is returned to normal  
15 operation.

2. An on-line steam sanitizing method for a production plant as claimed in claim 1, wherein the deionized water is supplied to a production plant which produces and packages contact lenses.

20 3. An on-line steam sanitizing method for a production plant as claimed in claim 2, wherein the deionized water is supplied to a predose facility for supplying predoses of deionized water to packages making them ready to accept lenses to be deposited therein, and to a lens transfer facility for supplying measured doses  
25 of deionized water to nozzles on robotic arms for transferring lenses from one processing step to the next.

30 4. An on-line steam sanitizing method for a production plant as claimed in claim 2, wherein a source



1 of house steam heats deionized water from the deionized  
water supply to generate a clean deionized steam  
therefrom, and the clean deionized steam is used in the  
sanitizing step.

5 5. An on-line steam sanitizing method for a  
production plant as claimed in claim 1, wherein the use  
of steam in a sanitizing operation in an existing  
deionized water supply system required modifying the  
production plant equipment to withstand the pressure and  
10 heat of the steam sanitizing step.

15 6. An on-line steam sanitizing method for a  
production plant as claimed in claim 5, wherein said  
modifying step includes removing reservoirs, which could  
not withstand the pressure and heat of sanitization, and  
replacing the reservoirs with pressure regulators.

20 7. An on-line steam sanitizing method for a  
production plant as claimed in claim 6, including  
reducing the pressure of the sanitizing clean steam from  
approximately 10 psi to approximately 1-3 psi with the  
pressure regulators.

25 8. An on-line steam sanitizing method for a  
production plant as claimed in claim 5, wherein said  
modifying step includes utilizing a new manifold design  
which has a symmetrical design leading to each of the  
pumps.

30 9. An on-line steam sanitizing method for a  
production plant as claimed in claim 8, including  
utilizing in the symmetrical design an equal number of  
fixtures leading in each line to each of a plurality of  
pumps in a symmetrical arrangement.



1           10. An on-line steam sanitizing method for a  
production plant as claimed in claim 5, wherein the  
modifying step includes utilizing Kynar tubes and Kynar  
fixtures.

5           11. An on-line steam sanitizing method for a  
production plant as claimed in claim 3, including  
introducing deionized water into the deionized water  
supply system through a shut-off valve, and closing the  
deionized water shut-off valve during the steam  
10 sanitizing step, after which it is opened, and  
introducing the clean steam into the deionized water  
supply through a shut-off valve, and opening the clean  
steam shut-off valve during the steam sanitization  
operation, after which it is closed.

15           12. An on-line steam sanitizing method for a  
production plant as claimed in claim 1, wherein a source  
of house steam heats deionized water from the deionized  
water supply to generate a clean deionized steam  
therefrom, and the clean deionized steam is used in the  
sanitizing step.

20           13. An on-line steam sanitizing method for a  
production plant as claimed in claim 1, including  
introducing deionized water into the deionized water  
supply system through a shut-off valve, and closing the  
deionized water shut-off valve during the steam  
25 sanitizing step, after which it is opened, and  
introducing the clean steam into the deionized water  
supply through a shut-off valve, and opening the clean  
steam shut-off valve during the steam sanitization  
operation, after which it is closed.

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1           14. An on-line steam sanitizing system for a  
production plant deionized water supply system which  
includes deionized water pumps, supply lines, and  
related equipment, to supply deionized water to various  
5 areas of the production plant which require deionized  
water for the operations being performed thereat, and a  
sanitizing steam input to the production plant deionized  
water supply, which is sanitized by an on-line steam  
sanitization procedure in which sanitizing steam is  
10 introduced from the sanitizing steam input into and  
through the deionized water supply, without disassembly  
thereof, for a predetermined sanitization period, after  
which the production plant is returned to normal  
operation.

15           15. An on-line steam sanitizing system for a  
production plant as claimed in claim 14, wherein the  
production plant includes facilities for the production  
and packaging of contact lenses.

20           16. An on-line steam sanitizing system for a  
production plant as claimed in claim 15, wherein the  
plant production line facilities include a predose  
facility wherein predoses of deionized water are  
supplied to packages making them ready to accept lenses  
to be deposited therein, and a lens transfer facility,  
25 which includes nozzles on robotic arms, to which  
measured doses of deionized water are supplied for  
transferring lenses from one processing step to the  
next.

30           17. An on-line steam sanitizing system for a  
production plant as claimed in claim 15, wherein the



1 production plant facilities include a source of house  
steam, and a sanitizing vessel in which house steam is  
used to heat deionized water from the deionized water  
supply to generate a clean deionized steam therefrom  
which is suitable for the sanitization procedure.

5 18. An on-line steam sanitizing system for a  
production plant as claimed in claim 14, wherein the use  
of steam in a sanitizing operation in an existing  
deionized water supply system required that the  
10 production plant equipment be modified to withstand the  
pressure and heat of the steam sanitizing operation, and  
the modifications include the addition of pressure  
regulators which reduce the pressure of the sanitizing  
clean steam or distilled water.

15 19. An on-line steam sanitizing system for a  
production plant as claimed in claim 18, wherein the  
modifications include a manifold which has a symmetrical  
design leading to each of a plurality of pumps.

20 20. An on-line steam sanitizing system for a  
production plant as claimed in claim 19, wherein the  
symmetrical design includes an equal number of fixtures  
leading in a symmetrical arrangement to each of the  
plurality of pumps.

25 21. An on-line steam sanitizing system for a  
production plant as claimed in claim 18, wherein the  
modifications include Kynar tubes and Kynar fixtures.

30 22. An on-line steam sanitizing system for a  
production plant as claimed in claim 16, including a  
shut-off valve, through which deionized water is  
introduced into the deionized water supply system, which



1 is closed during the steam sanitization operation and is  
opened thereafter, and a second shut-off valve, through  
which clean steam is introduced into the deionized water  
supply, which is opened during the steam sanitization  
5 operation and is closed thereafter.

23. An on-line steam sanitizing system for a  
production plant as claimed in claim 14, wherein the  
production plant facilities include a source of house  
steam, and a sanitizing vessel in which house steam is  
10 used to heat deionized water from the deionized water  
supply to generate a clean deionized steam therefrom  
which is suitable for the sanitization procedure.

24. An on-line steam sanitizing system for a  
production plant as claimed in claim 14, including a  
shut-off valve, through which deionized water is  
15 introduced into the deionized water supply system, which  
is closed during the steam sanitization operation and is  
opened thereafter, and a second shut-off valve, through  
which clean steam is introduced into the deionized water  
supply, which is opened during the steam sanitization  
20 operation and is closed thereafter.

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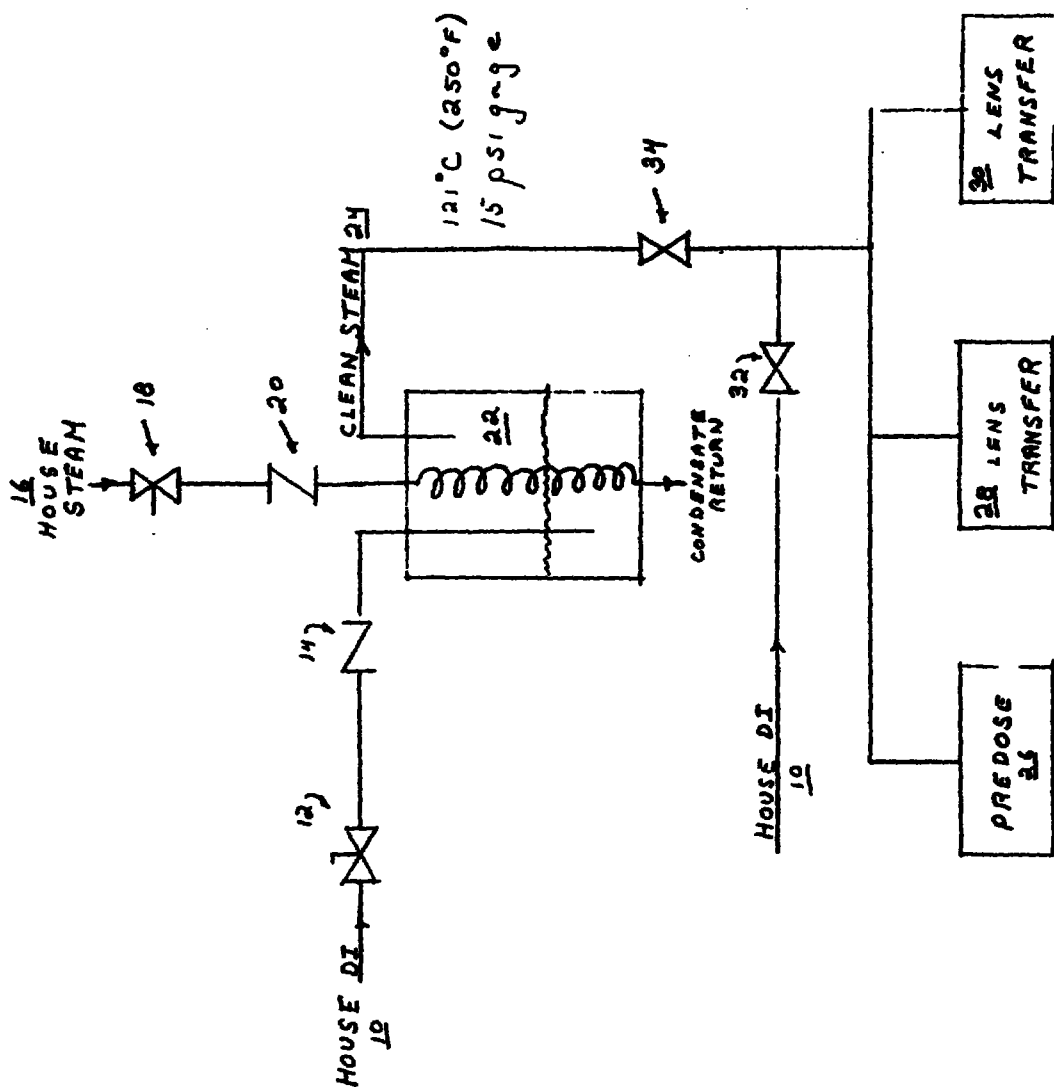
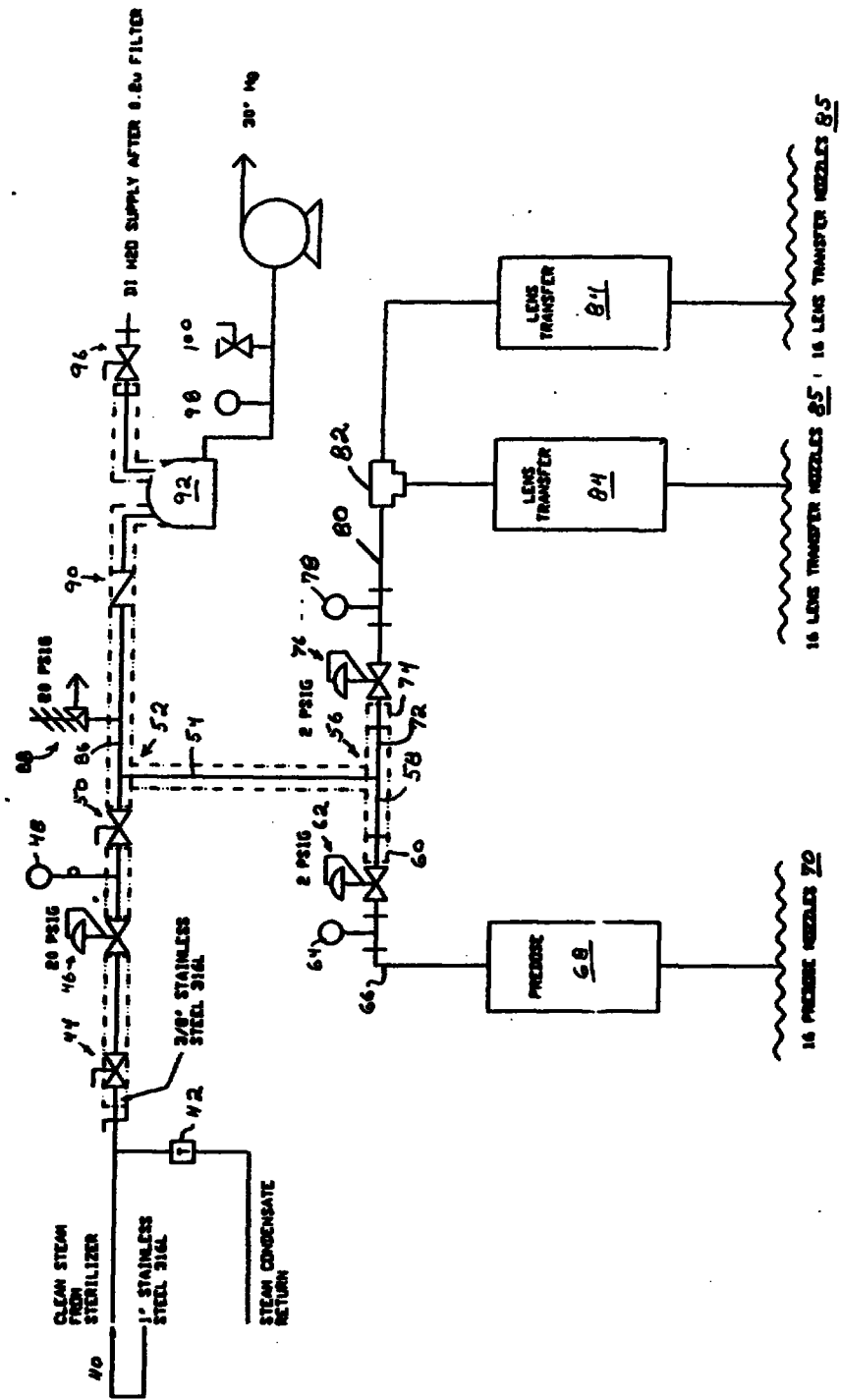


Fig. 1





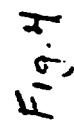


Fig. 4

## ON-LINE STEAM SANITIZATION SYSTEM

### ABSTRACT OF THE DISCLOSURE

1           An on-line steam sanitization system and  
method for a deionized water supply system for a plant  
production line such as a plant for the production and  
packaging of contact lenses. The sanitizing operation  
5   is performed by directing a clean deionized steam  
through all of the deionized water supply system while  
the deionized water supply system is closed, rather than  
disassembled and open to possible recontamination as in  
the prior art, which provides a much more effective  
10   sanitization operation, and also substantially reduces  
the down time for the plant production line. The clean  
steam is generated by using available house steam to  
heat deionized water from the deionized water supply to  
generate a clean steam therefrom which is suitable for  
15   the sanitization operation. The use of steam in an on-  
line sanitizing operation in the existing deionized  
water supply system required that the production line  
equipment be modified to withstand the pressure and heat  
of the steam sanitizing operation, which entailed the  
20   removal of reservoirs and their replacement with  
pressure regulators, a new manifold design which has a  
symmetrical design with an equal number of fixtures  
leading to each of the pumps, and by utilizing Kynar  
tubes and Kynar fixtures.

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