

What is claimed is:

1. A flowmeter (5) including a sensor assembly (10) and a meter electronics (20), comprising:
 - two or more flow tubes (130, 130');
5 a driver (180) coupled to the two flow tubes (130, 130') and configured to induce a drive mode vibration in the two flow tubes (130, 130');
two or more strain gages (200A-D) coupled to the two flow tubes (130, 130') and configured to detect a phase of the drive mode vibration;
one or more bridge circuits (206, 206') in electrical communication with the two
10 or more strain gages (200A-D), configured to output a signal indicating an asymmetric flow between the two or more flow tubes (130, 130').
2. The flowmeter (5) of Claim 1, wherein the signal is proportional to a strain difference between the two or more strain gages (200A-D).
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3. The flowmeter (5) of Claim 1, wherein the signal comprises an electrical subtraction of a signal from a first of the two or more strain gages (200A-D) from a signal from a second of the two or more strain gages (200A-D).
- 20 4. The flowmeter (5) of Claim 3, wherein the signal further comprises a sinusoidal output at a drive mode frequency having an amplitude that is proportional to a difference that comprises the subtraction of a phase-shifted signal of the first of the two or more strain gages (200A-D) from a phase-shifted signal of the second of the two or more strain gages (200A-D).
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5. The flowmeter (5) of Claim 1, further comprising a magnet/coil pickoff sensor coupled to the two or more flow tubes (130, 130').
6. The flowmeter (5) of Claim 1, further comprising an indicator configured to
30 indicate an asymmetric flow between the two or more flow tubes (130, 130').

7. The flowmeter (5) of Claim 6, wherein the indicator comprises at least one of a visual and an audible alarm.
8. The flowmeter (5) of Claim 1, wherein a strain gage of the two or more strain gages (200A-D) is coupled to one of the two or more flow tubes (130, 130') and is configured to detect a strain of the one of the two or more flow tubes (130, 130') that is approximately parallel with the longitudinal axis of the one of the two or more flow tubes (130, 130').
9. The flowmeter (5) of Claim 1, wherein a strain gage of the two or more strain gages (200A-D) is placed proximate a brace bar (140, 140') so that the strain gage of the two or more strain gages (200A-D) is subjected to approximately a maximum strain amplitude of the two or more flow tubes (130, 130') induced by the drive mode vibration.
10. The flowmeter (5) of Claim 1, wherein:
a first strain gage of the two or more strain gages (200A-D) is coupled to a distal surface (131A) of an inlet leg (131) of a first flow tube of the two or more flow tubes (130, 130');
the first strain gage of the two or more strain gages (200A-D) is in electrical communication with a first position (R1) of a first bridge circuit (206) of the one or more bridge circuits (206, 206');
a second strain gage of the two or more strain gages (200A-D) is coupled to a distal surface (131'A) of an inlet leg (131) of the first flow tube of the two or more flow tubes (130, 130'); and
the second strain gage of the two or more strain gages (200A-D) is in electrical communication with a second position (R2) of the first bridge circuit (206) of the one or more bridge circuits (206, 206').

11. The flowmeter (5) of Claim 1, wherein:
a first strain gage of the two or more strain gages (200A-D) is coupled to a proximal surface (131B) of an inlet leg (131) of a first flow tube of the two or more flow tubes (130, 130');
5 the first strain gage of the two or more strain gages (200A-D) is in electrical communication with a first position (R1) of a first bridge circuit (206) of the one or more bridge circuits (206, 206');
a second strain gage of the two or more strain gages (200A-D) is coupled to a proximal surface (131'B) of an inlet leg (131) of the first flow tube of the two or more flow tubes (130, 130'); and
10 the second strain gage of the two or more strain gages (200A-D) is in electrical communication with a second position (R2) of the first bridge circuit (206) of the one or more bridge circuits (206, 206').
- 15 12. A flowmeter (5) including a sensor assembly (10) and a meter electronics (20), comprising:
two or more flow tubes (130, 130');
a strain gage (200) coupled to at least one of the two or more flow tubes (130, 130'), wherein the strain gage (200) is configured to output a signal to
20 indicate the presence of an asymmetric flow between the two flow tubes (130, 130').
13. The flowmeter (5) of Claim 12, further comprising an electrical circuit in communication with the strain gage (200).
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14. The flowmeter (5) of Claim 13, wherein the electrical circuit comprises a bridge circuit (206, 206').
15. The flowmeter (5) of Claim 14, wherein the signal comprises an imbalance in the
30 bridge circuit (206, 206').

16. The flowmeter (5) of Claim 14, wherein the signal comprises a changed amplitude of an output of the bridge circuit (206, 206').
17. The flowmeter (5) of Claim 14, wherein the signal comprises an electrical subtraction comprising a phase-shifted signal of the strain gage (200).
18. The flowmeter (5) of Claim 15, wherein the signal further comprises a sinusoidal output at a drive mode frequency having an amplitude that is proportional to a difference that comprises an electrical subtraction comprising a phase-shifted signal of the strain gage (200).
19. A method for determining flow asymmetry through two flow tubes in a flowmeter, comprising the steps of:
- vibrating the two flow tubes in a drive mode vibration;
 - measuring a vibrational response of a first flow tube of the two flow tubes with a first strain gage;
 - measuring a vibrational response of a second flow tube of the two flow tubes with a second strain gage;
 - comparing the vibrational responses of the first and second flow tubes; and
 - determining the presence of a flow asymmetry between the first and second flow tubes.
20. The method for determining flow asymmetry through two flow tubes in a flowmeter of claim 19, further comprising the step of:
- indicating a presence of a flow asymmetry if the difference in the vibrational responses between the first flow tube and the second flow tube is greater than a predetermined threshold.
21. The method for determining flow asymmetry through two flow tubes in a flowmeter of claim 19, wherein the step of indicating the presence of the flow asymmetry if the difference in the vibrational responses between the first flow tube and

the second flow tube is greater than a predetermined threshold comprises the step of triggering an alarm.

22. The method for determining flow asymmetry through two flow tubes in a
5 flowmeter of Claim 19, wherein:

the step of measuring the vibrational response of the first flow tube of the two
flow tubes with a first strain gage further comprises measuring an output
of a bridge circuit in electrical communication with the first strain gage;
and

10 the step of measuring the vibrational response of the second flow tube of the two
flow tubes with a second strain gage further comprises measuring an
output of a bridge circuit in electrical communication with the second
strain gage.

15 23. The method for determining flow through two flow tubes in the flowmeter of
Claim 22, further comprising the steps of:

coupling the first strain gage to a distal surface of a leg of the first flow tube,
wherein the first strain gage is in electrical communication with a first
position of a bridge circuit;

20 coupling the second strain gage to a distal surface of a leg of the second flow
tube, wherein the second strain gage is in electrical communication with a
second position of the bridge circuit.

24. The method for determining flow asymmetry through two flow tubes in a
25 flowmeter of Claim 19, wherein the step of comparing the vibrational responses of the
first and second flow tubes further comprises the step of:

generating an output signal from at least one bridge circuit.

25. The method for determining flow asymmetry through two flow tubes in a
30 flowmeter of Claim 19, wherein:

the vibrational response of the first flow tube comprises a strain of the first flow
tube; and

the vibrational response of the second flow tube comprises a strain of the second flow tube.

26. The method for determining flow through two flow tubes in the flowmeter of
5 Claim 23, wherein:
the first strain gage is coupled to the first flow tube proximate a brace bar; and
the second strain gage is coupled to the second flow tube proximate a brace bar.

27. A method for determining flow asymmetry through two flow tubes in a
10 flowmeter, comprising the steps of:
vibrating the two flow tubes;
determining an absolute phase of a first flow tube of the two flow tubes;
determining an absolute phase of a second flow tube of the two flow tubes;
determining a difference in absolute phase between the first flow tube and the
15 second flow tube;
measuring a first strain of the first flow tube; and
measuring a first strain of the first flow tube.

28. The method for determining flow asymmetry through two flow tubes in a
20 flowmeter of Claim 27, further comprising the step of:
indicating a presence of a flow asymmetry if the difference in absolute phase
between the first flow tube and the second flow tube is greater than a
predetermined threshold.