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(54) REFRIGERATION SYSTEM HAVING DUAL COMPRESSORS AND EITHER A SINGLE EVAPORATOR OR DUAL EVAPORATORS

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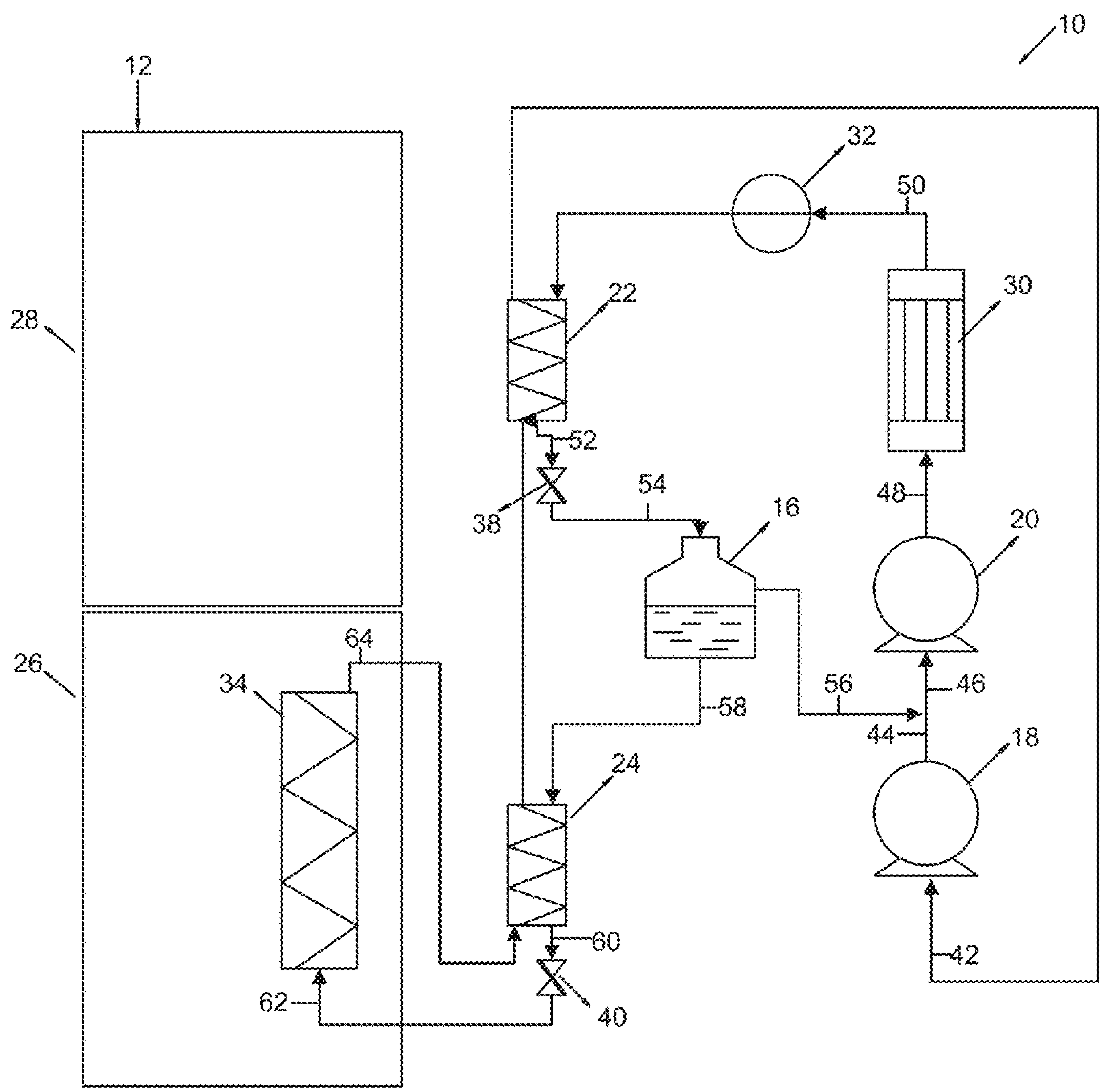
(57) **ABSTRACT**

A refrigeration system having either a single evaporator or dual evaporators where a flash chamber is used with first and second compressor stages. The flash chamber separates the refrigerant mixture from a high-stage capillary into liquid and gas, where the liquid is directed to a low-stage capillary and the gas is directed back to the first compressor. Additionally, the flash chamber may also be used for intercooling the gas going from the second compressor to the first compressor. For dual evaporator systems, this system is especially good for compartments where a first compartment requires a very low evaporator temperature and a second compartment requires a controllable evaporator temperature.



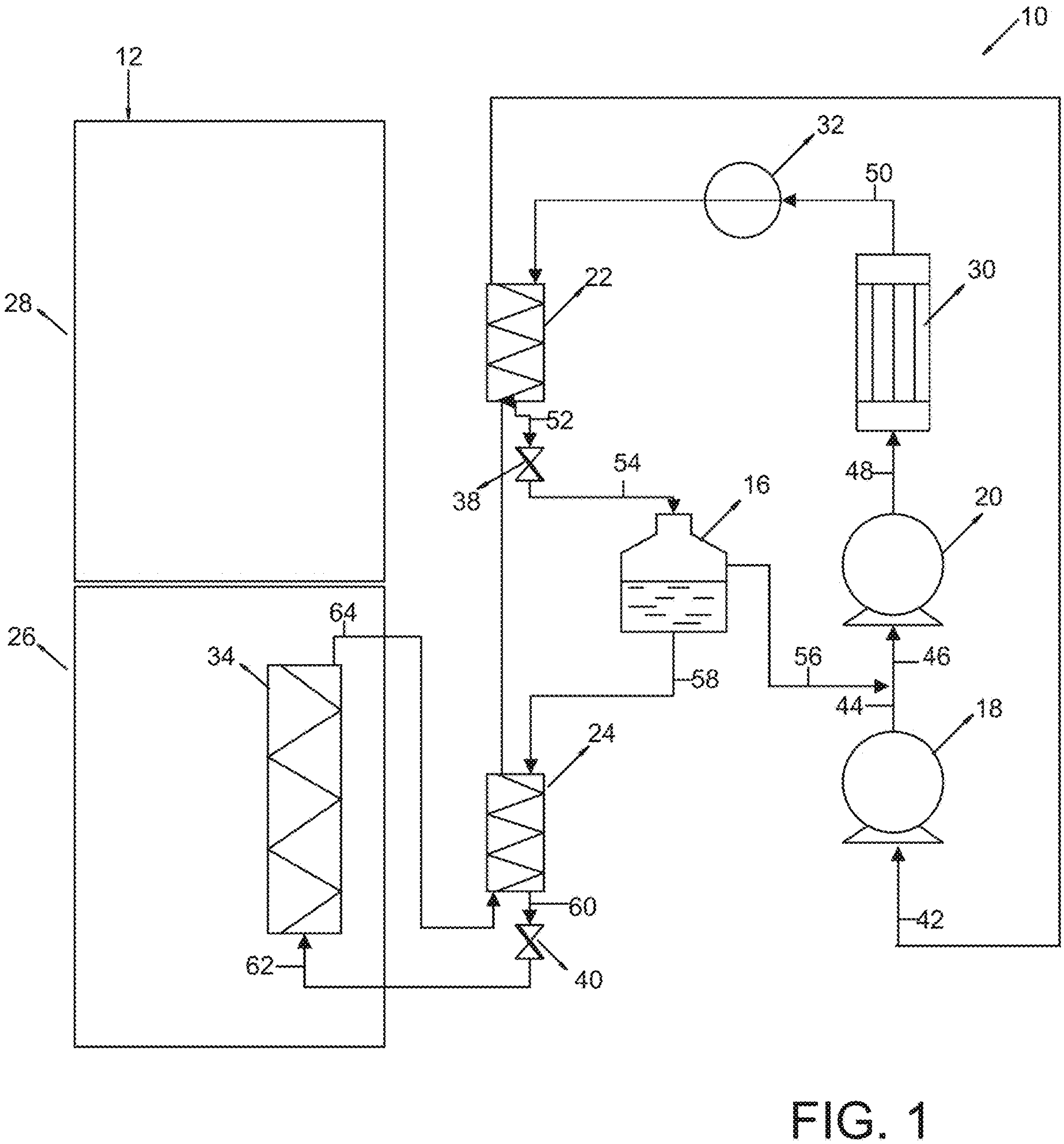

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FIG. 1

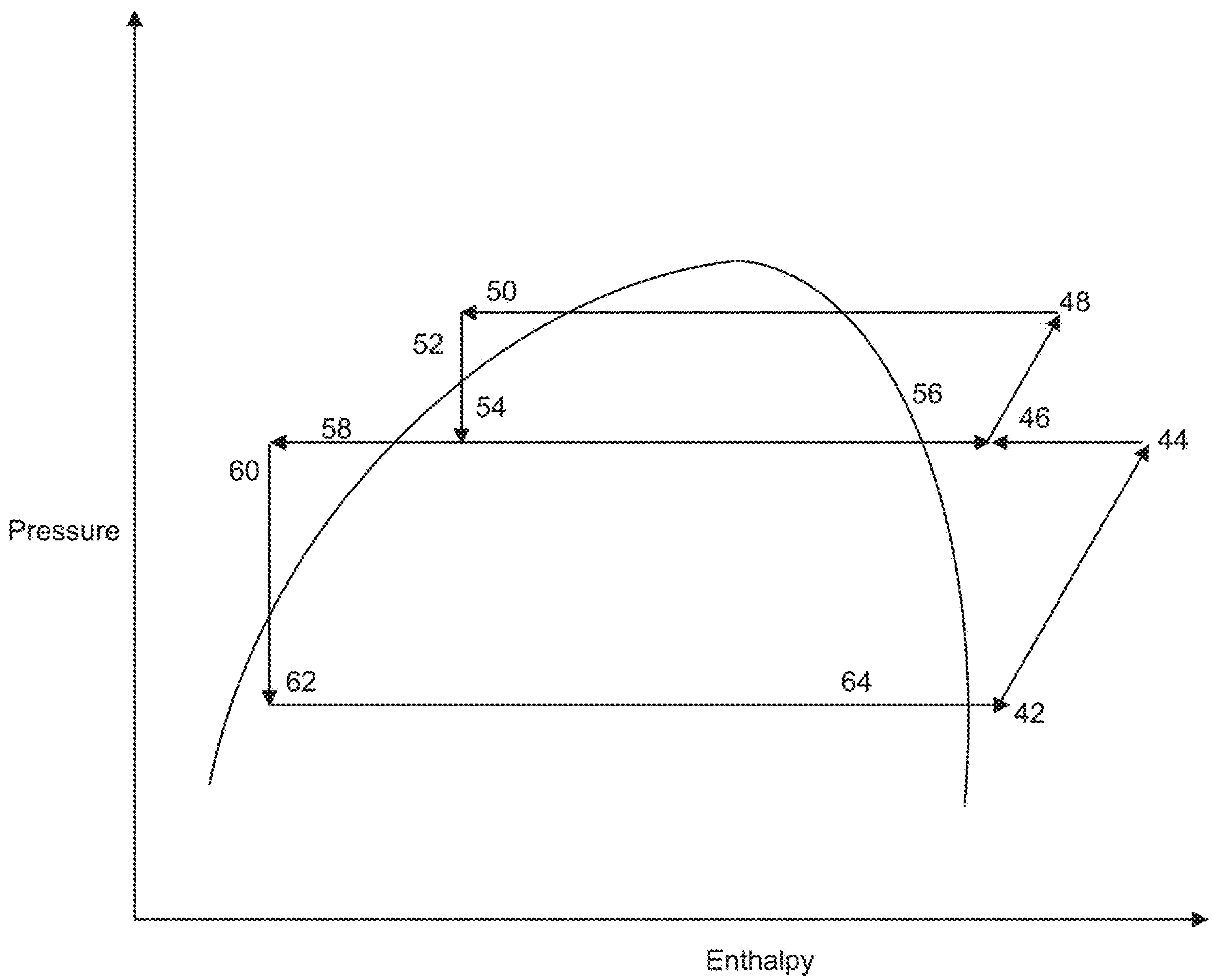

FIG. 2

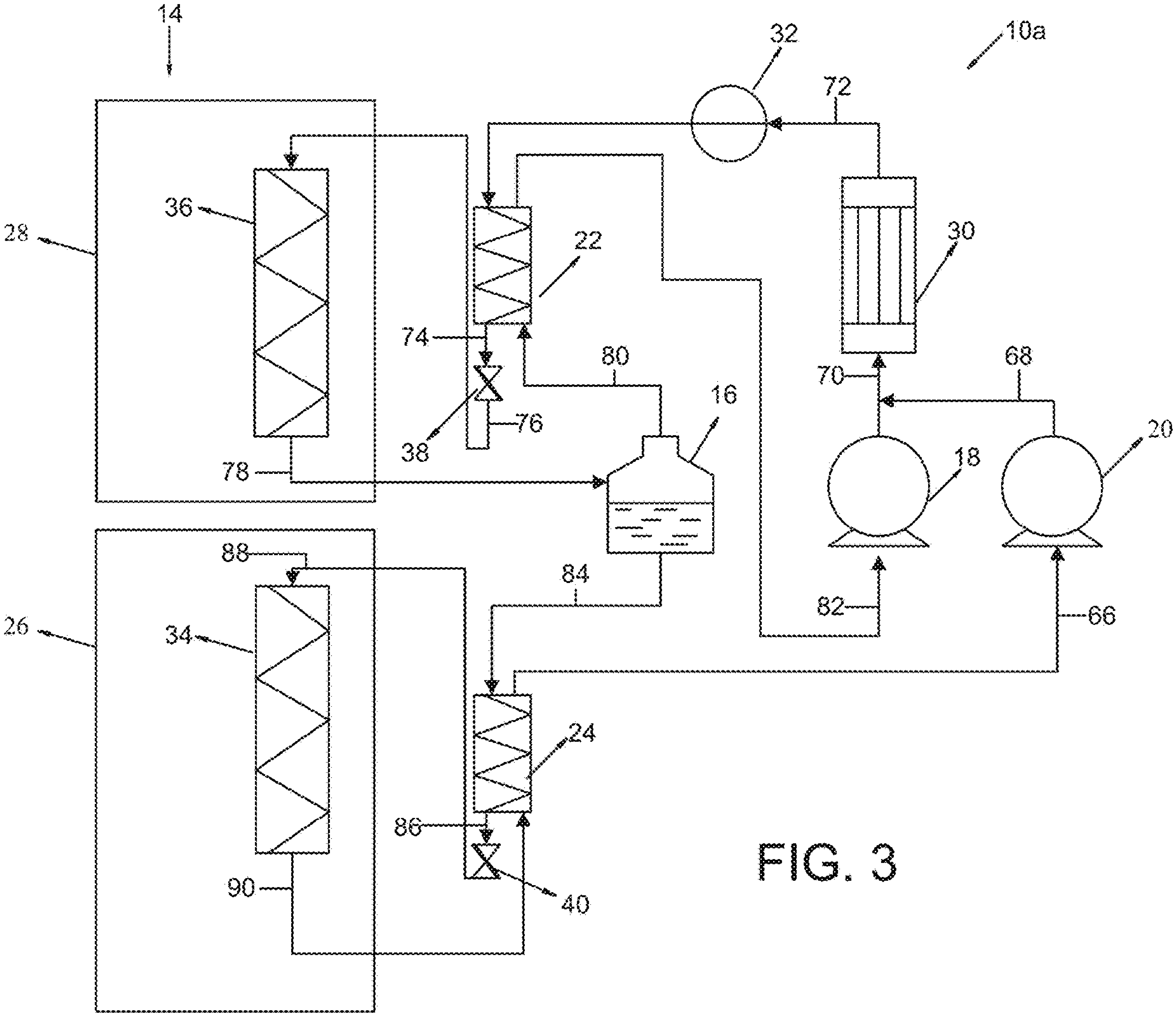
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FIG. 3

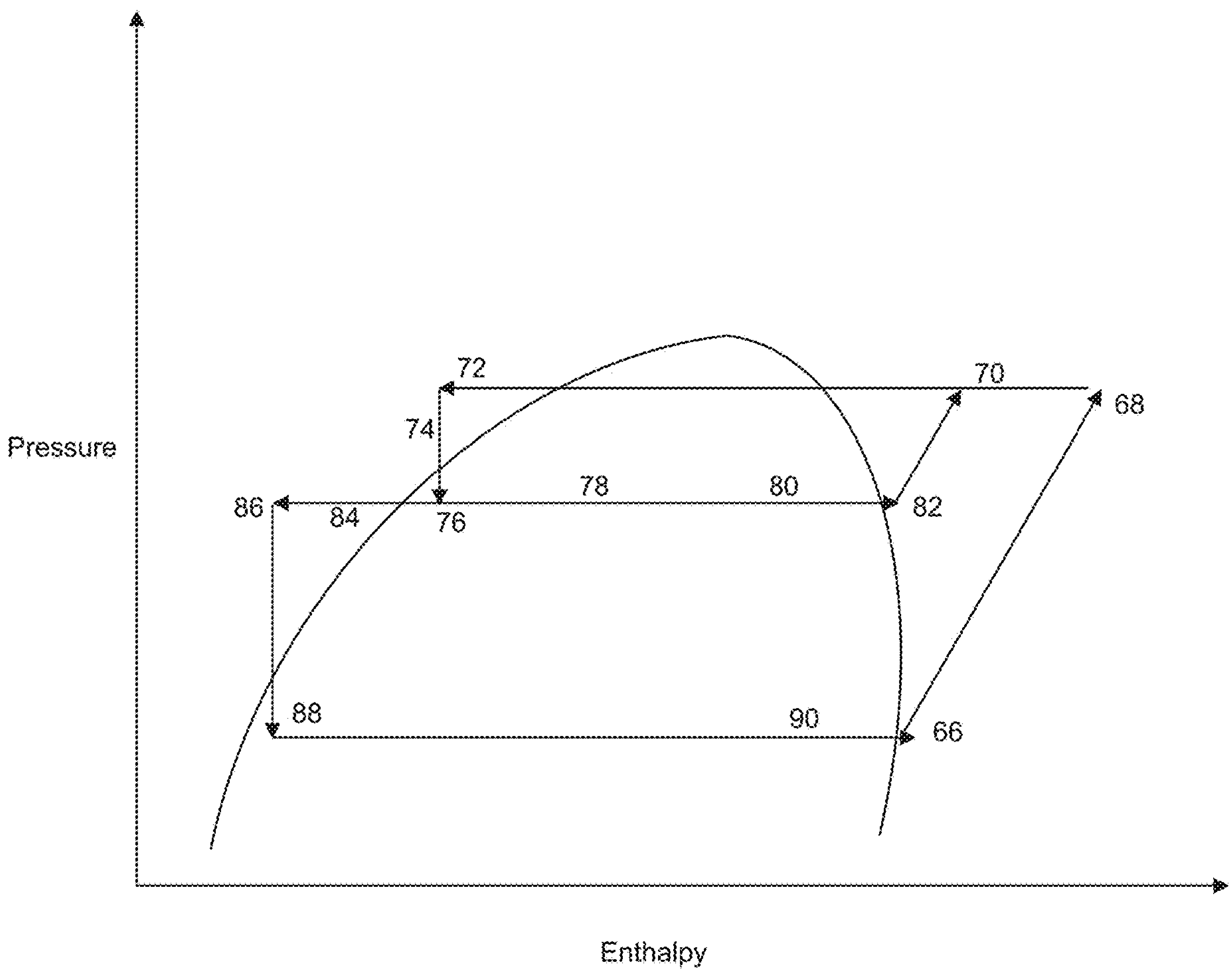

FIG. 4

REFRIGERATION SYSTEM HAVING DUAL COMPRESSORS AND EITHER A SINGLE EVAPORATOR OR DUAL EVAPORATORS

FIELD OF THE DISCLOSURE

[0001] The present disclosure generally relates to a refrigeration system and more particularly, to a dual-compressor refrigeration system having either a single evaporator or dual evaporators.

BACKGROUND OF THE DISCLOSURE

[0002] The present invention relates to household refrigerators operating with a vapor compression cycle and, more specifically, to refrigerators with two compressors.

SUMMARY OF THE DISCLOSURE

[0003] According to one aspect of the present disclosure, a refrigeration system includes a first and second compressor. The system also includes a condenser for receiving refrigerant gas from at least one of the first compressor and the second compressor. The condenser also condenses the refrigerant gas to a refrigerant liquid. The system also includes a high-stage first capillary for receiving the refrigerant liquid from the condenser. A flash chamber for receiving a mixture of refrigerant gas and refrigerant liquid is also included in the system. The flash chamber separates the refrigerant gas from the refrigerant liquid and provides the refrigerant gas to the second compressor. The system includes a low-stage second capillary for receiving the refrigerant liquid from the flash chamber. The system also includes an evaporator for receiving the refrigerant liquid from the second capillary and evaporating the liquid to form the refrigerant gas that is supplied to the first compressor.

[0004] According to another aspect of the present disclosure, the first compressor supplies refrigerant gas to the second compressor, the condenser receives refrigerant gas from the second compressor, and the flash chamber receives the mixture of refrigerant gas and refrigerant liquid from the high-stage capillary.

[0005] According to another aspect of the present disclosure, the flash chamber intercools the refrigerant gas supplied from the first compressor to the second compressor. The system may further comprise a second evaporator for receiving refrigerant liquid from the high-stage capillary. The condenser may receive refrigerant gas from both the first compressor and the second compressor, and the flash chamber receives the mixture of refrigerant gas and refrigerant liquid from the second evaporator. Also, another aspect may comprise the first compressor comprising a high-stage compressor and/or the second compressor comprising a low-stage compressor.

[0006] According to yet another aspect of the present disclosure, the system may comprise a drier located between the condenser and the high-stage capillary, wherein the drier receives the refrigerant liquid from the condenser, and/or a first capillary located between the flash chamber and the high-stage capillary and a second capillary located between the low-stage capillary and the evaporator.

[0007] According to another aspect of the present disclosure, the refrigeration system includes a high-state compressor and a low-stage compressor. The system also includes a condenser for receiving refrigerant gas from at least one of the high-stage compressor and the low-stage compressor and condensing the refrigerant gas to a refrigerant liquid. The system also includes a first heat exchanger for receiving the refrigerant liquid from the condenser and a flash chamber for receiving a mixture of refrigerant gas and refrigerant liquid from the first heat exchanger. The flash chamber separates the refrigerant gas from the refrigerant liquid and provides the refrigerant gas to the low-stage compressor. The system also includes a second heat exchanger for receiving the refrigerant liquid from the flash chamber and an evaporator. The evaporator receives the refrigerant liquid from the low-stage capillary and evaporates the liquid to form the refrigerant gas that is supplied to the high-stage compressor.

[0008] According to another aspect of the disclosure, the system may have the high-stage compressor supply refrigerant gas to the low-stage compressor, the condenser receives refrigerant gas from the low-stage compressor, and the flash chamber receives the mixture of refrigerant gas and refrigerant liquid from the first heat exchanger.

[0009] According to yet another aspect, the flash chamber intercools the refrigerant gas supplied from the low-stage compressor to the high-stage compressor. The system may also comprise a second evaporator for receiving refrigerant liquid from the first heat exchanger. The condenser receives refrigerant gas from both the high-stage compressor and the low-stage compressor and the flash chamber receives the mixture of refrigerant gas and refrigerant liquid from the second evaporator. The system may also comprise a drier located between the condenser and the first heat exchanger, wherein the drier receives the refrigerant liquid from the condenser.

[0010] According to yet another aspect of the present disclosure, the refrigeration system includes a first compressor and second compressor. The system also includes a condenser for receiving refrigerant gas from at least one of the first compressor and the second compressor and condensing the refrigerant gas to a refrigerant liquid. The system includes a high-stage first capillary for receiving the refrigerant liquid from the condenser and a first evaporator for receiving the refrigerant liquid from the high-stage capillary. The system also includes a flash chamber for receiving a mixture of refrigerant gas and refrigerant liquid from the first evaporator. The flash chamber separates the refrigerant gas from the refrigerant liquid and provides the refrigerant gas to the second compressor. The system also includes a low-stage second capillary for receiving the refrigerant liquid from the flash chamber. The system further includes a second evaporator for receiving the refrigerant liquid from the low-stage capillary and evaporating the liquid to form the refrigerant gas that is supplied to the first compressor.

[0011] According to another aspect of the present disclosure, the condenser receives refrigerant gas from both the first compressor and the second compressor and condenses the refrigerant gas to a refrigerant liquid; the first compressor comprises a mid-stage compressor; and/or the second compressor comprises a low-stage compressor.

[0012] According to yet another aspect, the system may comprise: a drier located between the high-stage first capillary and the condenser, wherein the drier receives the refrigerant liquid from the condenser; a third capillary located between the high-stage capillary and the first evaporator, wherein the third capillary receives the refrigerant liquid from the high-stage capillary; and/or a fourth capillary located between the low-stage second capillary and the second evaporator, wherein the fourth capillary receives the refrigerant liquid from the low-stage second capillary.

[0013] These and other aspects, objects, and features of the present disclosure will be understood and appreciated by those skilled in the art upon studying the following specification, claims, and appended drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014] In the drawings:

[0015] FIG. **1** is a schematic view of a refrigeration system with a single evaporator;

[0016] FIG. **2** is a pressure-enthalpy chart of the refrigeration system with the single evaporator;

[0017] FIG. **3** is a schematic view of a refrigeration system with dual evaporators; and

[0018] FIG. **4** is a pressure-enthalpy chart of the refrigeration system with the dual evaporators of the present disclosure.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0019] The present illustrated embodiments reside primarily in combinations of method steps and apparatus components related to using two compressors in a refrigeration system that may be used in a refrigerator having just a refrigeration compartment or both a refrigeration compartment and a freezer compartment and that may be used in a standalone freezer having a freezer compartment, which may all be more energy efficient and cost effective. Accordingly, the apparatus components and method steps have been represented, where appropriate, by conventional symbols in the drawings, showing only those specific details that are pertinent to understanding the embodiments of the present disclosure so as not to obscure the disclosure with details that will be readily apparent to those of ordinary skill in the art having the benefit of the description herein. Further, like numerals in the description and drawings represent like elements.

[0020] For purposes of description herein, the terms "upper," "lower," "right," "left," "rear," "front," "vertical," "horizontal," and derivatives thereof shall relate to the disclosure as oriented in FIG. **1**. However, it is to be understood that the disclosure may assume various alternative orientations, except where expressly specified to the contrary. It is also to be understood that the specific devices and processes illustrated in the attached drawings, and described in the following specification, are simply exemplary embodiments of the inventive concepts defined in the appended claims. Hence, specific dimensions and other physical characteristics relating to the embodiments disclosed herein are not to be considered as limiting, unless the claims expressly state otherwise.

[0021] In this document, relational terms, such as "first" and "second," "top" and "bottom," and the like, are used solely to distinguish one entity or action from another entity or action, without necessarily requiring or implying any actual such relationship or order between such entities or actions. The terms "comprises," "comprising," or any other variation thereof are intended to cover a non-exclusive inclusion, such that a process, method, article, or apparatus that comprises a list of elements does not include only those elements but may include other elements not expressly listed or inherent to such process, method, article, or apparatus. An element preceded by "comprises . . . a" does not, without more constraints, preclude the existence of additional identical elements in the process, method, article or apparatus that comprises the element.

[0022] Referring to FIGS. **1** and **3**, a refrigeration system **10**, **10***a* can be used for both a single evaporator refrigerator **12** (FIG. **1**) and a dual evaporator refrigerator **14** (FIG. **3**) where a flash chamber **16** is used with first and second compressors **18** and **20**, respectively. The refrigeration system **10**, **10***a* further includes a condenser for receiving a refrigerant gas from at least one of the first compressor **18** and the second compressor **20** and condensing the refrigerant gas to a refrigerant liquid, and a high-stage first capillary **22** for receiving the refrigerant liquid from a condenser **30**. The flash chamber **16** receives a mixture of the refrigerant gas and the refrigerant liquid and separates the refrigerant gas from the refrigerant liquid and provides the refrigerant gas to the second compressor **20**. The refrigeration system **10**, **10***a* also includes a low-stage second capillary **24** for receiving the refrigerant liquid from the flash chamber **16**, and an evaporator **34** for receiving the refrigerant liquid from the second capillary **24** and evaporating the liquid to form the refrigerant gas that is supplied to the first compressor **18**. Additionally, the flash chamber **16** may also be used for intercooling the gas going from the first compressor **18** to the second compressor **20**. For dual evaporator refrigerators **14**, the refrigeration system **10***a* is especially good where a first compartment **26** (e.g., refrigerator compartment) requires a very low evaporator temperature (for example, −25° C.) and a second compartment **28** (e.g., freezer compartment) requires a controllable evaporator temperature (for example, 5 to −15° C.). The schematic and pressure-enthalpy chart for the proposed dual evaporator refrigeration system **10***a* is shown below in FIG. **4**. The schematic and pressure-enthalpy chart for the proposed single evaporator refrigeration system **10** is shown below in FIG. **2**.

[0023] Referring now to FIG. **1**, a refrigeration system **10** is shown having a single evaporator subsystem **12**. In the refrigeration system **10**, a high-stage first compressor **18** supplies refrigerant gas to a low-stage second compressor **20**, which then supplies the refrigerant gas to a condenser **30**, which condenses the refrigerant gas to a refrigerant liquid. A high-stage first capillary **22** (also referred to herein as a first heat exchanger) receives the refrigerant liquid from the condenser **30** after passing through a drier **32**. A flash chamber **16** receives a mixture of the refrigerant gas and the refrigerant liquid from the high-stage first capillary **22** via an optional third capillary **38**. The flash chamber **16** separates the refrigerant gas from the refrigerant liquid and provides the refrigerant gas to the low-stage compressor **20** to intercool the refrigerant gas supplied from the high-stage first compressor **18** to the low-stage second compressor **20**. A low-stage second capillary **24** (also referred to herein as a second heat exchanger) receives the refrigerant liquid from the flash chamber **16**. Then a single evaporator **34** receives the refrigerant liquid from the low-stage second capillary **24** via an optional fourth capillary **40** to form the refrigerant gas that is supplied to the high-stage first compressor **18** via the low-stage second capillary **24** and the high-stage first capillary **22**, which function as heat exchangers.

[0024] Also illustrated in FIG. **1** are the various lines connecting the components noted above. More specifically, line **42** connects an output of the high-stage first capillary **22**

to an input of the high-stage compressor **18**; line **44** connects an output of the high-stage compressor **18** to an intercooling mix point; line **46** connects the intercooling mix point to an input of the low-stage compressor **20**; line **48** connects an output of the low-stage compressor **20** to an input of the condenser **30**; line **50** connects an output of the condenser **30** to an input of the drier **32**; line **52** connects an output of the high-stage capillary **22** to an input of the optional third capillary **38**; line **54** connects an output of the optional third capillary **38** to an input of the flash chamber **16**; line **56** connects a gas output of the flash chamber **16** to the intercooling mix point; line **58** connects a liquid output of the flash chamber **16** to an input of the low-stage second capillary **24**; line **60** connects an output of the low-stage second capillary **24** to an input of the optional fourth capillary **40**; line **62** connects an output of the optional fourth capillary **40** to the input of the single evaporator **34**; and line **64** connects an output of the single evaporator **34** to an input of the low-stage second capillary **24**. These particular lines are described for purposes of correlating the pressure-enthalpy chart in FIG. **3**.

[0025] Referring now to FIGS. **2** and **4**, FIG. **2** is an example of a pressure-enthalpy chart of the refrigeration system **10** with a single evaporator. FIG. **4** is an example of a pressure-enthalpy chart of the refrigeration system **10***a* with dual evaporators (FIG. **3**). In both figures, pressure is indicated on the y-axis and enthalpy is indicated on the x-axis. Typically, enthalpy is in units of Btu/lb and pressure is in units of pounds per square inch (psi). The upside down U figure shown on the diagram designates the points at which the refrigerant changes phase. The left vertical curve indicates the saturated liquid curve and the right vertical curve indicates the saturated vapor curve. The region in between the two curves describes refrigerant states that contain a mixture of both liquid and vapor. The locations to the left of the saturated liquid curve indicate that the refrigerant is in liquid form and locations to the right of the saturated vapor curve indicate that the refrigerant is in vapor form. No additional pressure will change the vapor into a liquid at the critical point.

[0026] Referring now to FIGS. **1** and **2**, the enthalpy and the pressure of the refrigerant gas may increase as the refrigerant gas exits the first compressor **18** (line **44**). As refrigerant gas combines with refrigerant gas from the flash chamber **16** and the first compressor **18** (line **46**), the refrigerant gas pressure remains constant but the enthalpy may decrease. As the refrigerant gas exits the second compressor **20**, the pressure and the enthalpy may increase (line **48**). As the refrigerant passes through the condenser **30**, the refrigerant is converted from a gas to a liquid with the pressure remaining constant but the enthalpy may decrease (line **50**). As the refrigerant gas exits the high-stage first capillary **22**, the pressure of the refrigerant gas may decrease but the enthalpy of the refrigerant gas may remain the same (line **52**). As the refrigerant mixture exits an optional third capillary **38** (line **54**), the pressure of the refrigerant mixture may decrease and enter the flash chamber **16**. The flash chamber may intercool the refrigerant mixture and separate the refrigerant liquid from the refrigerant gas. As the refrigerant gas exits the flash chamber **16** (line **56**), the refrigerant gas may combine with the refrigerant gas exiting the first compressor **18**. As the refrigerant liquid exits the flash chamber **16** (line **58**), the pressure of the refrigerant liquid may remain the same but the enthalpy may decrease. As the refrigerant liquid exits the low-stage capillary **24**, the pressure may decrease (line **60**). As the refrigerant liquid exits an optional fourth capillary **40**, the pressure may continue to decrease (line **62**). As the refrigerant liquid exits the evaporator **34** and changes into a refrigerant gas (line **64**), the refrigerant gas pressure may remain constant while the enthalpy of the refrigerant gas may increase.

[0027] Referring now to FIG. **3**, a refrigeration system **10***a* is shown having a dual evaporator subsystem **14**, the condenser **30** receives refrigerant gas from both a low-stage compressor **18** and a mid-stage compressor **20** and condenses the refrigerant gas into a refrigerant liquid. A high-stage first capillary **22** receives the refrigerant liquid from the condenser **30** after passing through a drier **32**. A first evaporator **36** receives the refrigerant liquid from the high-stage first capillary **22**. A flash chamber **16** receives a mixture of refrigerant gas and refrigerant liquid from the first evaporator **36**, wherein the flash chamber **16** separates the refrigerant gas from the refrigerant liquid and provides the refrigerant gas to the low-stage compressor **18**. A low-stage capillary **24** receives the refrigerant liquid from the flash chamber **16**. Then a second evaporator **34** receives the refrigerant liquid from the low-stage second capillary **24** to form the refrigerant gas that is supplied to the mid-stage compressor **20**.

[0028] Also illustrated in FIG. **2** are the various lines connecting the components noted above. More specifically, line **66** connects the output of the low-stage second capillary **24** to an input of the mid-stage compressor **20**; line **68** connects an output of the mid-stage compressor **20** to an input of the condenser **30**; line **70** connects an output of the low-stage compressor **18** to an input of the condenser **30**; line **72** connects an output of the condenser **30** to an input of the drier **32**; line **74** connects an output of the high-stage capillary **22** to an input of the optional third capillary **38**; line **76** connects an output of the optional third capillary **38** to an input of the first evaporator **36**; line **78** connects an output of the first evaporator **36** to an input of the flash chamber **16**; line **80** connects a gas output of the flash chamber **16** to an input of the high-stage first capillary **22**; line **82** connects an output of the high-stage first capillary **22** to an input of the low-stage compressor **18**; line **84** connects a liquid output of the flash chamber **16** to an input of the low-stage second capillary **24**; line **86** connects an output of the low-stage second capillary **24** to an input of the optional fourth capillary **40**; line **88** connects an output of the optional fourth capillary **40** to the input of the second evaporator **34**; and line **90** connects an output of the second evaporator **34** to an input of the low-stage second capillary **24**. These particular lines are described for purposes of correlating the pressure-enthalpy chart in FIG. **4**.

[0029] Referring now to FIGS. **3** and **4**, as the refrigerant gas enters the low-stage and mid-stage compressors, the pressure and the enthalpy may differ (line **66**), (line **82**). However, because the compressor **18** is a low-stage compressor and the compressor **20** is a mid-stage compressor, the pressure at the outputs of the two compressors **18** and **20** is the same (lines **68** and **70**) although the enthalpy is different. As the refrigerant passes through the condenser **30**, the refrigerant gas is converted to a liquid with a constant pressure and a decrease in enthalpy (line **72**). As the refrigerant mixture exits the high-stage capillary **22** (line **74**), the pressure of the refrigerant mixture may decrease while the enthalpy remains constant. As the refrigerant mixture exits the optional third capillary **38**, the pressure of the refrigerant mixture decreases further as the refrigerant mixture enters the first evaporator **36** (line **76**). As the refrigerant mixture exits the first evaporator **36** and enters the flash chamber **16**, the pressure of the refrigerant mixture remains constant but the enthalpy increases (**78**). The flash chamber **16** may intercool the refrigerant mixture and separate the refrigerant gas from the refrigerant liquid. As the refrigerant gas exits the flash chamber **16**, the pressure of the refrigerant gas remains the same but the enthalpy increases (line **80**) as the refrigerant gas re-enters the high-stage capillary **22**. As the refrigerant gas exits the high-stage capillary **22** for a second time the refrigerant gas may be directed to enter the first compressor **18** and increase the refrigerant gas enthalpy but maintain the refrigerant gas pressure (line **82**).

[0030] As the refrigerant liquid exits the flash chamber **16**, the enthalpy of the refrigerant liquid may decrease but may maintain pressure (line **84**). As the refrigerant liquid exits the low-stage capillary, the enthalpy may continue to decrease (line **86**). As the refrigerant liquid exits the optional fourth capillary **40**, the enthalpy of the refrigerant liquid may remain the same but the pressure may further decrease (line **88**). As the refrigerant liquid exits the second evaporator **34** and changes into a refrigerant gas (line **90**), the refrigerant gas may be directed back through the low-stage capillary **34** and enter the first compressor **18** and may maintain pressure but increase in enthalpy.

[0031] It will be understood by one having ordinary skill in the art that construction of the described disclosure and other components is not limited to any specific material. Other exemplary embodiments of the disclosure disclosed herein may be formed from a wide variety of materials, unless described otherwise herein.

[0032] For purposes of this disclosure, the term "coupled" (in all of its forms, couple, coupling, coupled, etc.) generally means the joining of two components (electrical or mechanical) directly or indirectly to one another. Such joining may be stationary in nature or moveable in nature. Such joining may be achieved with the two components (electrical or mechanical) and any additional intermediate members being integrally formed as a single unitary body with one another or with the two components. Such joining may be permanent in nature or may be removable or releasable in nature unless otherwise stated.

[0033] It is also important to note that the construction and arrangement of the elements of the disclosure as shown in the exemplary embodiments is illustrative only. Although only a few embodiments of the present innovations have been described in detail in this disclosure, those skilled in the art who review this disclosure will readily appreciate that many modifications are possible (e.g., variations in sizes, dimensions, structures, shapes and proportions of the various elements, values of parameters, mounting arrangements, use of materials colors, orientations, etc.) without materially departing from the novel teachings and advantages of the subject matter recited. For example, elements shown as integrally formed may be constructed of multiple parts or elements shown as multiple parts may be integrally formed, the operation of the interfaces may be reversed or otherwise varied, the length or width of the structures and/or members or connectors or other elements of the system may be varied, and/or the nature or number of adjustment positions provided between the elements may be varied. It should be noted that the elements and/or assemblies of the system may be constructed from any of a wide variety of materials that provide sufficient strength or durability, in any of a wide variety of colors, textures, and combinations. Accordingly, all such modifications are intended to be included within the scope of the present innovations. Other substitutions, modifications, changes, and omissions may be made in the design, operating conditions, and arrangement of the desired and other exemplary embodiments without departing from the spirit of the present innovations.

[0034] It will be understood that any described processes or steps within described processes may be combined with other disclosed processes or steps to form structures within the scope of the present disclosure. The exemplary structures and processes disclosed herein are for illustrative purposes and are not to be construed as limiting.

[0035] It is also to be understood that variations and modifications can be made on the aforementioned structures and methods without departing from the concepts of the present disclosure, and further it is to be understood that such concepts are intended to be covered by the following claims unless these claims by their language expressly state otherwise.

What is claimed is:

1. A refrigeration system comprising:

a first compressor;

a second compressor;

a condenser for receiving a refrigerant gas from at least one of the first compressor and the second compressor and condensing the refrigerant gas to a refrigerant liquid;

a high-stage first capillary for receiving the refrigerant liquid from the condenser;

a flash chamber for receiving a mixture of the refrigerant gas and the refrigerant liquid, wherein the flash chamber separates the refrigerant gas from the refrigerant liquid and provides the refrigerant gas to the second compressor;

a low-stage second capillary for receiving the refrigerant liquid from the flash chamber; and

an evaporator for receiving the refrigerant liquid from the second capillary and evaporating the liquid to form the refrigerant gas that is supplied to the first compressor.

2. The refrigeration system of claim **1**, wherein the first compressor supplies the refrigerant gas to the second compressor, the condenser receives the refrigerant gas from the second compressor, and the flash chamber receives the mixture of the refrigerant gas and the refrigerant liquid from the high-stage capillary.

3. The refrigeration system of claim **2**, wherein the flash chamber intercools the refrigerant gas supplied from the first compressor to the second compressor.

4. The refrigeration system of claim **1**, further comprising a second evaporator for receiving the refrigerant liquid from the high-stage capillary, wherein the condenser receives the refrigerant gas from both the first compressor and the second compressor, and the flash chamber receives the mixture of the refrigerant gas and the refrigerant liquid from the second evaporator.

5. The refrigeration system of claim **1**, wherein the first compressor comprises a high-stage compressor.

6. The refrigeration system of claim **1**, wherein the second compressor comprises a low-stage compressor.

7. The refrigeration system of claim **1**, further comprising a drier located between the condenser and the high-stage capillary, wherein the drier receives the refrigerant liquid from the condenser.

8. The refrigeration system of claim **1**, further comprising a first capillary located between the flash chamber and the high-stage capillary and a second capillary located between the low-stage capillary and the evaporator.

9. A refrigeration system comprising:

a high-stage compressor;

a low-stage compressor;

a condenser for receiving a refrigerant gas from at least one of the high-stage compressor and the low-stage compressor and condensing the refrigerant gas to a refrigerant liquid;

a first heat exchanger for receiving the refrigerant liquid from the condenser;

a flash chamber for receiving a mixture of the refrigerant gas and the refrigerant liquid from the first heat exchanger, wherein the flash chamber separates the refrigerant gas from the refrigerant liquid and provides the refrigerant gas to the low-stage compressor;

a second heat exchanger for receiving the refrigerant liquid from the flash chamber; and

an evaporator for receiving the refrigerant liquid from the second heat exchanger and evaporating the refrigerant liquid to form the refrigerant gas that is supplied to the high-stage compressor.

10. The refrigeration system of claim **9**, wherein the high-stage compressor supplies the refrigerant gas to the low-stage compressor, the condenser receives the refrigerant gas from the low-stage compressor, and the flash chamber receives the mixture of the refrigerant gas and the refrigerant liquid from the first heat exchanger.

11. The refrigeration system of claim **10**, wherein the flash chamber intercools the refrigerant gas supplied from the low-stage compressor to the high-stage compressor.

12. The refrigeration system of claim **9**, further comprising a second evaporator for receiving the refrigerant liquid from the first heat exchanger, wherein the condenser receives the refrigerant gas from both the high-stage compressor and the low-stage compressor and the flash chamber receives the mixture of the refrigerant gas and the refrigerant liquid from the second evaporator.

13. The refrigeration system of claim **9**, further comprising a drier located between the condenser and the first heat exchanger, wherein the drier receives the refrigerant liquid from the condenser.

14. A refrigeration system comprising:

a first compressor;

a second compressor;

a condenser for receiving refrigerant gas from at least one of the first compressor and the second compressor and condensing the refrigerant gas to a refrigerant liquid;

a high-stage first capillary for receiving the refrigerant liquid from the condenser;

a first evaporator for receiving the refrigerant liquid from the high-stage capillary;

a flash chamber for receiving a mixture of the refrigerant gas and the refrigerant liquid from the first evaporator, wherein the flash chamber separates the refrigerant gas from the refrigerant liquid and provides the refrigerant gas to the second compressor;

a low-stage second capillary for receiving the refrigerant liquid from the flash chamber; and

a second evaporator for receiving the refrigerant liquid from the low-stage capillary and evaporating the refrigerant liquid to form the refrigerant gas that is supplied to the first compressor.

15. The refrigeration system of claim **14**, wherein the condenser receives the refrigerant gas from both the first compressor and the second compressor and condenses the refrigerant gas to the refrigerant liquid.

16. The refrigeration system of claim **14**, wherein the first compressor comprises a mid-stage compressor.

17. The refrigeration system of claim **14**, wherein the second compressor comprises a low-stage compressor.

18. The refrigeration system of claim **14**, further comprising a drier located between the high-stage first capillary and the condenser, wherein the drier receives the refrigerant liquid from the condenser.

19. The refrigeration system of claim **14**, further comprising a third capillary located between the high-stage first capillary and the first evaporator, wherein the third capillary receives the refrigerant liquid from the high-stage first capillary.

20. The refrigeration system of claim **14**, further comprising a fourth capillary located between the low-stage second capillary and the second evaporator, wherein the fourth capillary receives the refrigerant liquid from the low-stage second capillary.

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