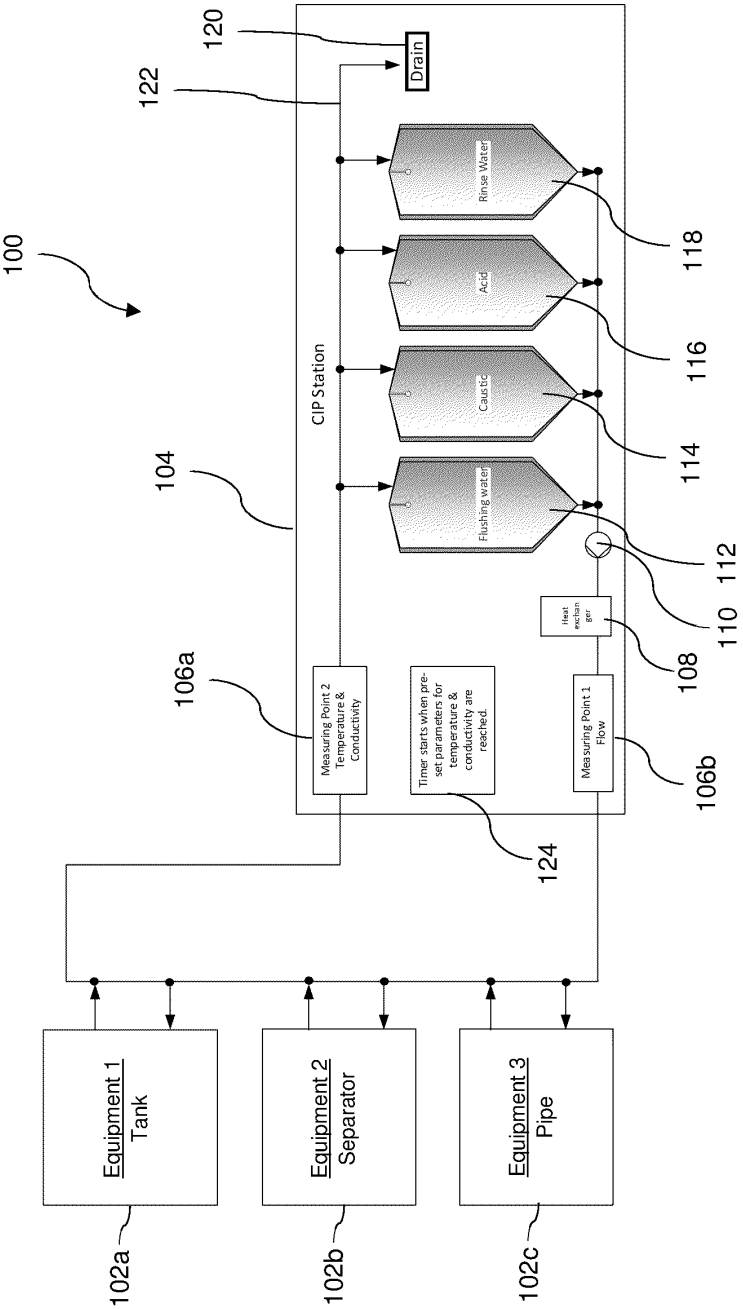

Fig. 1 (prior art)

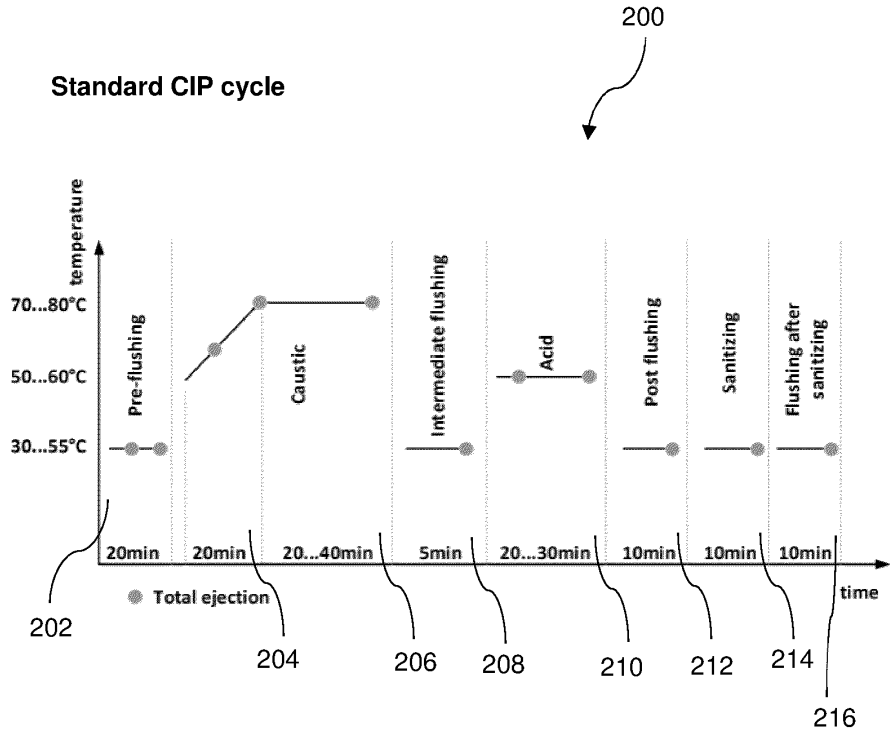

Fig. 2 (prior art)

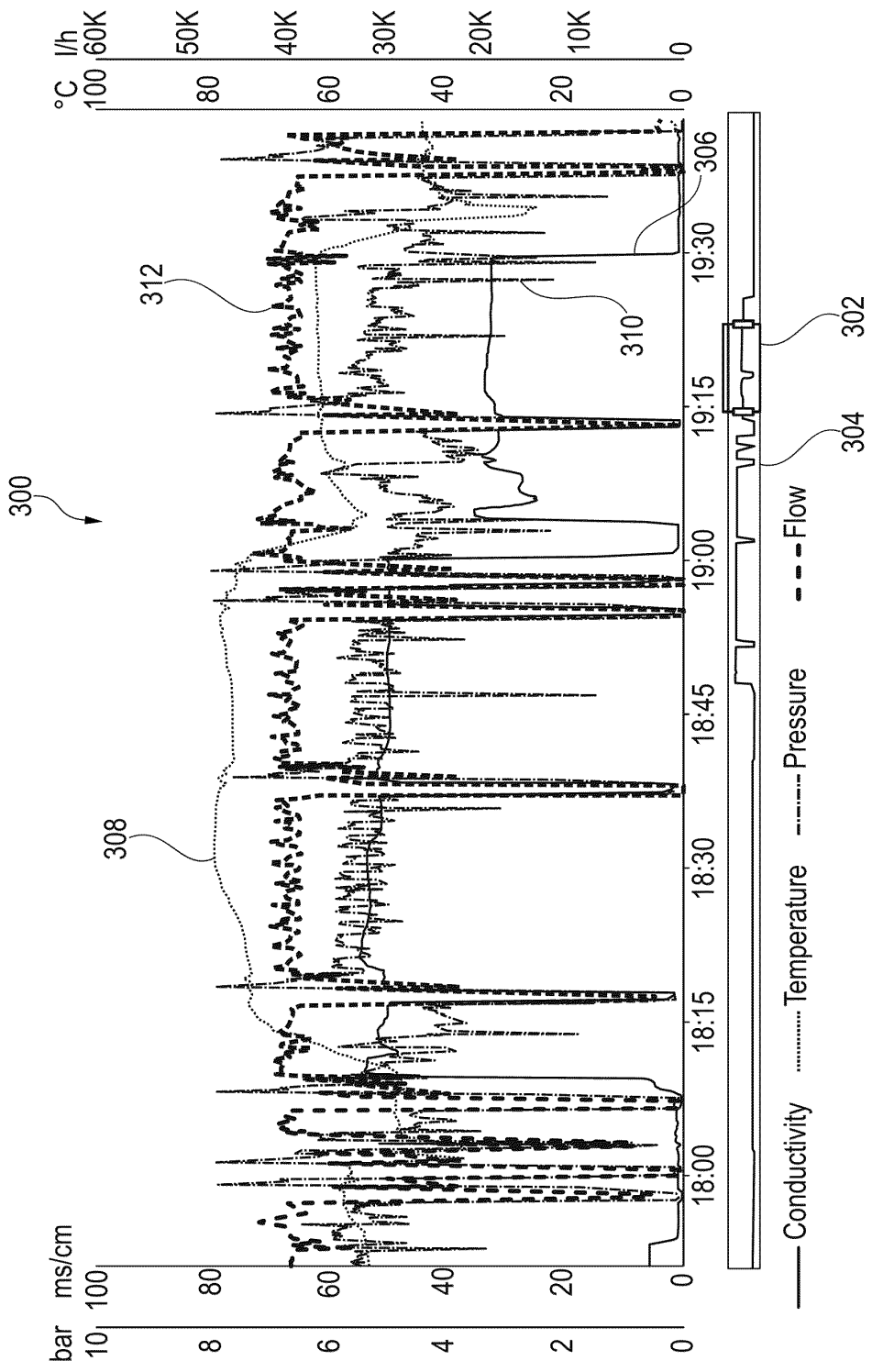
300
302
304
306
308
310
312
bar
ms/cm
°C
l/h
Conductivity
Temperature
Pressure
Flow
18:00
18:15
18:30
18:45
19:00
19:15
19:30

Fig. 3

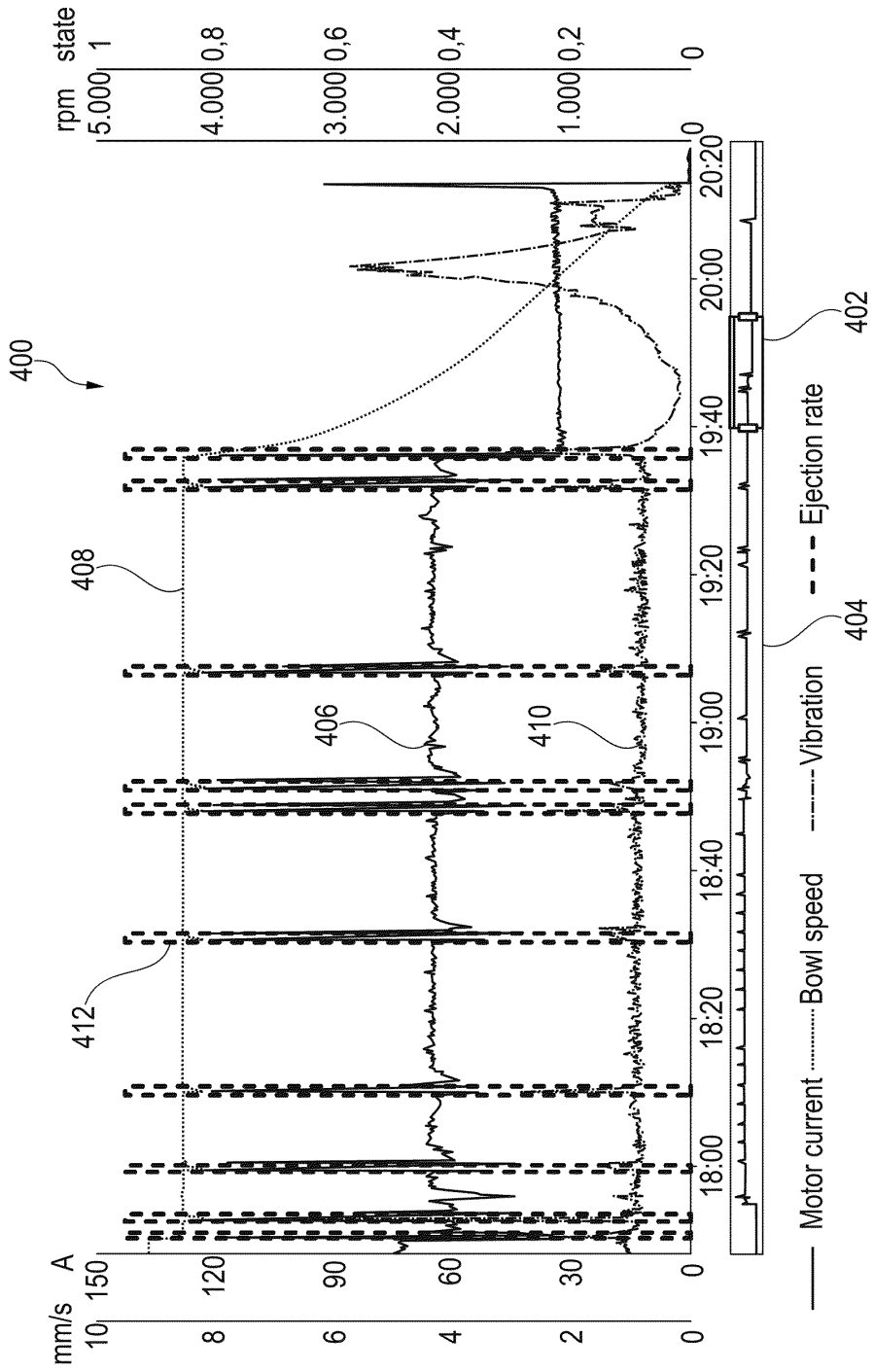
rpm
state
5.000
4.000
3.000
2.000
1.000
0
1
0,8
0,6
0,4
0,2
0
400
408
406
410
412
402
404
mm/s
A
10
8
6
4
2
0
150
120
90
60
30
0
18:00
18:20
18:40
19:00
19:20
19:40
20:00
20:20
Motor current
Bowl speed
Vibration
Ejection rate

Fig. 4

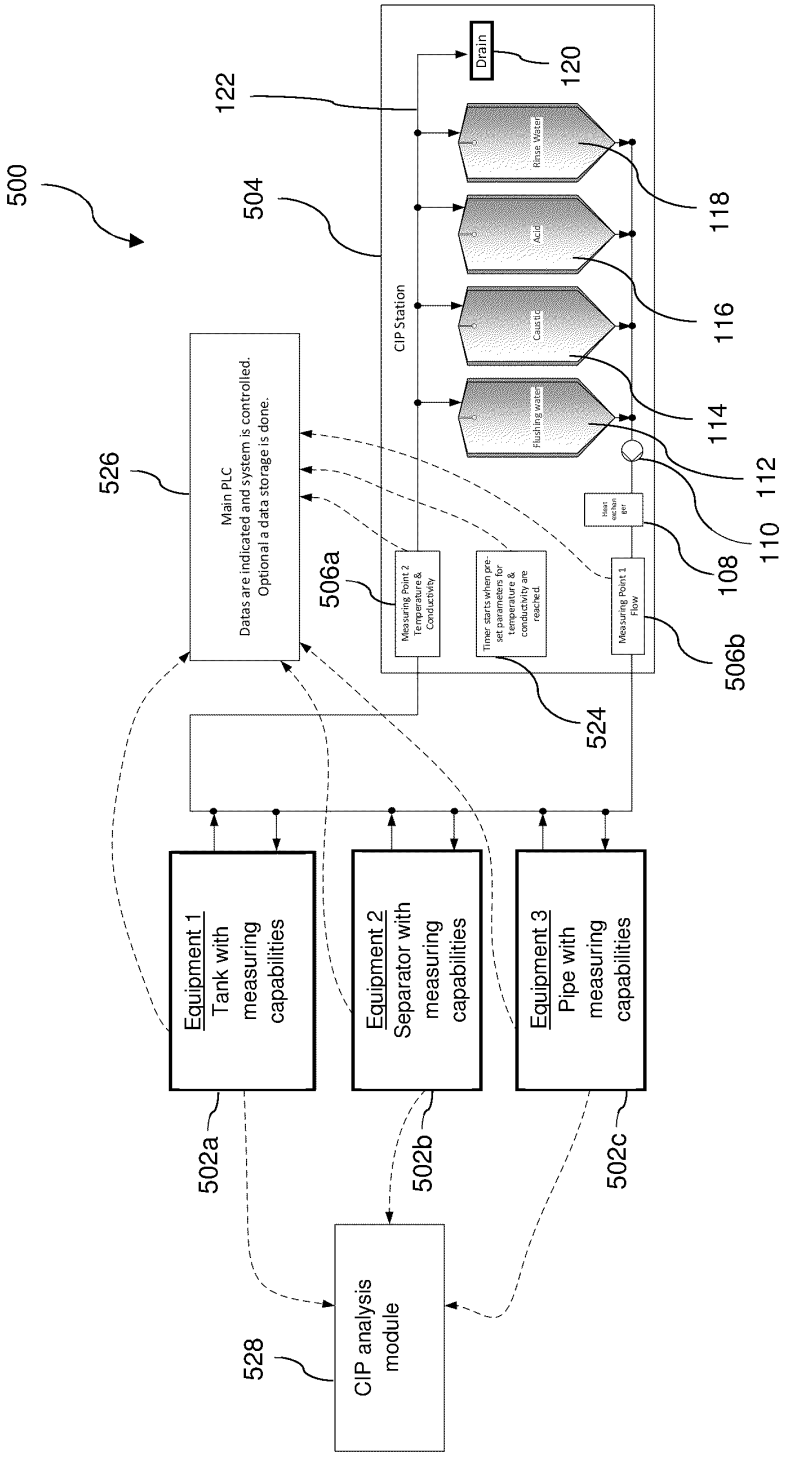
500
504
122
Drain
120
CIP Station
Rinse Water
Acid
Caustic
Flushing water
118
116
114
112
110
108
506b
506a
526
Main PLC
Datas are indicated and system is controlled.
Optional a data storage is done.
Measuring Point 2
Temperature &
Conductivity
Timer starts when pre-
set parameters for
temperature &
conductivity are
reached
Measuring Point 1
Flow
524
Equipment 1
Tank with
measuring
capabilities
Equipment 2
Separator with
measuring
capabilities
Equipment 3
Pipe with
measuring
capabilities
502a
502b
502c
528
CIP analysis
module

Fig. 5

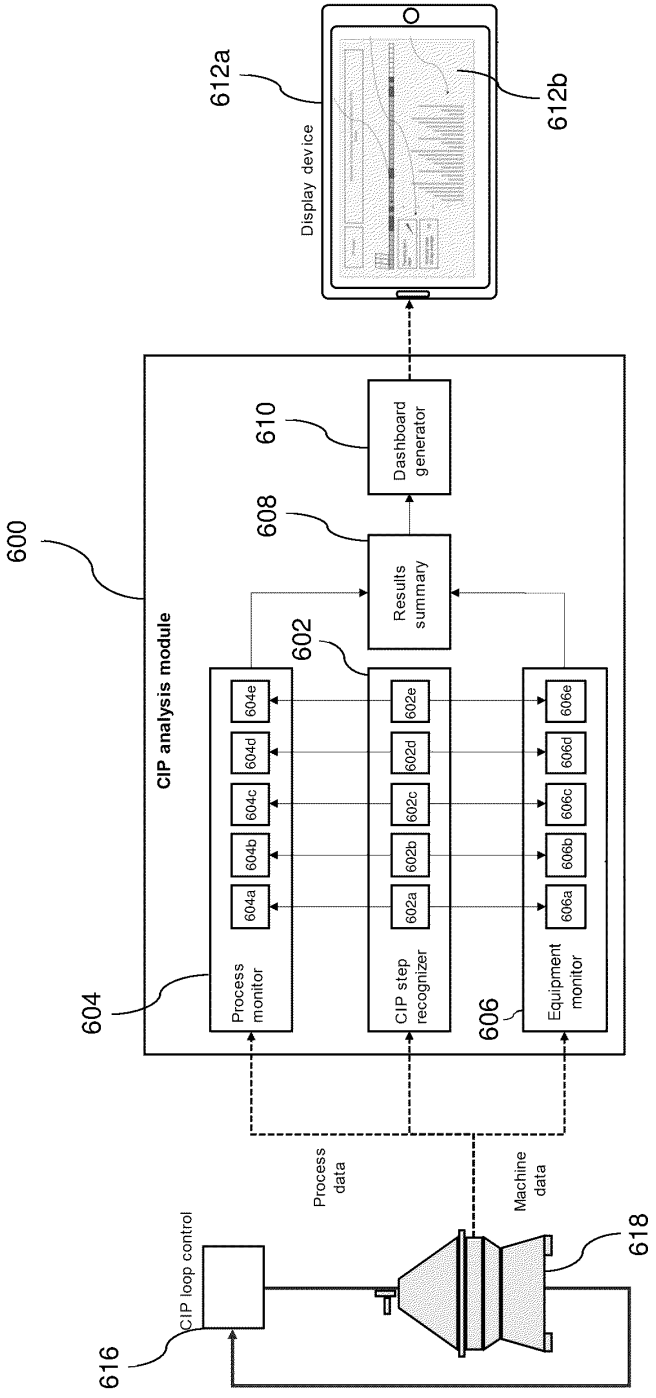
612a
612b
Display device
600
CIP analysis module
610
Dashboard generator
608
Results summary
602
604
Process monitor
604a
604b
604c
604d
604e
CIP step recognizer
602a
602b
602c
602d
602e
606
Equipment monitor
606a
606b
606c
606d
606e
Process data
Machine data
618
CIP loop control
616

Fig. 6

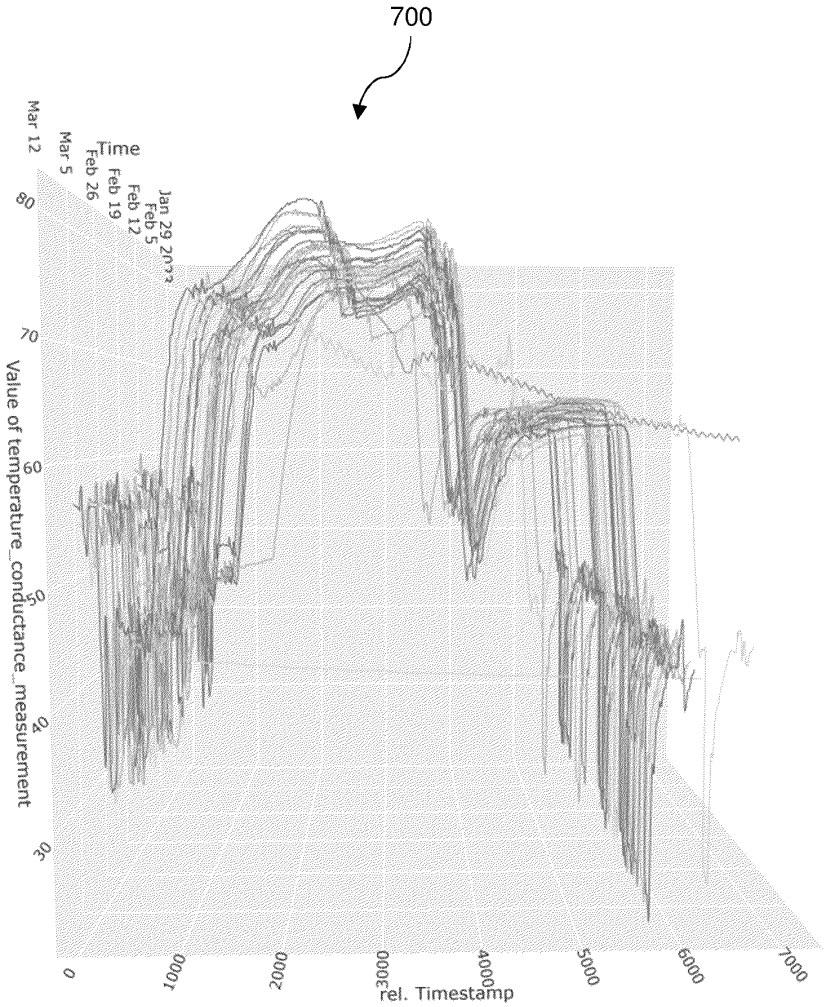
700
Time
Mar 12
Mar 5
Feb 26
Feb 19
Feb 12
Feb 5
Jan 29 2022
Value of temperature_conductance_measurement
80
70
60
50
40
30
0
1000
2000
3000
4000
5000
6000
7000
rel. Timestamp

Fig. 7

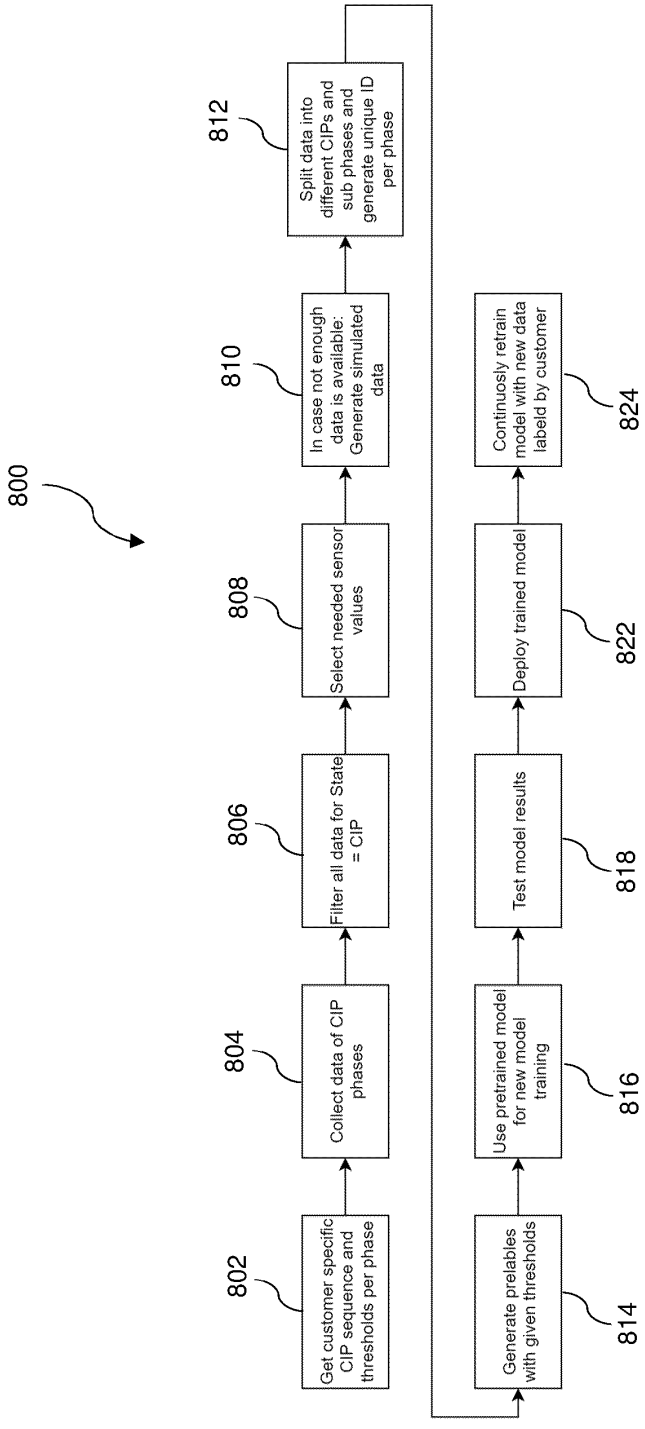
800
802
Get customer specific CIP sequence and thresholds per phase
804
Collect data of CIP phases
806
Filter all data for State = CIP
808
Select needed sensor values
810
In case not enough data is available: Generate simulated data
812
Split data into different CIPs and sub phases and generate unique ID per phase
814
Generate prelables with given thresholds
816
Use pretrained model for new model training
818
Test model results
822
Deploy trained model
824
Continuosly retrain model with new data labeld by customer

Fig. 8