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(54) **AIR COMPRESSOR AFTERCOOLER**

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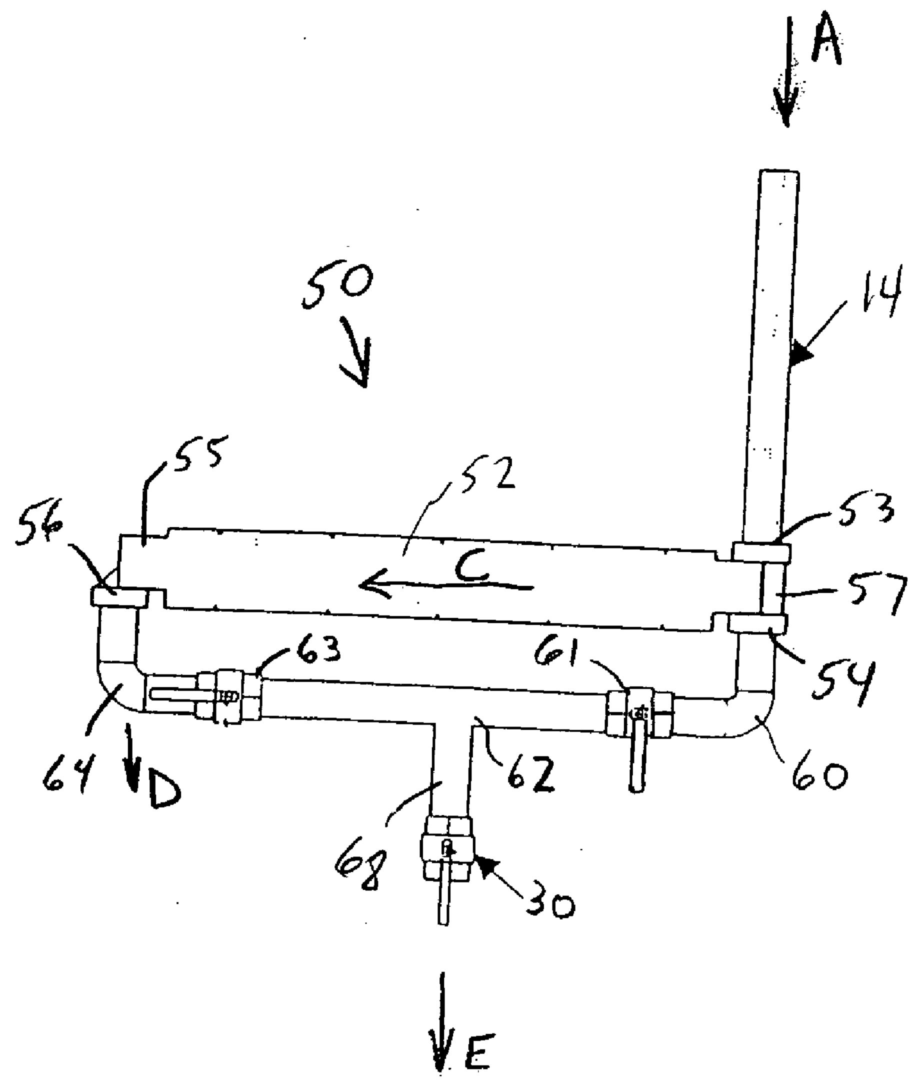
(57) **ABSTRACT**

A compressor aftercooler and an aftercooler assembly incorporating the aftercooler. The aftercooler has an inlet header and a cooler outlet that are in flow communication with a cooling area therebetween such that air passing from the inlet header to the cooler outlet is reduced in temperature. A bypass outlet exits directly from the inlet header such that air passing from the inlet header to the bypass outlet bypasses the cooling area. The aftercooler assembly further comprises a valve and piping arrangement to control flow through the aftercooler.



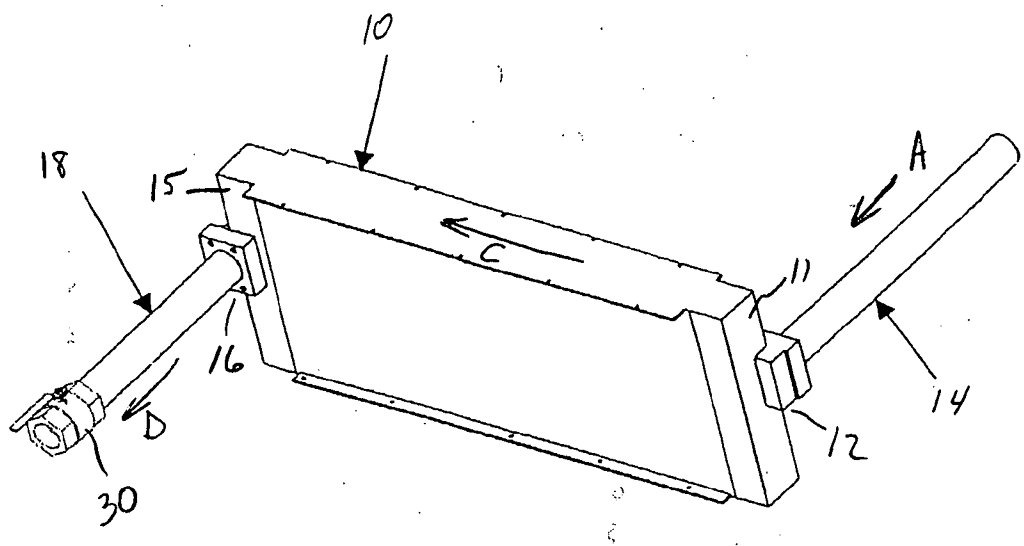


Fig. 1
(Prior Art)

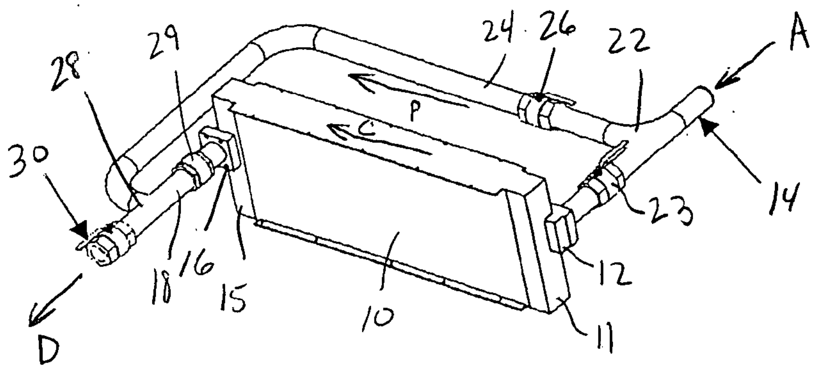


Fig. 2
(Prior Art)

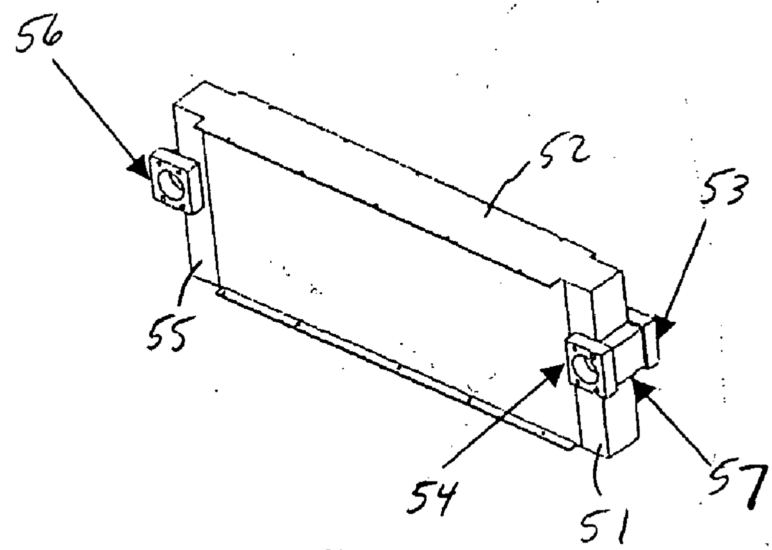


Fig. 3

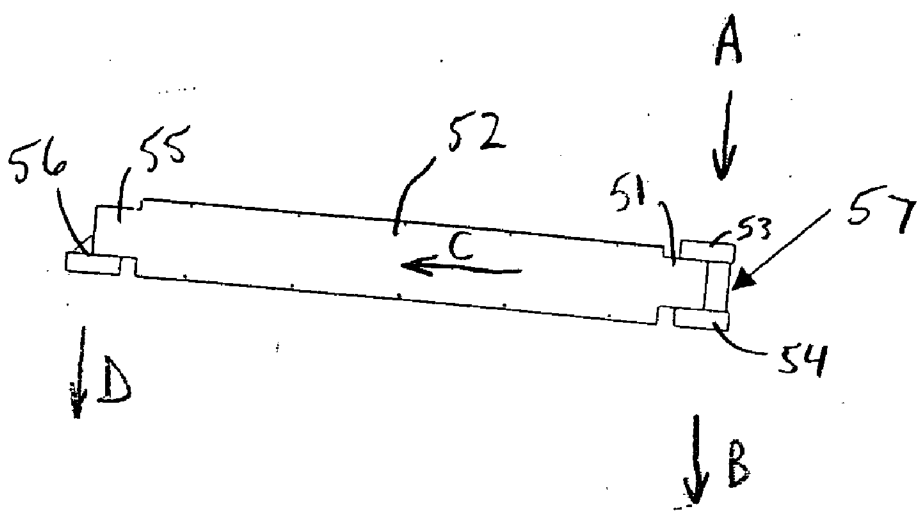


Fig. 4

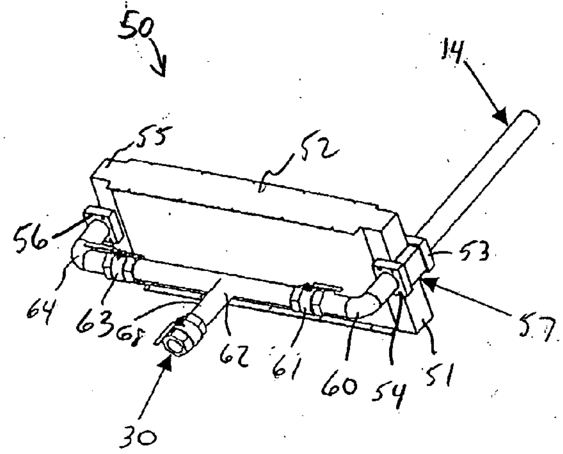


Fig. 5

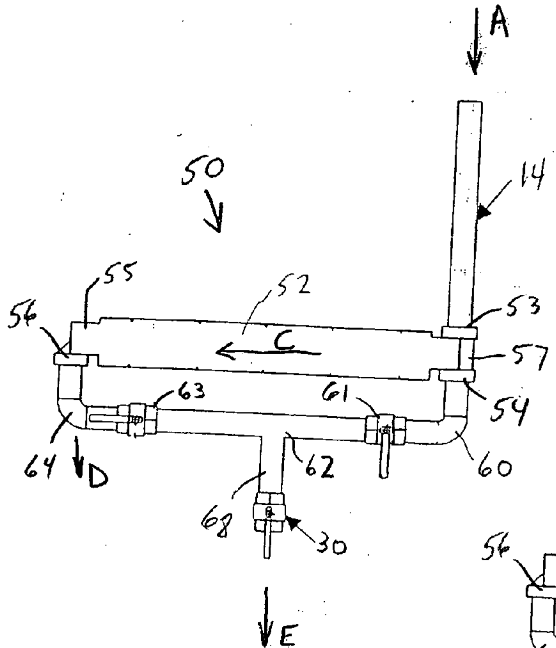


Fig. 6

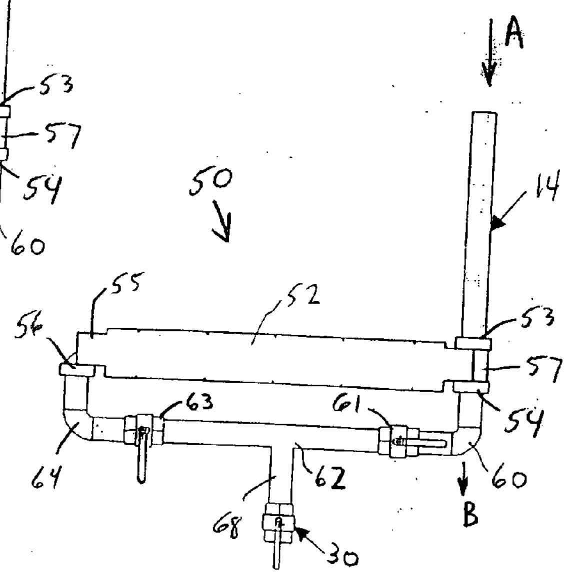


Fig. 7

AIR COMPRESSOR AFTERCOOLER

BACKGROUND

[0001] The present invention relates to air compressor aftercoolers. More particularly, the present invention relates to an aftercooler assembly for providing hot or cool air from an air compressor.

[0002] Engine driven and motor driven air compressors are frequently equipped with an aftercooler in the discharge circuit. As shown in **FIG. 1**, the aftercooler **10** receives air from the compressor (not shown) via an inlet pipe **14**. The compressed air traveling in the direction A enters the aftercooler header **11** via an inlet flange **12**. The compressed air travels across the aftercooler as indicated by arrow C. The aftercooler **10** lowers the temperature of the compressed air being delivered to the equipment connected to the compressor. The cooled air travels from the outlet header **15** through an outlet flange **16** to a discharge pipe **18** as indicated by arrow D. An outlet valve **30** may be provided to control the flow to downstream components. The cooler air is generally required in order to precipitate moisture from the compressed air as well as protect downstream equipment from excessive temperatures.

[0003] In certain applications, such as petrochemical, steel and glass manufacturing, high temperature compressed gas is required. A method to bypass the compressor aftercooler is needed for use in these applications. **FIG. 2** illustrates a typical system for achieving bypass of the aftercooler **10**. This bypass system generally incorporates an additional piping circuit around the aftercooler **10**. The inlet pipe **14** includes a tee **22** with a flow path toward the inlet flange **12** and a second path through a bypass pipe **24**. A first control valve **23** is provided before the inlet flange **12** and a second control valve **26** is provided along the bypass pipe **24**. The control valves **23** and **26** are controlled to provide the desired air temperature. If cool air is desired, control valve **26** is closed while control valve **23** is opened. As such, the compressed air travels through the inlet flange **12**, across the aftercooler as indicated by arrow C and out of the discharge pipe **18**, in manner similar to the standard aftercooler assembly of **FIG. 1**. If hotter air is desired, control valve **23** is closed such that the compressed air cannot enter the aftercooler **10**. The control valve **26** is opened such that the compressed air travels through bypass valve **24** as indicated by arrow P. The bypassed air reenters the discharge pipe **18** via a tee **28**. A check valve **29** must be provided along the discharge pipe **18** to prevent the hotter air from entering the aftercooler discharge header **15**.

[0004] Engine and motor driven air compressors are constantly being required to be packaged in increasingly smaller enclosures. The inclusion of the additional piping inside of the compressor package adds complexity to the assembly and service of the compressor and also increases the cost of the unit. Performance of the compressor may be reduced by the additional restriction of the cooling airflow by the additional pipe work.

SUMMARY

[0005] The present invention provides a compressor aftercooler and an aftercooler assembly incorporating the aftercooler. The aftercooler has a body having an inlet header and a cooler outlet. The inlet header and the cooler outlet are in flow communication with a cooling area therebetween such that air passing from the inlet header to the cooler outlet is reduced in temperature. A bypass outlet exits directly from the inlet header such that air passing from the inlet header to the bypass outlet bypasses the cooling area. The aftercooler assembly further comprises a first pipe section exiting the bypass outlet and a second pipe section exiting the cooler outlet. The first and second pipe sections each connected with a combining tee such that flow through the first and second pipe sections flows to a common discharge. A first valve is positioned along the first pipe section between the bypass outlet and the common discharge and a second valve is positioned along the second pipe section between the cooler outlet and the common discharge.

BRIEF DESCRIPTION OF THE DRAWINGS

[0006] **FIG. 1** is an isometric view of a standard aftercooler configuration.

[0007] **FIG. 2** is an isometric view of a standard aftercooler bypass configuration.

[0008] **FIG. 3** is an isometric view of the aftercooler of a first embodiment of the present invention.

[0009] **FIG. 4** is a top plan view of the aftercooler of **FIG. 3**.

[0010] **FIG. 5** is an isometric view of an aftercooler system according to the first embodiment of the present invention.

[0011] **FIG. 6** is a top plan view of the aftercooler system of **FIG. 5** with the valves positioned in a standard flow configuration.

[0012] **FIG. 7** is a top plan view of the aftercooler system of **FIG. 5** with the valves positioned in a bypass flow configuration.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0013] The present invention will be described with reference to the accompanying drawing figures wherein like numbers represent like elements throughout. Certain terminology, for example, "top", "bottom", "right", "left", "front", "frontward", "forward", "back", "rear" and "rearward", is used in the following description for relative descriptive clarity only and is not intended to be limiting.

[0014] Referring to **FIGS. 3-7**, an aftercooler system **50** that is a preferred embodiment of the present invention is shown. The aftercooler system **50** includes an aftercooler **52** having an inlet header **57** and an outlet header **55**. The outlet header **55** has an outlet flange **56** similar to the outlet flange of a standard aftercooler. The inlet header **57** includes an inlet flange **53** entering the header **57** and an outlet flange **54** exiting the inlet header **57**, preferably directly across from the inlet flange **53**. Compressed air entering the inlet flange **53** can travel through the aftercooler as indicated by arrow C or may travel directly through the inlet header **57** as indicated by arrow B.

[0015] Referring to **FIGS. 5-7**, the aftercooler assembly **50** includes a compact system of pipes **60**, **62**, **64** and valves **61**, **63** to control flow through the aftercooler **52**. A first pipe elbow **60** is connected to the outlet flange **54** to receive bypassed air traveling in the direction B. A -second pipe elbow **64** is connected to outlet flange **56** to receive air that has traveled through the aftercooler **52** as indicated by arrows C and D. The first and second elbows **60**, **64** are interconnected to a tee pipe **62** that provides a common discharge pipe **68**. The discharge pipe **68** may have a valve **30** to control flow to downstream equipment.

[0016] To control flow through the aftercooler system **50** a first control valve **61** is provided between the first elbow **60** and the tee **62** and a second control valve **63** is provided between the second elbow **64** and the tee **62**. When cool air is desired, the first control valve **61** is closed and the second control valve **63** is opened as shown in **FIG. 6**. Air travels into the inlet flange **53** via a standard inlet pipe **14** as indicated by arrow A. Since the first control valve **61** is closed and the second control valve **63** is open, the compressed air travels across the aftercooler **52** as indicated by arrow C. The cooled air exits the outlet flange **56** as indicated by arrow D and travels through elbow **64** to the tee **62**. Since the first control valve **61** is closed, the cooled compressed air travels through the discharge pipe **68** as indicated by arrow E.

[0017] When hot air is desired, the first control valve **61** is opened and the second control valve **63** is closed as shown in **FIG. 7**. Air travels into the inlet flange **53** via a standard inlet pipe **14** as indicated by arrow A. Since the first control valve **61** is opened and the second control valve **63** is closed, the compressed air does not travel across the aftercooler **52**, but instead flows directly through the inlet header **57** and out the outlet flange **54** as indicated by arrow B. The cooled air exits the outlet flange **57** and travels through elbow **60** to the tee **62**. Since the second control valve **63** is closed, the cooled compressed air travels through the discharge pipe **68** as indicated by arrow E. The second control valve **63** prevents backflow into the outlet header **55** and therefore the check valve as in the standard bypass system is eliminated.

[0018] In addition to the flow described above, the valves **61** and **63** may be partially opened to provide a mixing of cool air and hot air to achieve air having a desired discharge temperature between the cool temperature and the hot temperature. To facilitate such mixed air flow, the illustrated manual valves **61**, **63** may be replaced with automated valves, for example, solenoid valves. The compressor controller could than automatically control the valves to provide a desired discharge air temperature.

[0019] The aftercooler system **50** of the present invention uses a reduced amount of piping inside the compressor enclosure. The reduction in piping permits greater cooling air flow, greater access for servicing of the compressor, a reduced number of components, and reduced cost of the compressor system. While the illustrated piping configuration is preferred, other piping configurations may be used. Additionally, the outlet flange **57** may be capped and the aftercooler **52** utilized in a standard manner if such is desired. Additionally, the flow through the aftercooler **52** may be configured such that the outlet flange **56** may be provided on the inlet header **57** side of the aftercooler.

What is claimed is:

1. A compressor aftercooler comprising:

a body having an inlet header and a cooler outlet, the inlet header and the cooler outlet in flow communication with a cooling area therebetween such that air passing from the inlet header to the cooler outlet is reduced in temperature; and

a bypass outlet that exits directly from the inlet header such that air passing from the inlet header to the bypass outlet bypasses the cooling area.

2. A compressor aftercooler assembly comprising:

an aftercooler having a body having

an inlet header and a cooler outlet, the inlet header and the cooler outlet in flow communication with a cooling area therebetween such that air passing from the inlet header to the cooler outlet is reduced in temperature; and

a bypass outlet that exits directly from the inlet header such that air passing from the inlet header to the bypass outlet bypasses the cooling area;

a first pipe section exiting the bypass outlet and a second pipe section exiting the cooler outlet; the first and second pipe sections each connected with a combining tee such that flow through the first and second pipe sections flows to a common discharge;

a first valve positioned along the first pipe section between the bypass outlet and the common discharge and a second valve positioned along the second pipe section between the cooler outlet and the common discharge.

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