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(54) Benævnelse: **Method for producing a flow rich in methane and a flow rich in C2+ hydrocarbons, and associated installation**

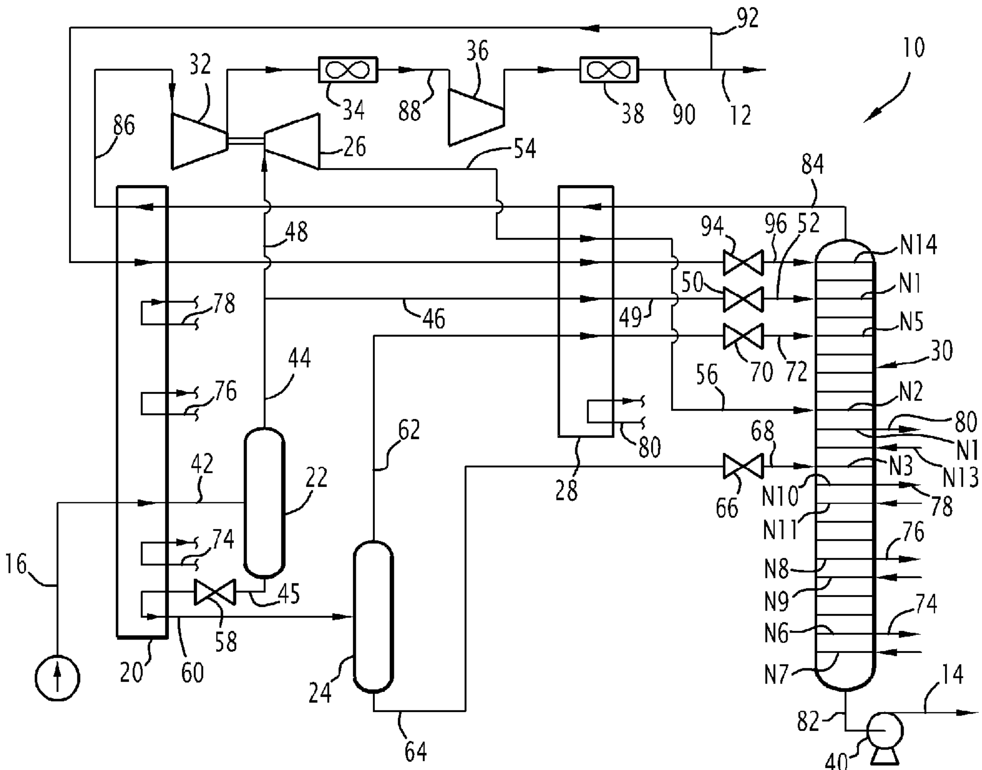
(57) Sammendrag:

This method comprises cooling the supply flow in a first heat exchanger (20), separation in a first separation flask (22) in order to produce a light upper flow (44) and a heavy lower flow (45) and dividing the light upper flow (44) into a supply fraction (48) of a dynamic pressure reduction turbine and a supply fraction (46) of a first distillation column (30).

The method comprises forming a cooled reflux flow (56) from an effluent (54) from a dynamic pressure reduction turbine (26), the portion of the effluent being cooled and at least partially liquefied in a heat exchanger (28).

It comprises introducing the cooled reflux flow (56) from the heat exchanger (28) into the first distillation column (30).

fortsættes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N6
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N7
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82
64
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FIG.1

CLAIMS

1. Method for producing a flow (12) rich in methane and a flow (14) rich in C_2^+ hydrocarbons from a supply flow (16) containing hydrocarbons, the method comprising the following steps:

- separating the supply flow (16) into a first fraction (115) of the supply flow and at least a second fraction (116) of the supply flow,
- introducing the first fraction (115) of the supply flow into a first heat exchanger (20);
- cooling the first fraction (16; 115) of the supply flow in the first heat exchanger (20);
- introducing the cooled first fraction (42) of the supply flow into a first separation flask (22) in order to produce a light upper flow (44) and a heavy lower flow (45);
- dividing the light upper flow (44) into a turbine supply fraction (48) and a column supply fraction (46);
- pressure reduction of the turbine supply fraction (48) in a first dynamic pressure reduction turbine (26) and introduction of at least a portion (56; 54) of the fraction (54) subjected to pressure reduction into the first turbine (36) in a middle portion of a first distillation column (30);
- cooling and at least partially condensing the column supply fraction (46) in a second heat exchanger (28), pressure reduction and introduction of the cooled column supply fraction into an upper portion of the first distillation column (30);
- pressure reduction and partial vaporisation of the heavy lower flow (45) in the first heat exchanger (20) and introduction of the heavy lower flow (45) subjected to pressure reduction into a second separation flask (24) in order to produce an upper gas fraction (62) and a lower liquid fraction (64);

- pressure reduction of the lower liquid fraction (64) and introduction in the middle portion of the first distillation column (30);
- cooling and at least partially condensing the upper gas fraction (62) in the second heat exchanger (28) and introduction into the upper portion of the first distillation column (30);
- recovery of a lower column flow (82) at the bottom of the first distillation column (30), the flow (14) rich in C_2^+ hydrocarbons being formed from the lower column flow (82);
- recovery and reheating of an upper column flow (84) rich in methane,
- compressing at least a fraction of the upper column flow (84) in at least a first compressor (32) coupled to the first dynamic pressure reduction turbine (26) and in at least a second compressor (36);
- forming the flow (12) rich in methane from the reheated and compressed upper column flow (90);
- removing an extraction flow (92) from the upper column flow (90);
- cooling and introducing the cooled extraction flow (96) into an upper portion of the first distillation column (30);

the method comprising the following steps:

- introducing at least a portion of the second fraction of the supply flow (116) into a second dynamic pressure reduction turbine (112), separate from the first dynamic pressure reduction turbine (26),
- forming a cooled reflux flow (160; 234) from at least a portion of an effluent (118) from a dynamic pressure reduction turbine (112), the fraction (118) subjected to pressure reduction from the second dynamic turbine (112) forming the effluent (118) from the dynamic pressure reduction turbine

the portion of the effluent from the dynamic pressure reduction turbine (112) being cooled and at least partially liquefied in a heat exchanger (28; 214) in order to form the cooled reflux flow (160; 234),

- introducing the cooled reflux flow (160; 234) from the heat exchanger (28; 214) into the first distillation column (30).

2. Method according to claim 1, characterised in that it comprises the following steps:

- removing a reboiling flow (80) from the first distillation column (30) at a removal level;
- placing the reboiling flow (80) in a heat exchange relationship with the portion of the effluent from a dynamic pressure reduction turbine in the heat exchanger (28) in order to cool and at least partially liquefy the portion of the effluent from the dynamic pressure reduction turbine, and
- reintroducing the reboiling flow (80) into the first distillation column (30) at a level lower than the removal level.

3. Method according to claim 1 or claim 2, characterised in that the method comprises the introduction of the fraction (54) subjected to pressure reduction from the first dynamic pressure reduction turbine (30) into the second heat exchanger (28) in order to be cooled and partially liquefied therein, the cooled fraction subjected to pressure reduction forming an auxiliary cooled reflux stream (56), the process comprising the introduction of the auxiliary cooled reflux stream (56) in the first distillation column (30).

4. Method according to anyone of the preceding claims, characterised in that it comprises the following steps:

- introducing the fraction (118) subjected to pressure reduction from the second dynamic pressure reduction turbine (112) into a downstream separation flask (152) in order to form a third upper gas flow (156) and a third lower liquid flow (154),

- cooling the third upper gas flow (156) in the heat exchanger (28; 214) in order to form the cooled reflux flow (160).

5. Method according to claim 4, characterised in that the third upper gas flow (156) is introduced, after cooling, into an auxiliary distillation column (216), the cooled reflux flow (234) being formed from the lower flow (232) of the auxiliary distillation column (216).

6. Method according to any one of the preceding claims, characterised in that it comprises the following steps:

- cooling and partially condensing the second supply flow fraction (116);
- introducing the second cooled supply flow fraction into an upstream separation flask (122) in order to form a second gas fraction (126) and a second liquid fraction (124);
- introducing the second gas fraction (126) into the second dynamic pressure reduction turbine (112);
- introducing the second liquid fraction (124), after pressure reduction, into a lower portion of the first distillation column (30).

7. Method according to any one of the preceding claims, characterised in that the whole of the second fraction of the supply flow (116) is introduced into the second dynamic pressure reduction turbine (112) without cooling between the step of separating the supply flow and the step of introducing the second fraction of the supply flow into the second dynamic pressure reduction turbine (112).

8. Method according to any one of the preceding claims, characterised in that it comprises the following steps:

- removing a secondary compression fraction (121B) from the upper column flow (86) rich in methane, before the upper column flow (86) rich in methane is passed into the first compressor (32),

- passing the secondary compression fraction (121B) into a third compressor (114) coupled to the second dynamic pressure reduction turbine (112);
- introducing the compressed secondary compression fraction (121C) from the third compressor (114) into the compressed upper column flow, downstream of the first compressor (32).

9. Method according to any one of the preceding claims, characterised in that it comprises the following steps:
- removing a make-up cooling flow (174) from the upper column flow (84, 86, 88, 90) rich in methane or from a flow (92) formed from the upper column flow (84, 86, 88, 90) rich in methane;
- pressure reduction and introduction of the make-up cooling flow (176) subjected to pressure reduction into a flow (42, 48) flowing upstream of the first pressure reduction turbine (26), advantageously into the first fraction of the cooled supply flow (42) or the turbine supply fraction (48).

10. Method according to any one of the preceding claims, characterised in that it comprises the following steps:
- passing the upper column flow (84) rich in methane into the first heat exchanger (20);
- removing an auxiliary pressure reduction flow (121B) from the upper column flow (84) rich in methane, after it has been passed into the first heat exchanger (20);
- dynamic pressure reduction of the auxiliary pressure reduction flow (121B) in an auxiliary dynamic pressure reduction turbine (182);
- introducing the flow (121C) subjected to pressure reduction from the auxiliary dynamic pressure reduction turbine (182) into the upper column flow (84) rich in methane before it is passed into the first heat exchanger (20).

11. Method according to any one of the preceding claims, characterised in that the second compressor (36) comprises a first compression stage (36A), at least a second compression

stage (36B) and a cooler (38A) interposed between the first compression stage (36A) and the second compression stage (36B), the method comprising a step of passing the compressed upper column flow (88) from the first compressor (32) successively into the first compression stage (36A), into the cooler (38A), then into the second compression stage (36B).

12. Method according to any one of the preceding claims, characterised in that the portion of the effluent (54; 118) from the dynamic pressure reduction turbine, the upper column flow (84), the column supply fraction (46) and the upper gas fraction (62) are placed in a heat exchange relationship in the second heat exchanger (28).

13. Method according to any one of claims 1 to 11, characterised in that at least a fraction (238) of the upper column flow (84) and the portion of the effluent (118) of the dynamic pressure reduction turbine are placed in a heat exchange relationship in a downstream heat exchanger (214) separate from the second heat exchanger (28).

14. Installation for producing a flow (12) rich in methane and a flow (14) rich in C_2^+ hydrocarbons from a supply flow (16) containing hydrocarbons, of the type comprising:

- means for separating the supply flow (16) into a first fraction (115) of the supply flow and at least a second fraction (116) of the supply flow,
- a first heat exchanger (20) for cooling the first fraction (115) of the supply flow (16);
- means for introducing the first fraction (115) of the supply flow into the first heat exchanger (20);
- a first separation flask (22) and means for introducing the cooled first fraction of the supply flow(42) into the first separation flask (22) in order to produce a light upper flow (44) and a heavy lower flow (45);
- means for dividing the light upper flow (44) into a turbine supply fraction (48) and a column supply fraction (46);

- a first distillation column (30);
- pressure reduction means for the turbine supply fraction (48) comprising a first dynamic pressure reduction turbine (26) and means for introducing at least a portion (56) of the fraction (54) subjected to pressure reduction into the first turbine (26) in a middle portion of the first distillation column (30);
- means for cooling and at least partially condensing the column supply fraction (46) comprising a second heat exchanger (28) and means for pressure reduction and introduction of the cooled column supply fraction (52) into an upper portion of the first distillation column (30);
- means (58) for pressure reduction and means for partial vaporisation of the heavy lower flow (60) comprising the first heat exchanger (20);
- a second separation flask (24) and means for introducing the heavy lower flow (60) into the second separation flask in order to produce an upper gas fraction (62) and a lower liquid fraction (64);
- means (66) for pressure reduction of the lower liquid fraction (64) and means for introduction into the middle portion of the first distillation column (30);
- means for cooling and at least partially condensing the upper gas fraction (62) comprising the second heat exchanger (28) and means for introducing the upper gas fraction (62) into the upper portion of the first distillation column (30);
- means for recovering a lower column flow (82) at the bottom of the first distillation column (30), and means for forming the flow (14) rich in C_2^+ hydrocarbons from the lower column flow (82);
- means for recovering and reheating an upper column flow (84) rich in methane, at the top of the first distillation column (30);

- means for compressing at least a fraction of the upper column flow comprising at least a first compressor (32) coupled to the first dynamic pressure reduction turbine (26) and at least a second compressor (36);
- means for forming the flow (12) rich in methane from the reheated and compressed upper column flow (90);
- means for removing from the upper column flow (84, 86, 88, 90) an extraction flow (92),
- means for cooling and introducing the cooled extraction flow into an upper portion of the first distillation column (30);

the installation comprising:

- a second dynamic pressure reduction turbine (112) separate from the first dynamic pressure reduction turbine (26);
- means for introducing at least a portion of the second fraction of the supply flow (116) into the second dynamic pressure reduction turbine (112),
- means for forming a cooled reflux flow (160; 234) from at least a portion of an effluent (118) from a dynamic pressure reduction turbine (112), the fraction (118) subjected to pressure reduction from the second dynamic turbine forming the effluent (118) from the dynamic pressure reduction turbine,

the portion of the effluent from the dynamic pressure reduction turbine (112) being cooled and at least partially liquefied in a heat exchanger (28; 214) in order to form the cooled reflux flow (160; 234),

- means for introducing the cooled reflux flow (160; 234) from the heat exchanger (28; 214) into the first distillation column (30).

15.- Installation according to claim 14, comprising means for introducing the fraction (54) subjected to pressure reduction from the first dynamic pressure reduction turbine (30) into the second heat exchanger (28) in order to be cooled and partially liquefied therein, the cooled fraction subjected to pressure reduction forming an auxiliary cooled reflux stream (56), the installation comprising means for introducing the auxiliary cooled reflux stream (56) in the first distillation column (30).

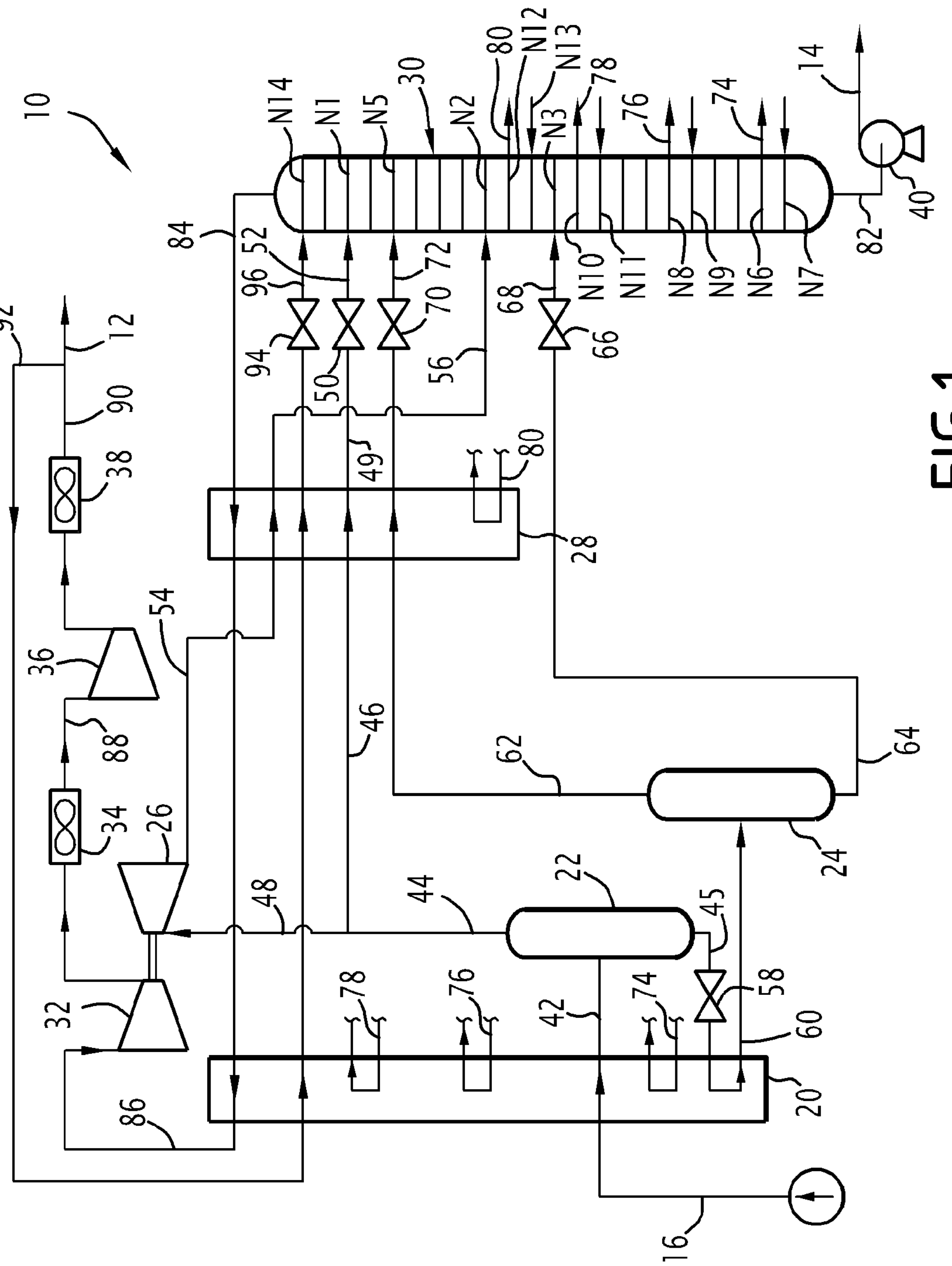
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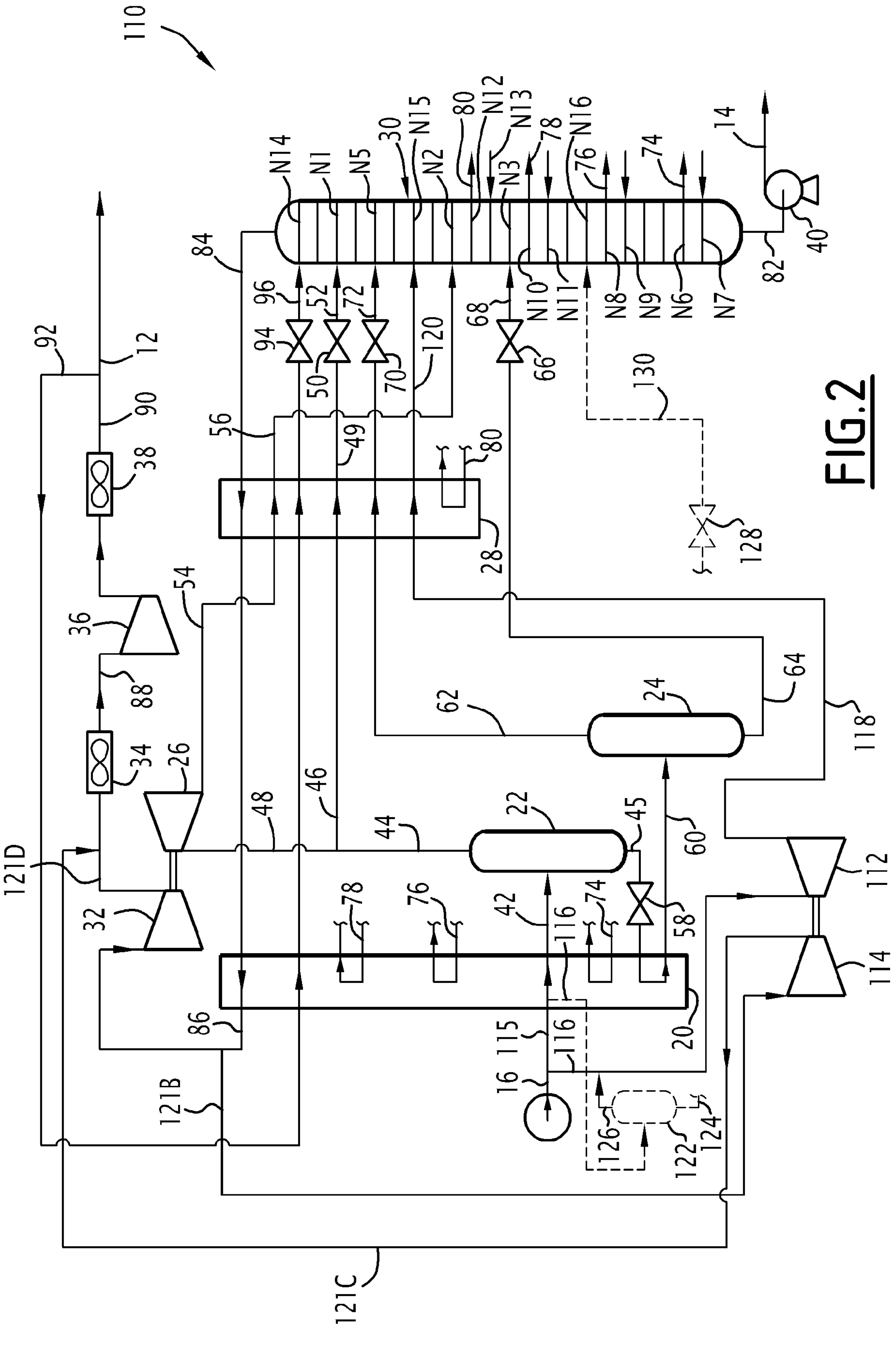
FIG.1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44
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121D
32
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122
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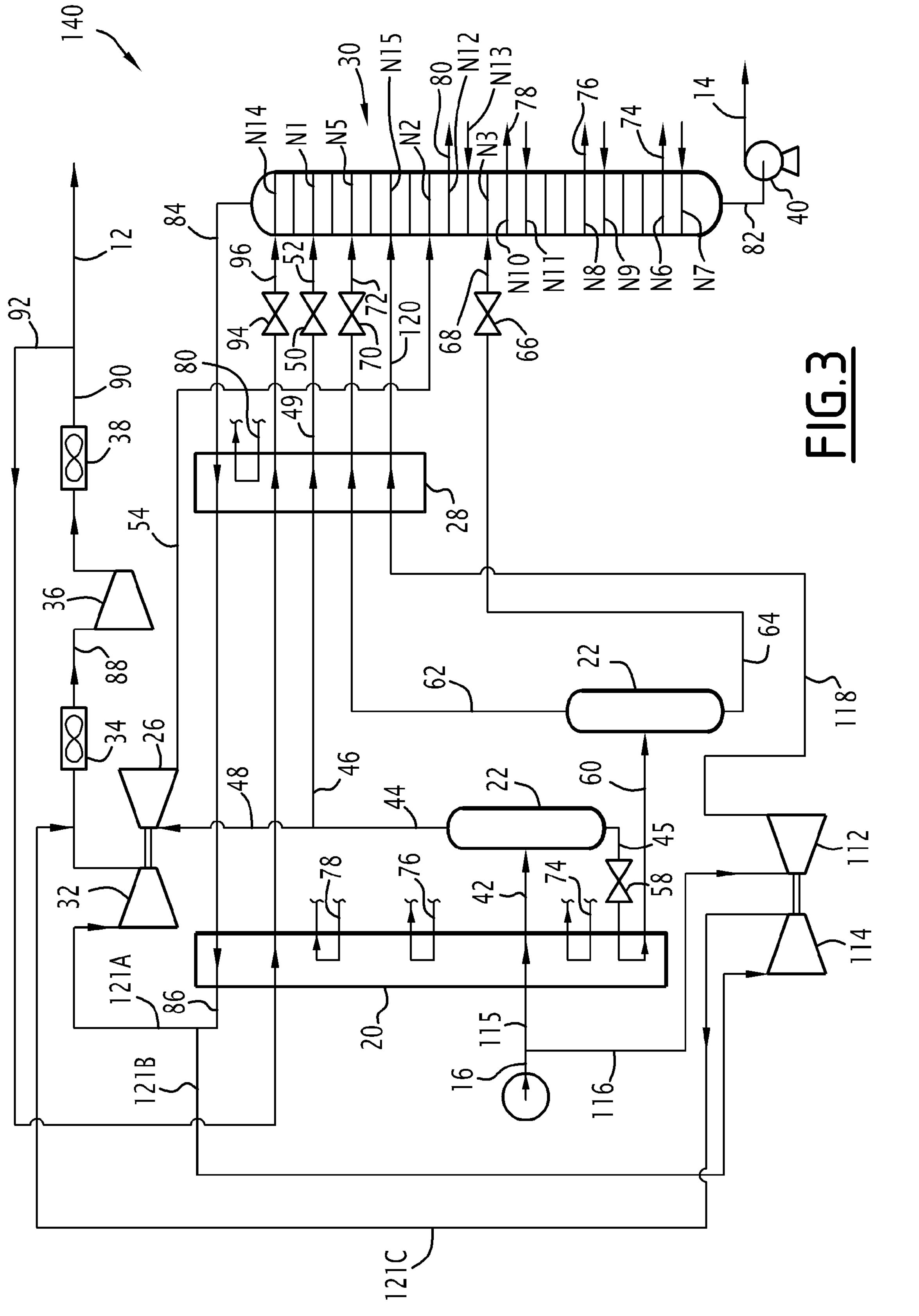
121C

FIG.2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72
120
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N7
92
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90
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54
28
36
88
22
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118
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44
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86
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115
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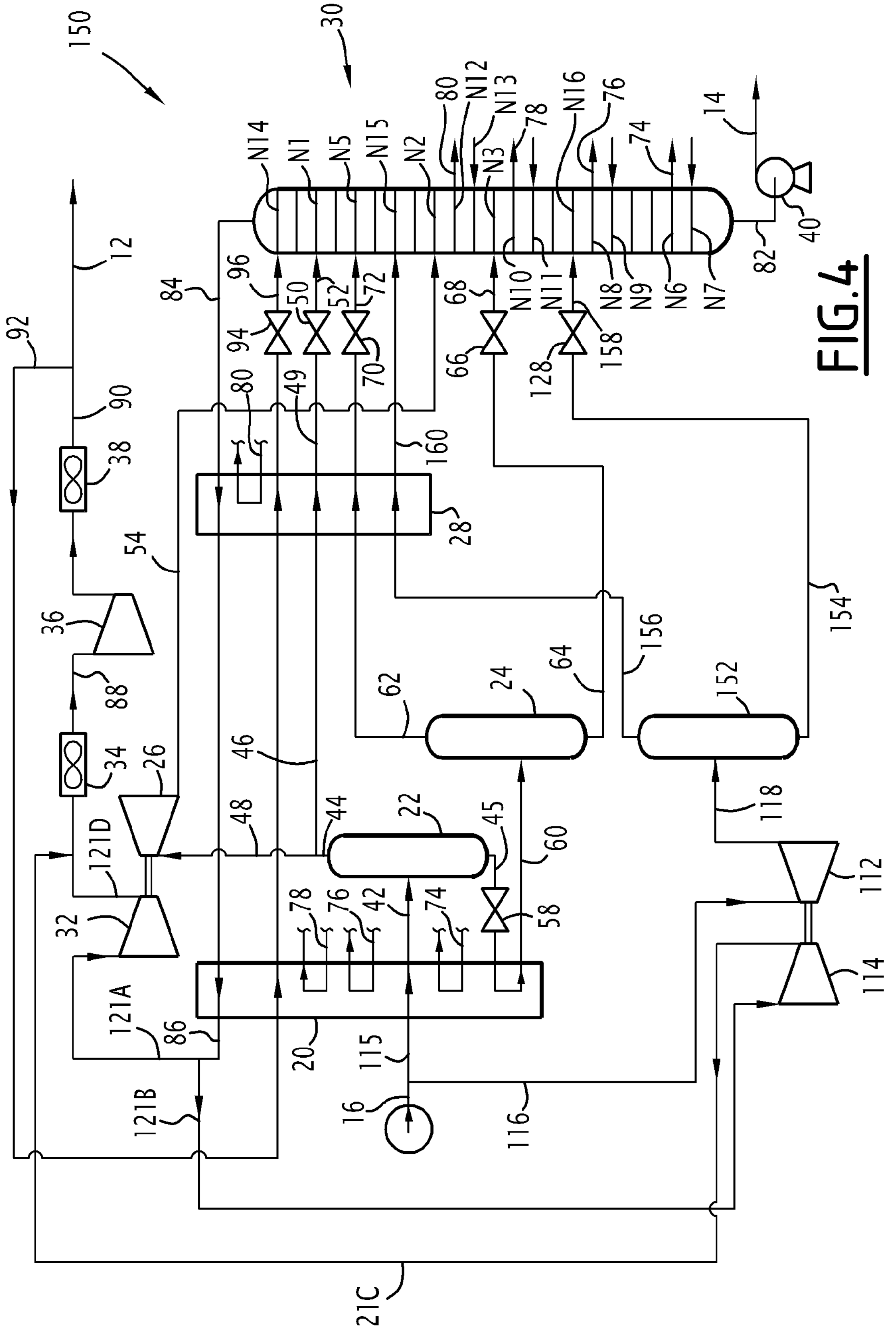
116
121B
121C

FIG.3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N16
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FIG.4

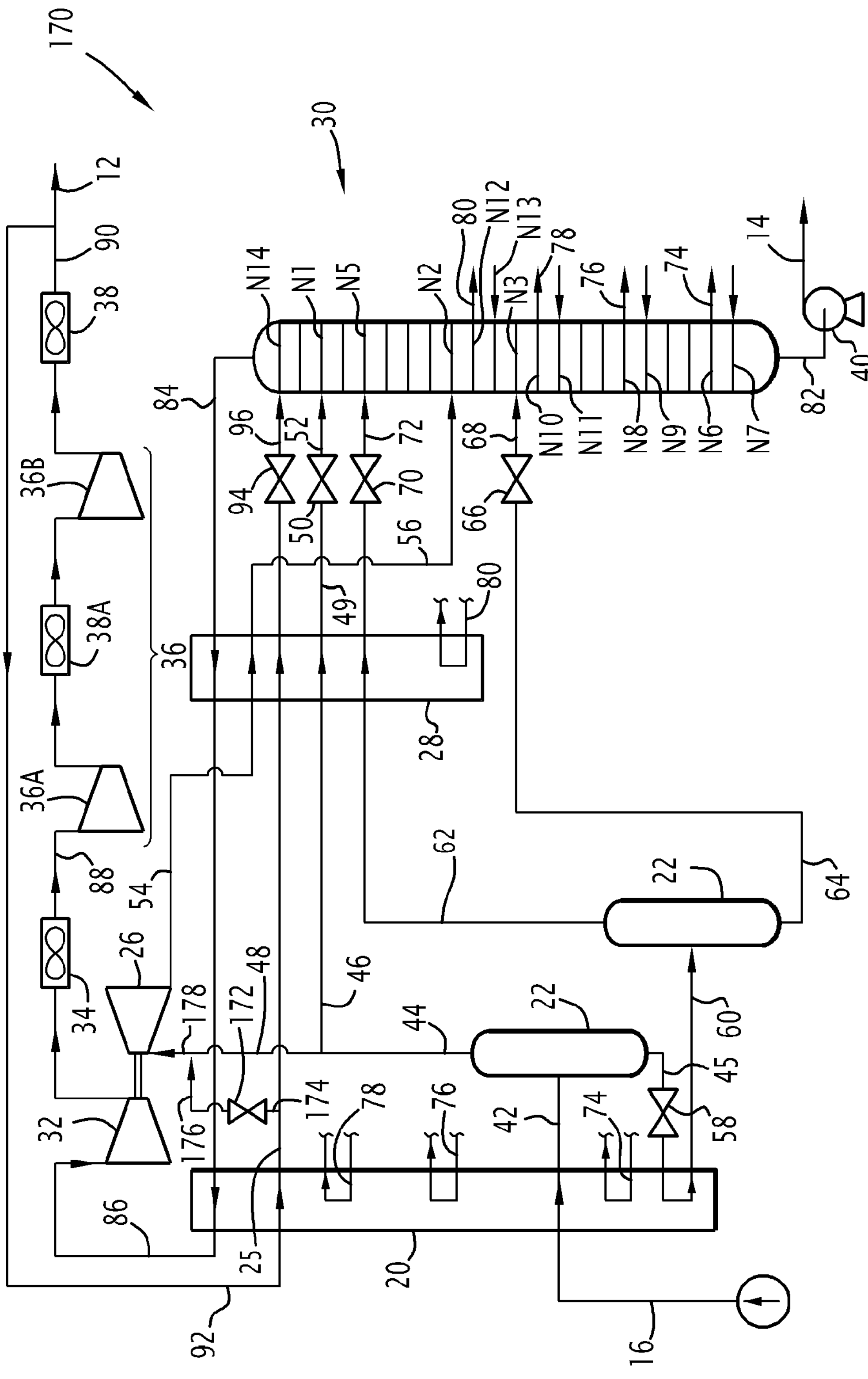
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FIG.5

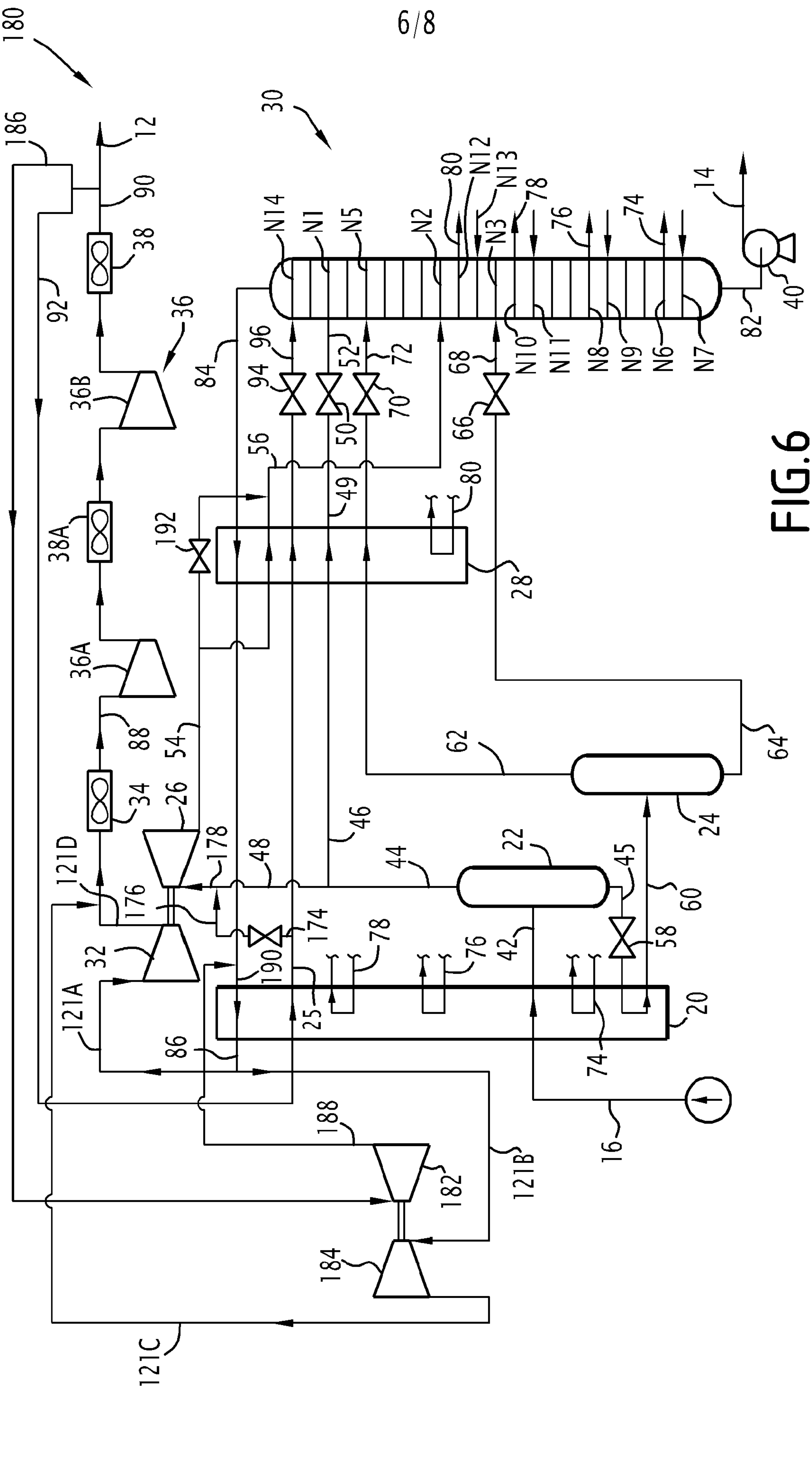
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FIG.6

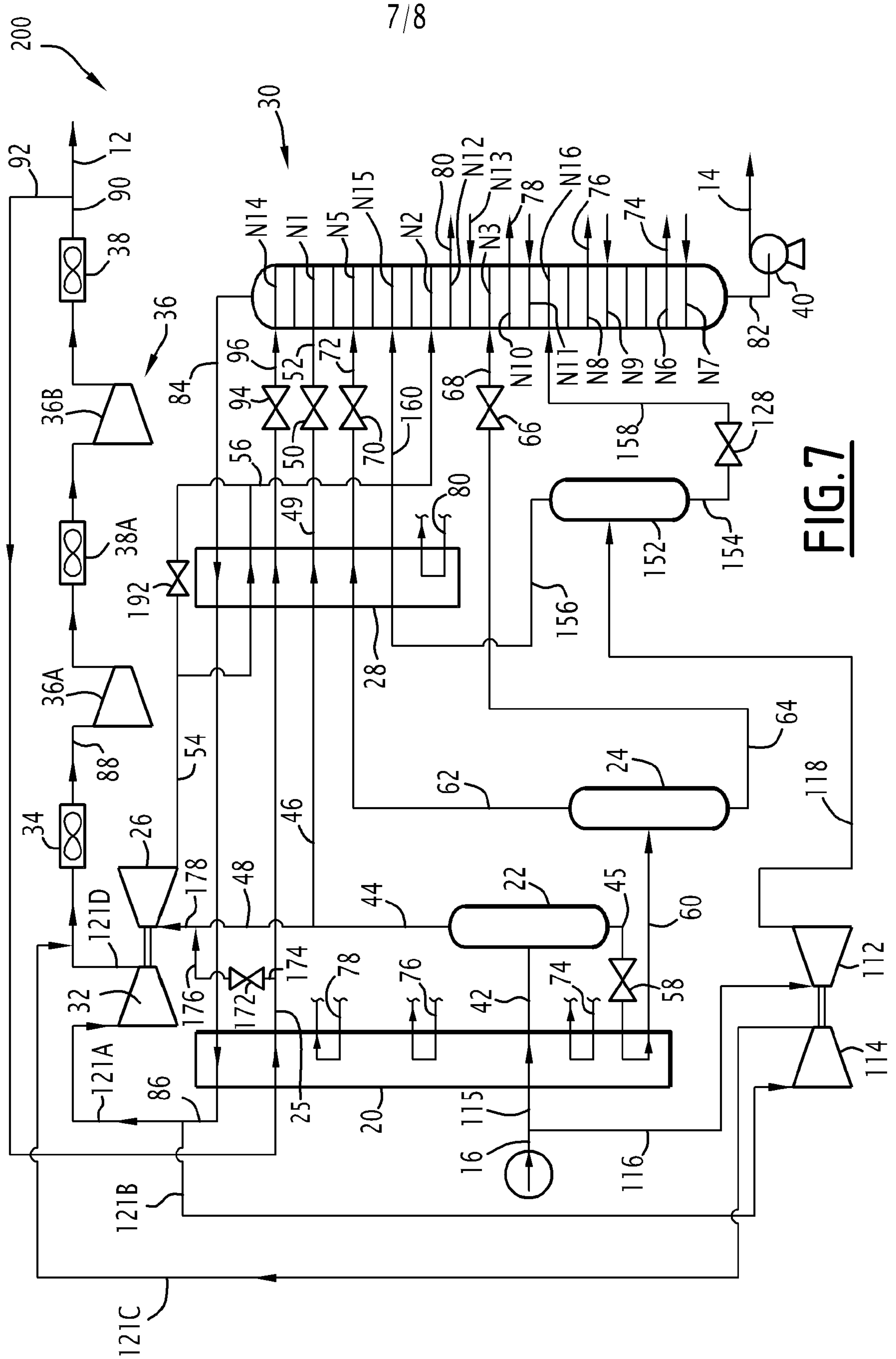

FIG.7

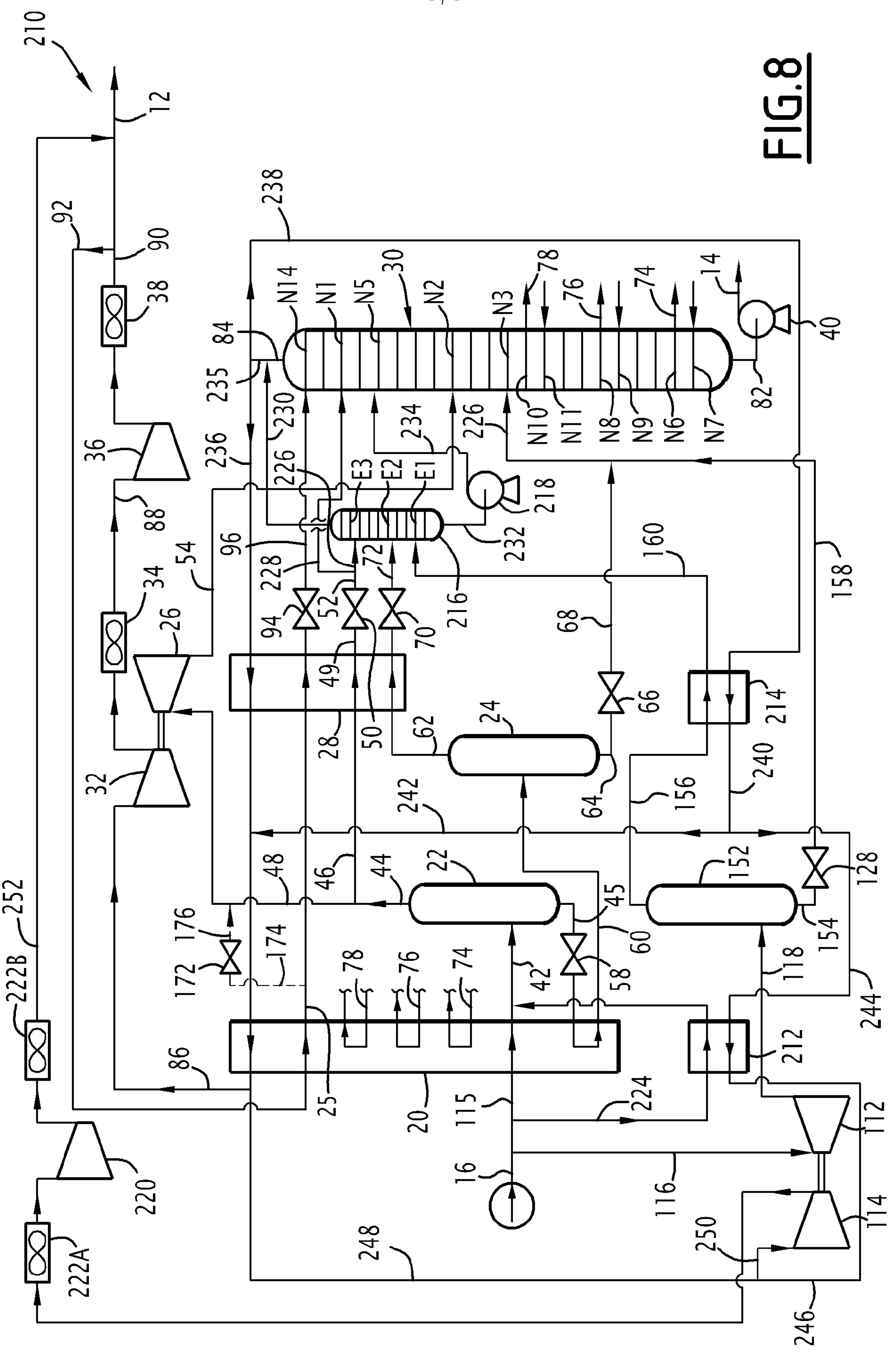
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FIG.8