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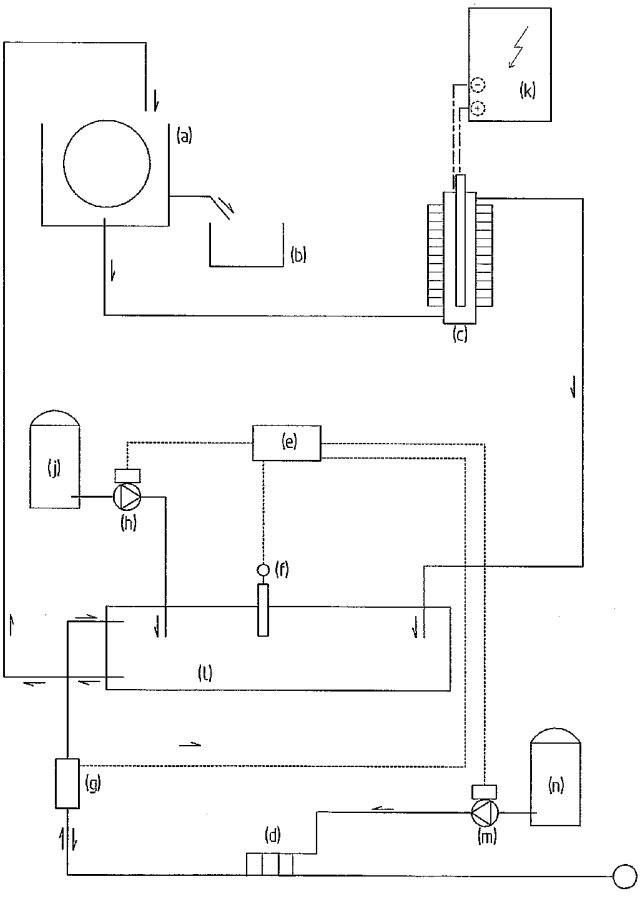
(54) Title: ELECTROCHEMICAL METHOD OF STERILIZING THE SEA BALLAST OF SHIPS



(57) Abstract: Electrochemical method of sterilizing the sea water, which is used as a ballast balance of the ships, during which the solid ingredients of the sea ballast are separated, through a hydro cyclone system and the whole or a part of the sea water is led to a specific electrolytic cell, within which oxidants are produced under specific electrolysis conditions and these oxidants accomplish its sterilization. Subsidiarily as to the existence of adequate oxidants, the same electrolytic cell with a different hydraulic connection in a container with sea water, produces oxidants, which after the instruction of the PLC that receives indications by a REDOX meter within the ballast dock, are injected through a dosing pump and the desired value of the oxidants is kept within the sea ballast. Furthermore, according to the indications of a REDOX meter, the PLC gives the instruction to inject the oxidation reduction material for the dechlorination of the sea ballast during its rejection through the inflow - outflow line.

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ELECTROCHEMICAL METHOD OF STERILIZING THE SEA BALLAST OF SHIPS

TECHNICAL FIELD

The invention refers to the electrochemical method of sterilizing the sea water, which is used as ballast for the balance of ships.

The transportation of sea water, which is used as ballast for the balance of ships, from one sea area to another, has caused a major problem to the sea environment, because pathogenic organisms that are dangerous for spreading illnesses, are being transported and the transferee species, that do not have their natural enemies at the new sea environment, are multiplied in the expense of the native organisms, thus changing the area's variety of live organisms. Up to today the problem is dealt by changing the sea ballast at water depths of 2000m, but this is something that besides the cost, cannot accomplish a change of the sea ballast more than 90%, or by using chemicals, which cause an environmental decay, or with UV rays, which are ineffective, due to the fact that they do not have a residual action.

ADVANTAGES OF THE INVENTION

Since the electrochemical method of sterilizing the sea ballast uses sea water for the production of the oxidants, such as O_3, Cl_2, ClO_2, is very simple in use and totally effective to the sterilization of the sea ballast and can be applied to great flows of sea water.

DESCRIPTION

The sea water, which enters the bilge of the ship, passes through a separation hydro cyclone and the whole or a part of it is led directly or through a bypass to an electrolytic cell, which is supported by a voltage supply of 3 to 30 Volts and an intensity of 5 to 600 Ambers. The total amount of water gathers to the ballast docks of the ship. Inside these docks, there is a REDOX meter that is connected with a PLC, which, depending on the REDOX value, gives a dosing pump, which is within a production and storage container of oxidant made of sea water, the instruction to inject it to the water ballast docks. In order to inactivate the oxidants, a second REDOX meter that is inside the docks, gives the instruction to inject oxidation reduction agents, a solution of acid Sodium Thiosulfate or Sodium Thiosulfate from storage containers. Furthermore, through the line of sea water collection and rejection, there are nozzles that inject a solution of acid Sodium Thiosulfate or Sodium Thiosulfate from storage containers after a PLC instruction and through a dosing pump during the rejection in order to inactivate all the oxidants that are within the sea ballast so as to avoid the environment decay.

Example 1. Drawing 1.
A hydro cyclone that separates solids from liquids (a) is put at an inflow line of sea ballast 300m3/h. The solids left on the grid end up to a bucket (b) in order to be farther treated. The already separated from solids sea water, containing a salt concentration of 2.9% to 3.5%, is led to the electrolytic cell (c), which is supported by a supply of direct current (k) with a voltage of 0.5 to 30 Volts and an intensity of 5 to 600 Ambers. We apply a voltage of 16 Volts and we have an intensity of 250 Ambers at the electrolytic cell for the production of the oxidants. The already electrolyzed water along with the oxidants ends to the ballast dock (I). Inside the dock (I), there is a REDOX meter (f), which is connected to the PLC (e). If the residual oxidants are below the requested limit Cl_2 / lit, the PLC gives the instruction through a dosing pump (h), which is put inside the oxidants production and storage container (j), to forward the oxidant to the ballast dock (I). Through the line of sea water collection and rejection, during the rejection in order to protect the environment from the discard of more oxidants than what is provided by the legislation, there are nozzles (d) that are connected to a container with a solution of acid Sodium Thiosulfate (n) and through a dosing pump (m) inject acid Sodium Thiosulfate, for the thorough inactivation of any possible residual oxidants, following the instruction of the PLC (e) that receives the indication from a REDOX meter (g).

Example 2. Drawing 2.
A hydro cyclone that separates solids from liquids (a) is put at an inflow line of sea ballast 300m3/h. The solids left on the grid end up to a bucket (b) in order to be farther treated. The already separated from solids sea water, ends to the ballast dock (I). Inside the dock (I), there is a REDOX meter (g), which is connected to the PLC (e) that gives the instruction through a dosing pump (h), which is put inside the oxidants production and storage container (j), to forward the oxidant to the ballast dock (I), up to the requested limit Cl_2 / lit. The oxidant is produced by the electrolytic cell (c), which is supported by a supply of direct current (k) with a voltage of 0.5 to 30 Volts and an intensity of 5 to 600 Ambers, by the recirculation of the sea water through the pump (d) inside the container (j). Inside the ballast dock (I), there is a REDOX meter (f), which is connected to the PLC (e) and if the residual oxidants at the outflow are more than what is provided by the legislation, gives the instruction to a dosing pump (m) that is put inside a container with a solution of Sodium Thiosulfate (n) to inject it in the ballast dock (I) in order to inactivate any possible residual oxidants.

CLAIMS

1. Electrochemical method of sterilizing the sea water, which is used as a ballast balance of the ships, during which the incoming sea water goes through a hydro cyclone system of liquids – solids separation and then the whole or a part of it passes through an electrolytic cell, whose anode is made of Titanium, on which one layer of Pt, or Ir, or Rh, or Pd, or Ru, or Zr, or an alloy of these or two layers, the first made of Ta, or Nb, or Zr, or an alloy of these and the second made of Pt, or Ir, or Rh, or Pd, or Ru, or Zr, or an alloy of these are placed with a welding method and whose cathode is made of steel 316L, or 316IS, or 322 and during the passing through of the sea water an electrolysis is taken place under a controlled voltage and intensity of direct current, controlled pH, controlled salt concentration. The reading of the residual oxidants inside the ballast docks is carried out by a REDOX meter, which gives the instruction, through a PLC, to inject oxidants until they reach the desired value. These oxidants have been produced in a sea water container by an electrolytic cell, whose anode is made of Titanium, on which one layer of Pt, or Ir, or Rh, or Pd, or Ru, or Zr, or an alloy of these or two layers, the first made of Ta, or Nb, or Zr, or an alloy of these and the second made of Pt, or Ir, or Rh, or Pd, or Ru, or Zr, or an alloy of these are placed with a welding method and whose cathode is made of steel 316L, or 316IS, or 322. The oxidation reduction of the sea ballast is carried out through dosing pumps by adding oxidation reduction agents, from their storage containers, in the sea ballast docks or during the outflow of the sea ballast through the inflow outflow line, by injecting oxidation reduction agents from nozzles after the instruction of the PLC that counts the oxidants through a REDOX meter.

2. Electrochemical method of sterilizing the sea water, which is used as a ballast balance of the ships, according to the claim 1, where the concentration of the electrolytically produced oxidant inside the sea ballast docks, in the form of free chlorine is within 1 to 100 ppm.

3. Electrochemical method of sterilizing the sea water, which is used as a ballast balance of the ships, according to the claim 1, where the voltage of the direct current is from 3 to 30 Volts.

4. Electrochemical method of sterilizing the sea water, which is used as a ballast balance of the ships, according to the claim 1, where the intensity of the direct current is from 5 to 800 Ambers.

5. Electrochemical method of sterilizing the sea water, which is used as a ballast balance of the ships, according to the claim 1, where the pH value during the electrolysis is within the range of 5 to 9.

6. Electrochemical method of sterilizing the sea water, which is used as a ballast balance of the ships, according to the claim 1, where the measurement of the oxidants in the sea water ballast and the at the inflow outflow line is carried out with a REDOX meter.

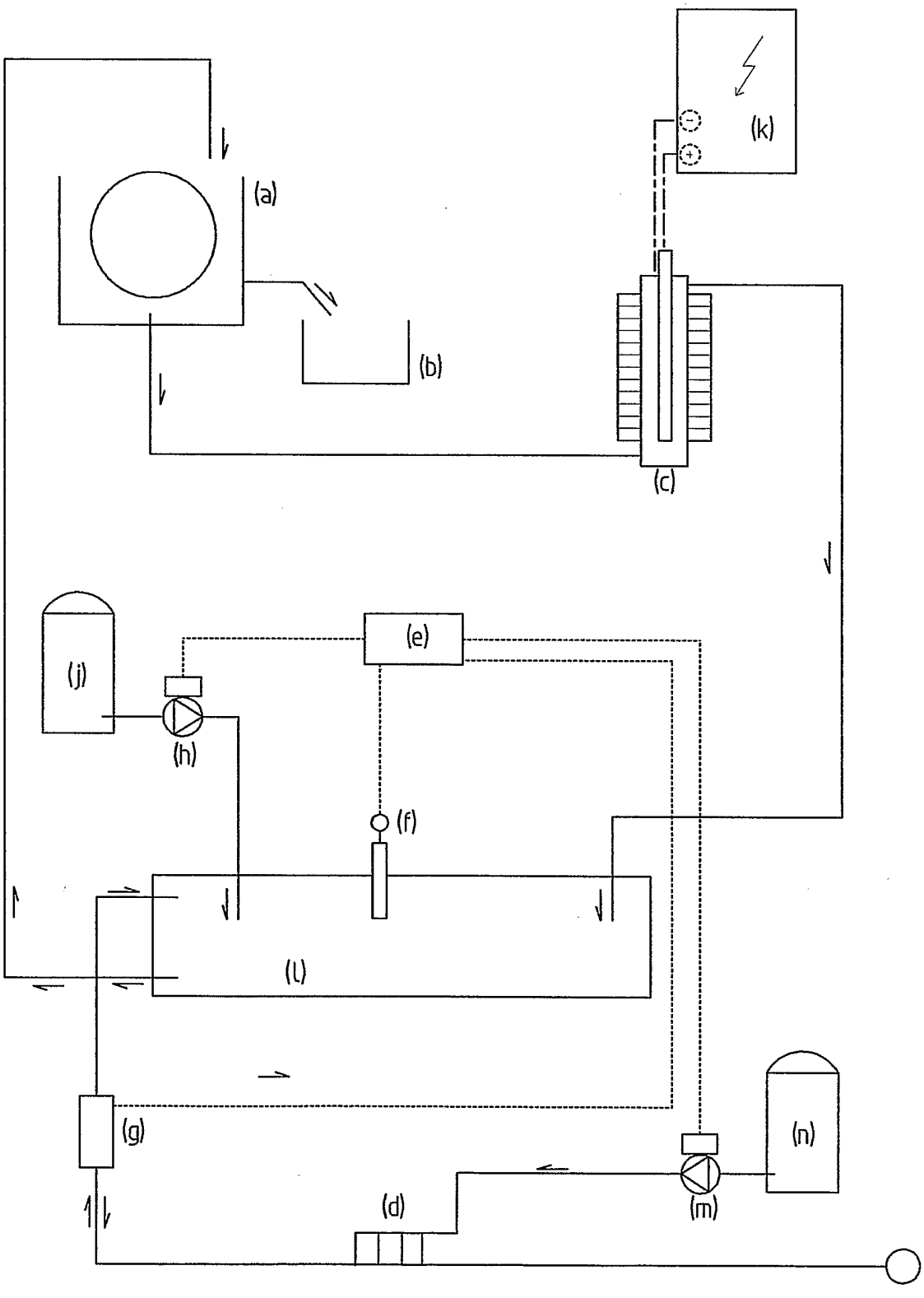
7. Electrochemical method of sterilizing the sea water, which is used as a ballast balance of the ships, according to the claim 1, where the concentration of the oxidant in the production and storage container in the form of free chlorine is within 500 to 10.000 ppm.

8. Electrochemical method of sterilizing the sea water, which is used as a ballast balance of the ships, according to the claim 1, where the oxidation reduction is carried out inside the sea water ballast docks and at the inflow outflow line using a solution of acid Sodium Thiosulfate by a dosing pump or by nozzles, based on the instruction of the PLC that receives the indication of a REDOX meter.

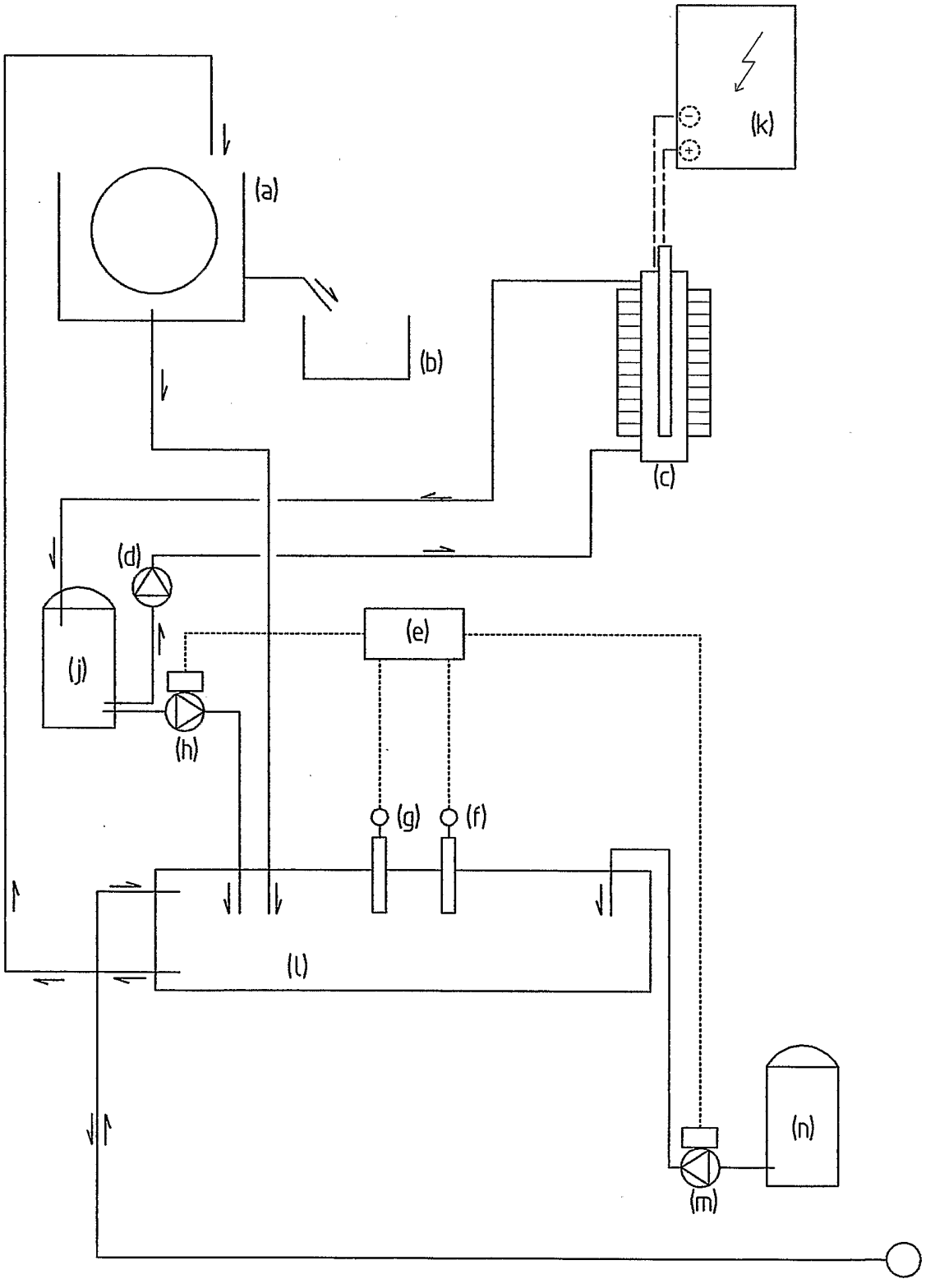
9. Electrochemical method of sterilizing the sea water, which is used as a ballast balance of the ships, according to the claim 1, where the oxidation reduction is carried out inside the sea water ballast docks and at the inflow outflow line using a solution of Sodium Thiosulfate by a dosing pump or by nozzles, based on the instruction of the PLC that receives the indication of a REDOX meter.

10. Electrochemical method of sterilizing the sea water, which is used as a ballast balance of the ships, according to the claim 1, where the salt concentration of the sea water is within 2.8% to 3.5%.

DRAWING 1



DRAWING 2



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IPC 7 C02F1/00 C02F1/461 C02F1/467

According to International Patent Classification (IPC) or to both national classification and IPC

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Minimum documentation searched (classification system followed by classification symbols)
IPC 7 C02F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
P,Y	WO 03/031345 A (NINOLAKIS MARKOS) 17 April 2003 (2003-04-17) page 1, line 34 -page 2, line 2; claims 1,3,4,7; figures 1,2; examples 1,2	1,3-6,10
Y	WO 02/085793 A (C & M GROUP LLC) 31 October 2002 (2002-10-31) page 3, paragraphs 1,2; figures 1-4 page 22, paragraph 5 -page 23, paragraph 2 page 24, paragraph 4 page 30, paragraph 2 -page 31, paragraph 1 page 33, paragraph 4 -page 35, paragraph 1	1,3,4
Y	US 3 458 413 A (HORIGUCHI TSUTOMU ET AL) 29 July 1969 (1969-07-29) column 2, line 37-50,63-68 column 4, line 31-36; claims 4-6	1,3-6,10

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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
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Name and mailing address of the ISA	Authorized officer
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INTERNATIONAL SEARCH REPORT

International Application No
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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

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Y	EP 0 608 200 A (ELTECH SYSTEMS CORP) 27 July 1994 (1994-07-27) page 3, line 9-20 page 4, line 6,7,37-40 page 5, line 49 -page 6, line 10; claims 1-6,11; figure 1; examples 1,2	1,3-6,10
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