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(54) **MAINTAINING LOW CARBON MONOXIDE LEVELS IN PRODUCT CARBON DIOXIDE**

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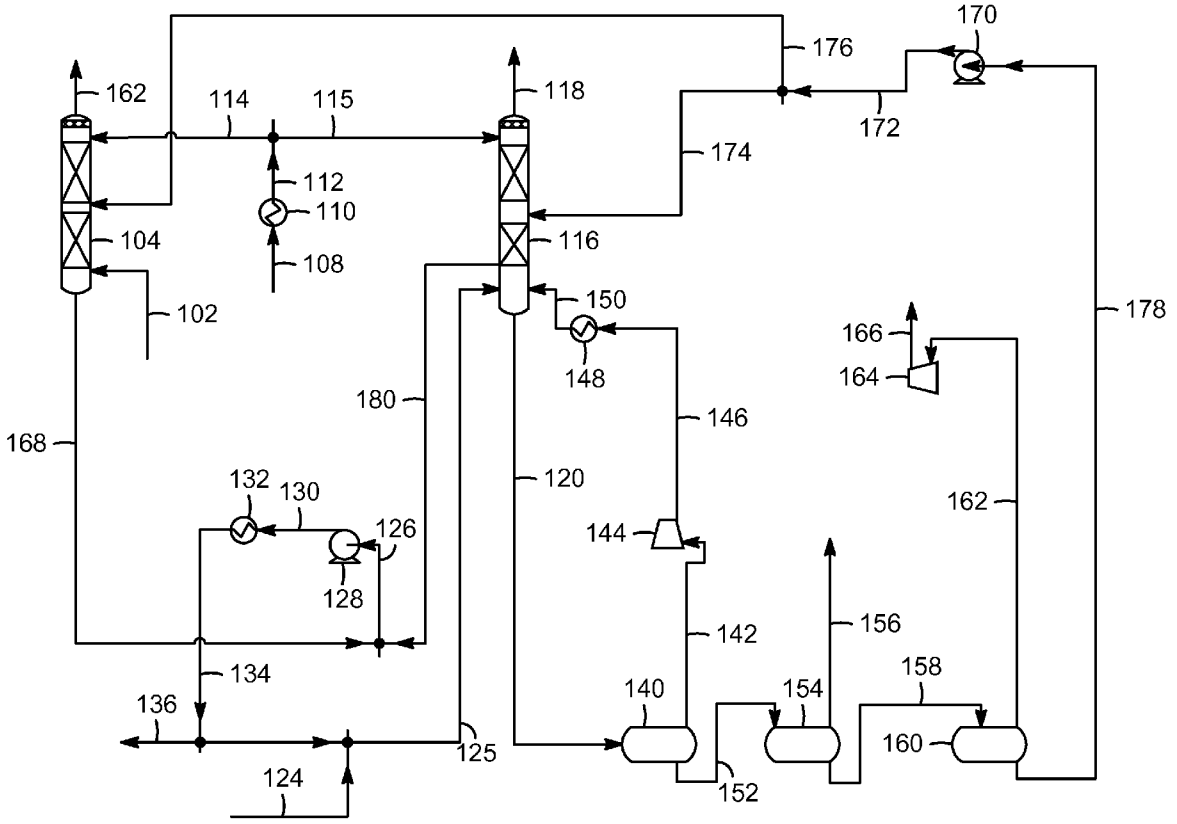
(57) **ABSTRACT**

A process for maintaining a low carbon monoxide content in a carbon dioxide product that is made in a synthesis gas purification process is disclosed. More particularly, the invention involves an improved process in which a portion of a loaded solvent is sent through a carbon dioxide absorber instead of to a series of carbon dioxide flash drums.



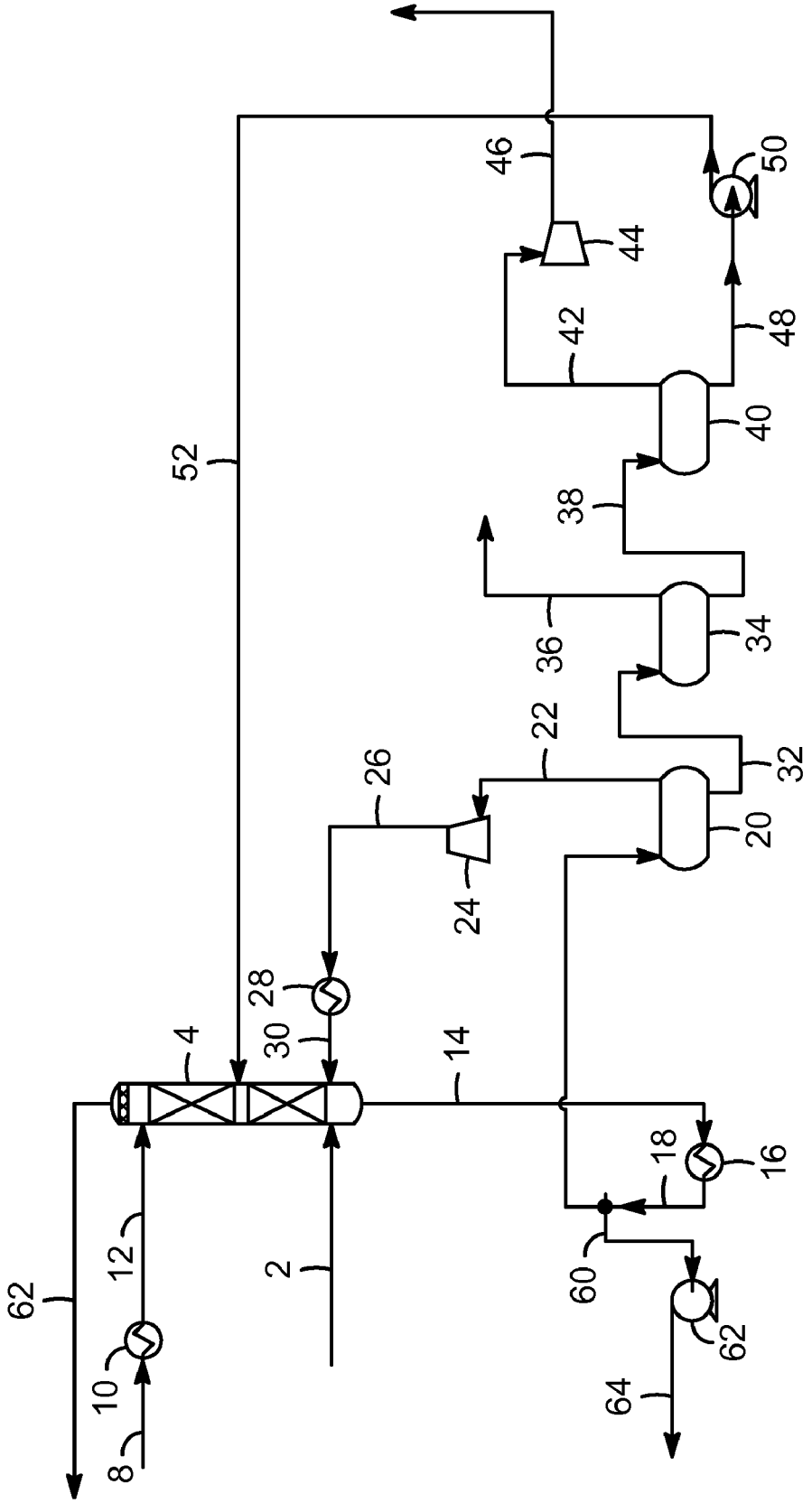


FIG. 1
(Prior Art)

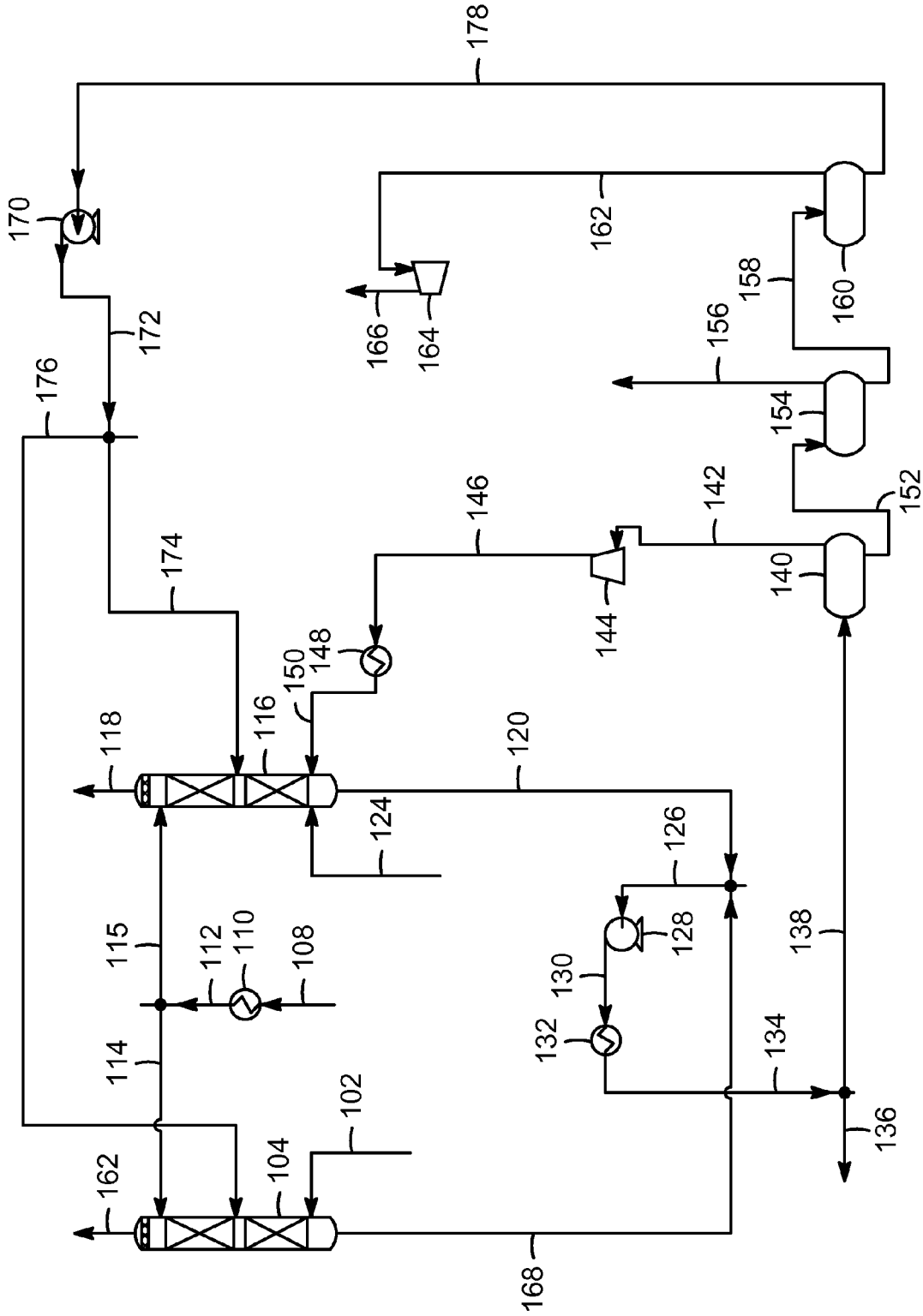


FIG. 2 (Prior Art)

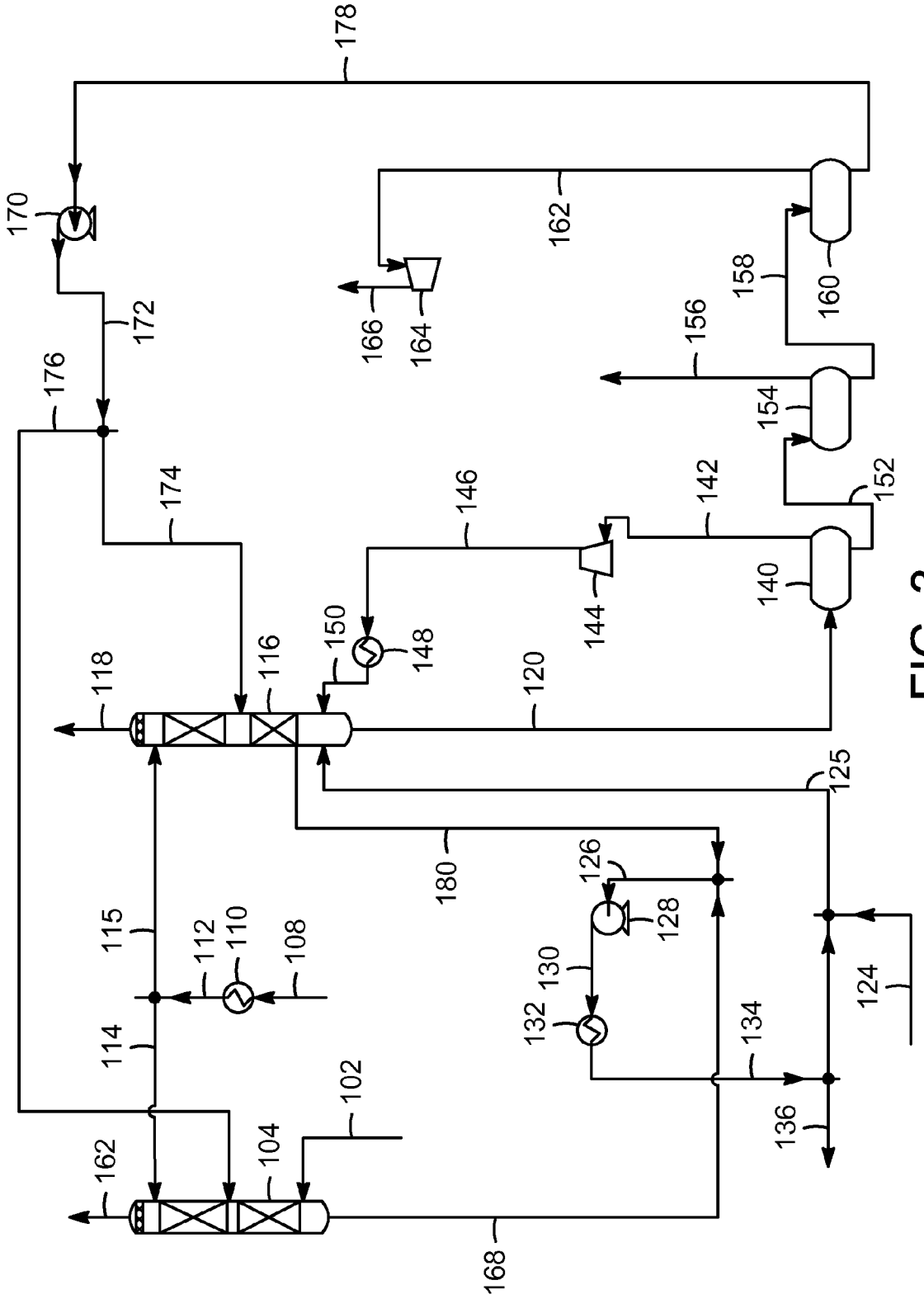

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FIG. 3

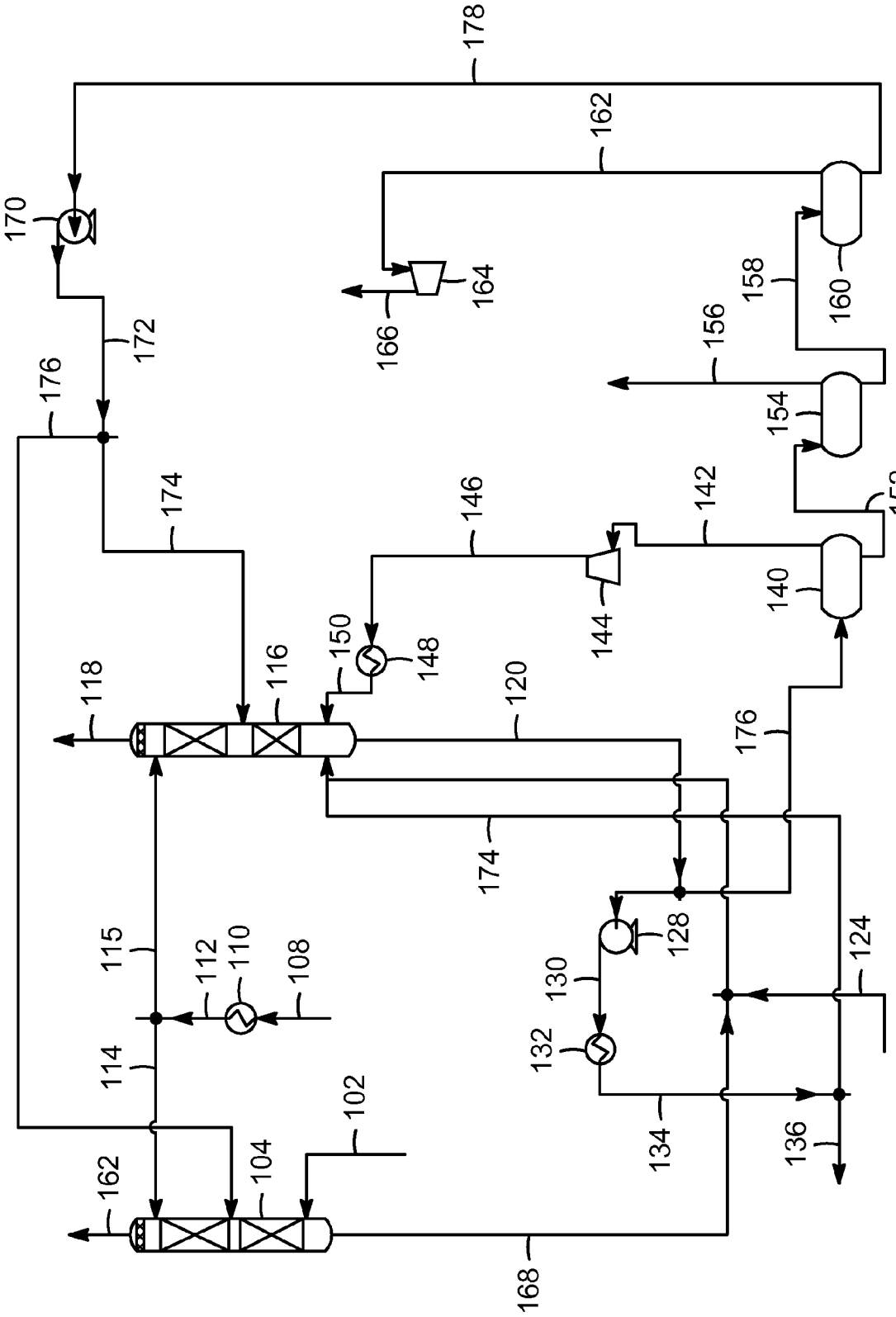
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FIG. 4

MAINTAINING LOW CARBON MONOXIDE LEVELS IN PRODUCT CARBON DIOXIDE

CROSS-REFERENCE TO RELATED APPLICATION

[0001] This application is a Division of copending application Ser. No. 12/566,822 filed Sep. 25, 2009, the contents of which are hereby incorporated by reference in its entirety.

BACKGROUND OF THE INVENTION

[0002] This invention generally relates to a process for a gas removal zone, such as an acid gas removal zone. More specifically, this invention relates to improvements in efficiency of such processes in which the level of carbon monoxide is reduced from the carbon dioxide that is being removed.

SUMMARY OF THE INVENTION

[0003] The invention provides a process for separation, recovery and utilization of gas streams comprising sulfur compounds, carbon dioxide and carbon monoxide from a synthesis gas (also referred to herein as "syngas")comprising an unshifted synthesis gas or a partially shifted synthesis gas produced from high pressure partial oxidation of a hydrocarbonaceous reactant while removing carbon monoxide from these gas streams and concentrating CO in a shifted synthesis gas stream. The process comprises first contacting the synthesis gas with a first liquid solvent in a first acidic gas removal unit to selectively absorb and remove at least a portion of carbon dioxide from the synthesis gas and to produce a purified synthesis gas; and then sending a portion of the first liquid solvent to a second acidic gas removal unit wherein at least a portion of carbon dioxide is contacted with the first liquid solvent mixed with a second liquid solvent to remove CO_2 from a shifted synthesis gas to produce a purified shifted synthesis gas and wherein at least a portion of CO from said first liquid solvent is transferred to said purified shifted synthesis gas.

[0004] In an embodiment of the invention, the loaded solvent from the carbon dioxide absorber for the unshifted or partially shifted syngas feed or syngas from a sulfur removal section is combined with the fully shifted syngas feed or syngas from the sulfur removal section prior to being sent to the carbon dioxide absorber for the fully shifted syngas.

BRIEF DESCRIPTION OF THE DRAWINGS

[0005] FIG. **1** shows the carbon dioxide removal section for an absorbent process for treating a single synthesis gas stream.

[0006] FIG. **2** shows the carbon dioxide removal sections of an absorbent process for processing both a fully shifted and an unshifted or partially shifted feed using separate absorbers for two feed gases but equipment in common for other parts of the process.

[0007] FIG. **3** shows carbon dioxide removal sections for an absorbent process for processing both shifted and unshifted or partially shifted feeds that minimize the carbon monoxide in a product carbon dioxide stream.

[0008] FIG. **4** shows a modification of the carbon dioxide removal sections shown in FIG. **3**.

DETAILED DESCRIPTION OF THE INVENTION

[0009] As used herein, the term "stream" can be a stream including various hydrocarbon molecules, such as straight-chain, branched, or cyclic alkanes, alkenes, alkadienes, and alkynes, and optionally other substances, such as gases, e.g., hydrogen, or impurities, such as heavy metals, and sulfur and nitrogen compounds. The stream can also include aromatic and non-aromatic hydrocarbons. Moreover, the hydrocarbon molecules may be abbreviated C1, C2, C3 . . . Cn where "n" represents the number of carbon atoms in the one or more hydrocarbon molecules. Additionally, characterizing a stream as, e.g., a "partially-lean solvent stream" or a "lean solvent stream" can mean a stream including or rich in, respectively, at least one partially-lean solvent or lean solvent.

[0010] As used herein, the term "zone" can refer to an area including one or more equipment items and/or one or more sub-zones. Equipment items can include one or more reactors or reactor vessels, heaters, exchangers, pipes, pumps, compressors, and controllers. Additionally, an equipment item, such as a reactor, dryer, or vessel, can further include one or more zones or sub-zones.

[0011] As used herein, the term "vapor" can mean a gas or a dispersion that may include or consist of one or more hydrocarbons.

[0012] As used herein, the term "cooler" can mean a device cooling a fluid with water.

[0013] As used herein, the term "chiller" can mean a device cooling a fluid to a temperature below that obtainable by only using water. Typically, a chiller may use a refrigerant such as an ammonia, a hydrocarbon or a hydrofluorocarbon.

[0014] As used herein, the term "rich" can mean an amount of generally at least about 30%, or about 30%-about 70%, by mole, of a compound or class of compounds in a stream.

[0015] As used herein, the term "absorber" can include an adsorber, and relates, but is not limited to, absorption and/or adsorption.

[0016] As depicted, process flow lines in the drawings can be referred to as lines, effluents, streams, or portions. Particularly, a line can contain one or more effluents, streams or portions.

[0017] Often, a sour gas, such as a syngas, from a gasifier is treated with a solvent in at least one absorber to selectively remove one or more sulfur compounds, such as a hydrogen sulfide or a carbonyl sulfide, and carbon dioxide. It is sometimes desired to produce large quantities of hydrogen along with power from a gasification unit. In such instances a portion of the syngas from the gasifier is shifted to hydrogen in a reactor according to the reaction $CO+H_2O \rightarrow CO_2+H_2$. See for example U.S. Pat. No. 5,152,975 to Fong et al., incorporated herein by reference. The remainder of the syngas is cooled without shifting and, after further processing, sent to a combustion turbine. In addition, in gasification applications in which the final product is liquid fuels or chemicals, typically both a fully shifted and a partially shifted or unshifted feed must be treated in a process that removes the sulfur compounds (H_2S and COS) and CO_2. There are several commercial processes for this application that are currently being marketed, including the Selexol® process—using a mixture of dimethyl ethers of polyethylene glycol (UOP LLC, Des Plaines, Ill.), the Rectisol® process—using a methanol solvent (licensed by both Linde AG, Polach, Germany and Lurgi

AG, Frankfurt Am Main Germany), the Sulfinol® process—using a mixture of sulfolane and an aqueous solution of either di-isopropanol amine or methyl-diethanol amine(Jacobs, Pasadena, Calif.), the Flexsorb® process—using a proprietary solvent (ExxonMobil Research and Engineering, Fairfax, Va.), the Morphysorb® process—using a mixture of n-formylmorpholine and n-acetylmorpholine (Uhde GmbH, Dortmund, Germany) and the Purisol® process using N-Methyl-2-Pyrrolidone (NMP) (Lurgi AG, Frankfurt Am Main Germany). Each of these processes employs a solvent that absorbs the sulfur compounds and/or carbon dioxide from an acid gas. The most straightforward set-up for these types of processes is a separate train for both feeds similar to what is pictured in FIG. **1**. From a capital cost stand-point, it is advantageous to have separate H_2S and CO_2 absorbers for the two feeds and common equipment for the remainder of the process similar to what is pictured in FIG. **2**. The set-up in FIG. **2** is typically able to meet the sulfur specifications for the treated gases and product CO_2 (using a medium pressure vent $CO_2$and CO_2 from a vacuum compressor in FIGS. **1** and **2**) without problems. However, the electricity requirements for the CO_2 recycle compressor become excessive as the CO spec in the product CO_2 is reduced below 1 mole %. The difficulty in keeping CO out of the product CO_2 is due to the high levels of CO in the partially shifted or unshifted feed and the relatively large absorption of CO in the H_2S and CO_2 Absorbers for this feed. In current applications 1000 ppmv CO limits in the product CO_2 are becoming the normal specification. The large quantities of recycle gas from the CO_2 recycle compressor ultimately increase the semi-lean and lean solvent requirements and associated utilities such as refrigeration and reboiler duty to undesirable levels as well.

[0018] The CO levels in the product CO_2 are kept at manageable levels by transferring the CO that is absorbed in the H_2S and CO_2 absorbers for the partially shifted or unshifted syngas to the treated fully shifted syngas. This transfer is acceptable as long as the additional CO in the treated fully shifted syngas does not adversely affect its properties, which is the case for most applications. The absorbed CO is transferred to the fully shifted syngas by combining the solvent from the bottom of the CO_2 Absorber for the partially shifted or unshifted syngas with sidedraw solvent from the CO_2 absorber for the fully shifted syngas and returning the combined solvent to the CO_2 absorber for the fully shifted syngas (FIG. **3**). Prior to returning the solvent to the CO_2absorber for the fully shifted syngas it is chilled and contacted with overhead vapor from the H_2S absorber for the fully shifted syngas to increase the CO_2 loading. The increased CO_2 loading combined with the relatively low level of CO in the fully shifted syngas provides a driving force that causes desorption of much of the CO in the CO_2 absorber into the fully shifted syngas. This desorption effectively removes the CO that is absorbed from the partially shifted or unshifted syngas from the solvent and prevents it from entering the product CO_2. One design based on the FIG. **3** configuration had electricity requirements of slightly less than 12 mW. Designs based on separating the 2 feeds into separate trains (as in FIG. **1**), having separate absorbers for the 2 feeds without the transfer of CO into the fully shifted gas (as in FIG. **2**), or a variation of the separate absorbers case in which the partially shifted or unshifted syngas has its own recycle flash and compressor, require a minimum of 10 mW more electricity to operate even when the 1000 ppmv CO spec in the product $CO_2$is met.

[0019] The invention is best implemented via the configuration presented in FIGS. **3** and **4**. Since the invention requires modifications in only the CO_2 removal section, it is possible to implement via the CO_2 removal section configurations appearing in FIGS. **3** and **4** combined with an H_2S removal section that is configured at the discretion of the engineer.

[0020] In order to understand the present invention, it is useful to first consider a simplified explanation of a system to treat a single synthesis gas stream. FIG. **1** shows a carbon dioxide removal section for an absorbent process for treating a single synthesis gas stream. A solvent or mixture of solvents is used in the process. Among the solvents that can be used are a dimethyl ether of polyethylene glycol, a N-methyl pyrrolidone, a tetrahydro-1,4-oxazine, a methanol, and a mixture comprising diisopropanolamine, tetrahydrothiophene-1,1-dioxide and mixtures thereof FIG. **1** shows a feed stream **2** of syngas which may be a feed syngas or a syngas feed from a sulfur removal section that is not shown in the figure. The stream **2** is shown entering a lower portion of a carbon dioxide absorber **4** in which the syngas travels in an upward direction while contacting the solvent to remove carbon dioxide and producing a treated syngas **62** that is shown exiting a top portion of carbon dioxide absorber **4**. A lean stream **8** of solvent is shown being cooled by chiller **10** and then continuing as stream **12** to enter an upper portion of carbon dioxide absorber **4**. Lean stream **8** of solvent is either a fresh stream that has not been employed in the carbon dioxide removal section of the present invention or the lean stream has been regenerated through removal of impurities including carbon dioxide and sulfur compounds. The loaded solvent **14** is shown exiting the bottom of carbon dioxide absorber **4** and pass through a loaded solvent chiller **16** to continue as cooled loaded solvent stream **18** that is either sent to a carbon dioxide removal section that has a series of flash drums and compressors or it may be pumped to a sulfur removal section (not shown) or otherwise disposed of The portion of the cooled loaded solvent stream **18** that is sent to the carbon dioxide removal section first is shown going to a carbon dioxide recycle flash drum **20** in which a portion of the solvent stream **22** is flashed to a carbon dioxide recycle compressor **24** to compressed stream **26** carbon dioxide recycle cooler **28** to return the compressed stream to about the temperature of stream **2** and finally to return to a bottom portion of carbon dioxide absorber **4**. A solvent stream **32** is sent from carbon dioxide recycle flash drum **20** to carbon dioxide vent flash drum **34** from which vents purified carbon dioxide stream **36**. The solvent stream then continues in line **38** to carbon dioxide vacuum flash drum **40** with carbon dioxide leaving at line **42** to vacuum compressor **44** and to purified carbon dioxide stream **46**. A stream of semi-lean solvent that now has a reduced concentration of carbon dioxide is shown in line **48** to be pumped by semi-lean solvent pump **50** to return to a middle portion of carbon dioxide absorber **4** through line **52**. The portion of the loaded solvent that exits the carbon dioxide removal section shown in this drawing, is sent through line **60** to pump **62** where it is pumped as exiting the system shown at **64**.

[0021] FIG. **2** is also shown to provide a comparison between the prior art process of FIG. **2** with the process of the invention shown in FIGS. **3** and **4**. FIG. **2** shows the carbon dioxide removal section for an absorbent process for processing both fully shifted and unshifted or partially shifted feeds using separate absorbers for two feed gases but common equipment for other aspects of the process. More specifically,

there are shown a first feed **102** and a second feed **124** that are being sent to a first carbon dioxide absorber **104** and a second carbon dioxide absorber **116**, respectively. The first feed **102** may be an unshifted or a partially shifted syngas feed or a syngas feed from a sulfur removal section of the process. The second feed **124** may be a fully shifted syngas feed or may be a syngas feed from a sulfur removal section of the process. First feed **102** contacts a solvent as explained in FIG. **1** above in which carbon dioxide is removed from first feed **102** to be dissolved or otherwise contained within the solvent until the solvent is regenerated. A treated unshifted or partially shifted syngas **162** exits the top of carbon dioxide absorber **104**. Second feed **124** contacts a solvent in carbon dioxide absorber **116** and a treated fully shifted syngas exits at **118**. A lean solvent **108** is cooled by lean solvent chiller **110** and passes through line **112** to lines **114** and **115** to enter a top portion of carbon dioxide absorbers **104** and **116**, respectively. Regarding carbon dioxide absorber **104**, a loaded solvent stream **168** exits a bottom portion of carbon dioxide absorber **104** and then passes through line **126** to loaded solvent pump **128**, to line **130** to loaded solvent chiller **132** and line **134**. The loaded solvent stream in line **134** is then either sent in line **136** to be regenerated or to the sulfur removal sections of the process to be used in sulfur removal absorbers. Similar to loaded solvent stream **168** that exits carbon dioxide absorber **104** is shown a second loaded solvent stream **120** that exits carbon dioxide absorber **116**. Loaded solvent stream **168** and second loaded solvent stream **120** are combined in line **126**. Also shown in the figure is a portion of the solvent being sent through a series of flash drums to remove a carbon dioxide product. More specifically, a portion of the loaded solvent stream continues through line **138** to carbon dioxide recycle flash drum **140** with an overhead vapor passing through line **142** to carbon dioxide recycle compressor **144** to line **146** to carbon dioxide recycle cooler **148** to line **150** and then to return to bottom portion of carbon dioxide absorber **116**. The solvent having a higher proportion of carbon dioxide relative to the overhead vapor in line **142** is sent through line **152** to carbon dioxide medium pressure vent flash drum **154** with a medium pressure flow of carbon dioxide exiting through line **156** and the solvent stream continuing to line **158** to carbon dioxide vacuum flash drum **160**. The carbon dioxide exits through line **162** to vacuum compressor **164** and then exits the process in line **166**. The solvent which now is considered to be semi-lean is returned to the carbon dioxide absorbers through line **178** to semi-lean solvent pump **170** to line **172**. One portion of the semi-lean solvent in line **172** is returned to the first carbon dioxide absorber through line **176** and a second portion of the semi-lean solvent is returned to the second carbon dioxide absorber through line **174**.

[0022] FIG. **3** generally shows carbon dioxide removal sections of an absorbent process for purifying a gas stream that contains two different feeds such as a shifted and an unshifted or partially shifted feed that minimizes the carbon monoxide content in a carbon dioxide stream that is removed from the feeds. More specifically, there are shown a first feed **102** and a second feed **124** that are being sent to a first carbon dioxide absorber **104** and a second carbon dioxide absorber **116**, respectively. The second feed **124** is shown first passing through line **125** prior to entering second carbon dioxide absorber **116**. The first feed **102** may be an unshifted or a partially shifted syngas feed or a syngas feed from a sulfur removal section of the process. The second feed **124** may be a fully shifted syngas feed or a syngas feed from a sulfur removal section of the process. In this embodiment of the invention, a portion of a loaded solvent in line **134** from first carbon dioxide absorber **104** is combined with the second feed **124**.

[0023] First feed **102** contacts a solvent as explained in FIG. **1** above in which carbon dioxide is removed from first feed **102** and then a treated unshifted or partially shifted syngas **162** exits the top of carbon dioxide absorber **104**. Second feed **124** contacts a solvent which removes carbon dioxide in carbon dioxide absorber **116** and a treated fully shifted syngas exits at **118**. The solvent that is used in the two carbon dioxide absorbers are shown as a lean solvent **108** that is cooled by lean solvent chiller **110** and then passes through line **112** to lines **114** and **115** to enter a top portion of carbon dioxide absorbers **104** and **116** respectively. Regarding carbon dioxide absorber **104**, a loaded solvent stream **168** exits a bottom portion of carbon dioxide absorber **104** and then passes through line **126** to loaded solvent pump **128**, then to line **130** to loaded solvent chiller **132** and then line **134**. The loaded solvent stream is then either sent in line **136** to be regenerated or to the sulfur removal sections of the process to be used in sulfur removal absorbers or a portion from line **134** is combined with second feed **124** in line **125**. Similar to loaded solvent stream **168** that exits carbon dioxide absorber **104** is shown a loaded solvent stream **180** that exits carbon dioxide absorber **116**. Loaded solvent stream **168** and loaded solvent stream **180** are combined in line **126**. Also shown in the figure is the solvent being sent through a series of flash drums to remove a carbon dioxide product. More specifically a loaded solvent stream **120** exits a bottom portion of carbon dioxide absorber **116** to carbon dioxide recycle flash drum **140** with an overhead vapor passing through line **142** to carbon dioxide recycle compressor **144** to line **146** to carbon dioxide recycle cooler **148** to line **150** and then to return to a bottom portion of carbon dioxide absorber **116**. The solvent having a higher proportion of carbon dioxide relative to the overhead vapor in line **142** is sent through line **152** to carbon dioxide medium pressure vent flash drum **154** with a medium pressure flow of carbon dioxide exiting through line **156** and the solvent stream continuing to line **158** to carbon dioxide vacuum flash drum **160**. The carbon dioxide stream which contains less than 10% carbon monoxide exits through line **162** to vacuum compressor **164** and then exits the process in line **166**. The solvent which now is considered to be semi-lean is returned to the carbon dioxide absorbers through line **178** to semi-lean solvent pump **170** to line **172**. One portion of the semi-lean solvent is returned to the first carbon dioxide absorber through line **176** and a second portion of the semi-lean solvent is returned to the second carbon dioxide absorber through line **174**.

[0024] FIG. **4** generally shows carbon dioxide removal sections of an absorbent process for purifying a gas stream that contains two different feeds such as a shifted and an unshifted or partially shifted feed that minimizes the carbon monoxide content in a carbon dioxide stream that is removed from the feeds. Unlike the embodiment shown in FIG. **3**, a portion of the loaded solvent from the carbon dioxide absorber for fully shifted syngas is sent to regeneration or to the sulfur removal sections of the process instead of being first sent to the carbon dioxide removal section of the process. More specifically, there are shown a first feed **102** and a second feed **124** that are being sent to a first carbon dioxide absorber **104** and a second carbon dioxide absorber **116**, respectively. The second feed

124 combined with loaded solvent **168** from first carbon dioxide absorber **102** before entering second carbon dioxide absorber **116**. The first feed **102** may be an unshifted or a partially shifted syngas feed or a syngas feed from a sulfur removal section of the process. The second feed **124** may be a fully shifted syngas feed or may be a syngas feed from a sulfur removal section of the process. In this embodiment of the invention, a portion of a loaded solvent **174** from the second carbon dioxide absorber **116** is combined with the loaded solvent **168** and the second feed **124**.

[0025] First feed **102** contacts a solvent as explained in FIG. **1** above in which carbon dioxide is removed from first feed **102** with a treated unshifted or partially shifted syngas **162** exiting the top of carbon dioxide absorber **104**. Second feed **124** after combining with chilled loaded solvent **134** and loaded solvent **168** contacts a solvent in carbon dioxide absorber **116** and a treated fully shifted syngas exits at **118**. A lean solvent **108** is cooled by lean solvent chiller **110** and passes through line **112** to lines **114** and **115** to enter a top portion of carbon dioxide absorbers **104** and **116** respectively. Regarding carbon dioxide absorber **104**, a loaded solvent stream **168** exits a bottom portion of carbon dioxide absorber **104** combines with second feed **124** and then is combined with solvent stream **174** to enter a lower portion of second carbon dioxide absorber **116**. The loaded solvent stream **120** is then either sent to be regenerated or it is sent to a carbon dioxide recovery section of the process. Similar to loaded solvent stream **168** that exits carbon dioxide absorber **104** is shown a second loaded solvent stream **120** that exits carbon dioxide absorber **116**. Loaded solvent stream **168** and second loaded solvent stream **120** are combined. Also shown in the figure is the solvent being sent through a series of flash drums to remove a carbon dioxide product. More specifically the loaded solvent stream **120** exits a bottom portion of carbon dioxide absorber **116** to line **176** to carbon dioxide recycle flash drum **140** with an overhead vapor passing through line **142** to carbon dioxide recycle compressor **144** to line **146** to carbon dioxide recycle cooler **148** to line **150** and then to return to bottom portion of carbon dioxide absorber **116**. The solvent having a higher proportion of carbon dioxide relative to the overhead vapor in line **142** is sent through line **152** to carbon dioxide medium pressure vent flash drum **154** with a medium pressure flow of carbon dioxide exiting through line **156** and the solvent stream continuing to line **158** to carbon dioxide vacuum flash drum **160**. The carbon dioxide exits through line **162** to vacuum compressor **164** and then exits the process in line **166**. The solvent which now is considered to be semi-lean is returned to the carbon dioxide absorbers through line **178** to semi-lean solvent pump **170** to line **172**. One portion of the semi-lean solvent is returned to the first carbon dioxide absorber through line **176** and a second portion of the semi-lean solvent is returned to the second carbon dioxide absorber through line **174**.

[0026] Without further elaboration, it is believed that one skilled in the art can, using the preceding description, utilize the present invention to its fullest extent. The preceding preferred specific embodiments are, therefore, to be construed as merely illustrative, and not limitative of the remainder of the disclosure in any way whatsoever.

[0027] In the foregoing, all temperatures are set forth in degrees Celsius and, all parts and percentages are by weight, unless otherwise indicated.

[0028] From the foregoing description, one skilled in the art can easily ascertain the essential characteristics of this invention and, without departing from the spirit and scope thereof, can make various changes and modifications of the invention to adapt it to various usages and conditions.

1. A process for producing a gas stream comprising carbon dioxide and less than 1000 ppm carbon monoxide, said process comprising sending a first synthesis gas stream through a first carbon dioxide absorber wherein said first synthesis gas stream comprises an unshifted or partially shifted synthesis gas and sending a second synthesis gas stream through a second carbon dioxide absorber wherein said second synthesis gas stream is a fully shifted synthesis gas stream or a synthesis gas stream from a sulfur removal section of said process, wherein within said first carbon dioxide absorber and said second carbon dioxide absorber said first synthesis gas stream and said second synthesis gas stream contact a solvent to remove carbon dioxide from said first and said second synthesis gas stream and wherein at least a portion of solvent from said first and said second carbon dioxide absorber is returned to said second carbon dioxide absorber prior to a loaded solvent being sent from said second carbon dioxide absorber to a zone for removal of carbon dioxide from said solvent.

2. The process of claim **1** wherein said synthesis gas is sent to a sulfur absorber to contact a liquid solvent to remove said sulfur compounds and produce a synthesis gas with a reduced concentration of sulfur compounds.

3. The process of claim **1** wherein said shifted synthesis gas is sent to a sulfur absorber unit to contact a liquid solvent to remove said sulfur compounds and produce a shifted synthesis gas with a reduced concentration of sulfur compounds.

4. The process of claim **1** wherein said liquid streams comprise at least one of a dimethyl ether of polyethylene glycol, a N-methyl pyrrolidone, a tetrahydro-1,4-oxazine, a methanol, and a mixture comprising diisopropanolamine and tetrahydrothiophene-1,1-dioxide.

5. The process of claim **1** wherein a loaded solvent stream from said second carbon dioxide absorber is combined with said second feed to form a third stream that is then returned to said second carbon dioxide absorber.

6. The process of claim **5** wherein a loaded solvent stream from said first carbon dioxide absorber is combined with said third stream.

7. The process of claim **1** wherein said carbon dioxide product stream contains less than about 1000 ppm carbon monoxide in addition to carbon dioxide in said carbon dioxide product stream.

8. The process of claim **1** wherein a portion of a loaded solvent is removed from said second absorber to be chilled and a second portion of a loaded solvent is removed from said second absorber to be treated in a carbon dioxide removal zone.

* * * * *