~~CLAIMS~~

~~**1. Use of a device**~~**CLAIMS**

1. A method for increasing flow capacity of a fluid channel ~~(300)~~ in a downstream direction ~~(310),~~, the fluid channel having a channel surface ~~(304, 308) with a~~configured for liquid flow there along, the channel surface including a discontinuity ~~(110),~~ the ~~device~~method comprising:

disposing a fairing ~~(302)~~ adjacent the discontinuity, the fairing defining a respective fairing surface ~~(312),~~absent convolutions transverse to the downstream direction, the fairing surface:

being located entirely in the fluid channel ~~(300);~~;

being configured for liquid flow there along; and

extending from a respective leading edge ~~(400)~~ of the fairing surface ~~(312)~~ located upstream ~~(306)~~ of the discontinuity ~~(110)~~ to a respective trailing edge ~~(402)~~ of the fairing surface ~~(312)~~ located downstream of the leading edge ~~(400)~~ at least as far as the discontinuity ~~(110);~~; wherein:

at the leading edge ~~(400),~~ the fairing surface ~~(312)~~ is tangent the channel surface ~~(304, 308);~~;

at the trailing edge ~~(402),~~ the fairing surface ~~(312)~~ is tangent the channel surface ~~(304, 308);~~; and

the fairing surface ~~(312)~~ follows a curve that smoothly transitions between the leading edge ~~(400)~~ and the trailing edge ~~(402).~~.

2. ~~2. Use of a device~~A method according to claim ~~1,~~1, wherein the fairing surface ~~(312)~~ follows a reverse curve that smoothly transitions between the leading edge ~~(400)~~ and the trailing edge ~~(402).~~.

3. ~~3. Use of a device~~A method according to ~~any previous~~ claim~~,~~ 1, wherein the trailing edge ~~(402)~~ of the fairing surface ~~(312)~~ is located no further downstream than the discontinuity ~~(110).~~.

4. ~~4. Use of a device~~A method according to ~~any~~ claim ~~1 or 2,~~1, wherein the trailing edge ~~(402)~~ of the fairing surface ~~(312)~~ is located downstream of the discontinuity ~~(110).~~.

5. ~~5. Use of a device~~A method according to claim ~~4,~~3, wherein the fairing surface ~~(312)~~ follows an at least two-cycle reverse curve.

6. 6. Use of a deviceA method according to any previous claim, 1, wherein the fluid channel (300) defines a volume (109) configured for liquid flow therethrough and disposing the fairing comprises disposing the fairing such that at least a portion of the fairing surface (312) between the leading edge (400) and the trailing edge (402) is displaced a positive distance, measured perpendicular to the downstream direction, into the volume of the fluid channel (300) from a hypothetical channel surface of the channel absent the fairing.

7. 7. Use of a deviceA method according to any previous claim 1, wherein the fluid channel (300) defines a volume (109) configured for liquid flow therethrough and disposing the fairing comprises disposing the fairing such that, at each location of at least a portion of the fairing surface (312) along the downstream direction, between the leading edge (400) and the trailing edge (402),, the fairing surface (312) is displaced a positive distance, measured perpendicular to the downstream direction, into the volume of the fluid channel (300) from a hypothetical channel surface of the channel absent the fairing.

8. 8. Use of a deviceA method according to any previous claim, 1, wherein disposing the fairing comprises disposing the fairing such that, at each corresponding location along the downstream direction, between the leading edge (400) and the trailing edge (402),, a cross-sectional fluid flow area, measured perpendicular to the downstream direction and taking into account the fairing (302),, of the fluid channel (300) is no greater than a hypothetical cross-sectional fluid flow area absent the fairing.

9. 9. Use of a deviceA method according to any previous claim, 1, wherein the discontinuity (110) is defined by a portion of the fluid channel: (a) having an elbow-shape, a T-shape or a Y-shape or (b) comprising an entrance region to a centrifugal pump or to a rotary valve.

10. 10. Use of a device A method according to any previous claim, 1, wherein disposing the fairing (302) is configured for permanent or temporary installation adjacent the discontinuity comprises temporarily installing the fairing in the fluid channel (300).

11. 11. Use of a device A method according to any of claims 1 to 9,claim 1, wherein disposing the fairing (302) is formedadjacent the discontinuity comprises forming the fairing as an integral part of the fluid channel (300).

12. Use of a device according to any previous claim, wherein the fairing surface (312) is smooth.

~~13. Use of a device according to any of claims 1 to 11, wherein the fairing surface (312) is dimpled, rough or patterned.~~

12. ~~14. Use of a device~~A method according to claim 1, wherein the fairing surface is smooth.

13. A device for increasing flow capacity of a fluid channel in a downstream direction, the fluid channel having a channel surface configured for liquid flow there along, the channel surface including a discontinuity, the device comprising:

a fairing defining a respective fairing surface, the fairing surface:

being located entirely in the fluid channel;

being configured for liquid flow there along; and

~~13~~extending from a respective leading edge of the fairing surface located upstream of the discontinuity to a respective trailing edge of the fairing surface located downstream of the leading edge at least as far as the discontinuity; wherein:

at the leading edge, the fairing surface is tangent the channel surface;

at the trailing edge, the fairing surface is tangent the channel surface; and

the fairing surface follows a curve that smoothly transitions between the leading edge and the trailing edge, wherein the fairing surface ~~(312)~~is dimpled, rough or patterned.

14. A device according to claim 13, wherein the fairing surface defines a surface pattern configured to cause, in response to flow of liquid there along, emission of an acoustic signal indicative of a predetermined flow characteristic of the fluid.

~~15. Use of a device according to any previous claim, wherein the fairing (302) comprises a pin (900), and the fairing (302) is configured to pivot about the pin (900).~~

~~16. Use of a device according to any previous claim, wherein the fairing (302) defines a hollow portion (1000) and an aperture (1002) between the hollow portion (1000) and the fluid channel (300), the hollow portion (1000) and the aperture (1002) forming a Helmholtz resonator, wherein the hollow portion (1000) and the aperture (1002) are configured to emit an oscillating acoustic signal in response to a liquid flow across the aperture (1002).~~

17. Use of a device according to any previous claim, wherein the fairing (302) defines a bladder (1102) in fluid communication with a control port (1106) and configured to change the shape of the surface (312) of the fairing (302) in response to inflation of the bladder (1102).

18. Use of a device according to claim 17, wherein the fairing (302) defines at least one pressure sensing port (1108) fluidically coupled to a respective gauge port (1110).

19. Use of a device according to claim 18, wherein the gauge port (1110) is fluidically coupled to the control port (1106).

20. Use of a device according to any previous claim, wherein the fairing (302) defines at least one passage (1200-1202) through the fairing (302), each passage (1200-1202) fluidically connecting a respective upstream portion to a respective downstream portion of the fairing (302), each passage (1200-1202) defining a respective upstream opening (1204-1206) and a respective downstream opening (1208-1210), each passage (1200-1202) being configured to permit at least a portion of liquid flowing in the fluid channel (300) to bypass full profile of the fairing (302).

21. Use of a device according to any previous claim, wherein the fairing (302) comprises an upstream portion (1300) and a downstream portion (1302) joined together by a pivot hinge (1304), wherein an upstream end of the upstream portion (1300) is translatably attached to the channel surface (304), and the upstream and downstream portions (1300, 1302) are configured to pivot in response to translation of the upstream end of the upstream portion (1300) and thereby extend the pivot hinge (1304), a downstream end of the upstream portion (1300) and an upstream end of the downstream portion (1302) further into the fluid channel (300), the fairing (302) further comprising a spring (1318) configured to urge the upstream end of the upstream portion (1300) to a neutral position.

22. Use of a device according to any previous claim, wherein the fairing (302) defines:

a first bladder (1402) in fluid communication with a port (1410) downstream of the fairing (302) in the fluid channel (300); and

a second bladder (1404) in fluid communication with a port (1412) upstream of the fairing (302) in the fluid channel (300); wherein the first and second bladders (1402-1404) are configured to automatically regulate shape of the fairing 302, based on respective pressures at the ports (1410-1412).

~~23. Use of a device according to any previous claim, wherein the channel surface (304, 308) includes a second discontinuity (1506), the device further comprising:~~

~~a second fairing (1600) defining a respective second fairing surface (1602), the second fairing surface (1602):~~

~~being located entirely in the fluid channel (300);~~

~~being configured for liquid flow there along; and~~

~~extending from a respective leading edge (1604) of the second fairing surface located upstream (1606) of the second discontinuity (1506) to a respective trailing edge (1608) of the second fairing surface (1602) located downstream of the leading edge at least as far as the discontinuity (1506); wherein:~~

~~at the leading edge (1604), the second fairing surface (1602) is tangent the channel surface;~~

~~at the trailing edge (1608), the second fairing surface (1602) is tangent the channel surface (304, 308); and~~

~~the second fairing surface (1602) follows a curve that smoothly transitions between the leading edge (1604) and the trailing edge (1608).~~

~~24.~~15. A device for increasing flow capacity of a fluid channel ~~(300)~~ in a downstream direction ~~(310),~~ the fluid channel having a channel surface ~~(304, 308)~~ configured for liquid flow there along, the channel surface including a discontinuity ~~(110),~~ the device comprising:

a fairing ~~(302)~~ defining a respective fairing surface ~~(312),~~ the fairing surface:

being located entirely in the fluid channel ~~(300);~~

being configured for liquid flow there along; and

extending from a respective leading edge ~~(400)~~ of the fairing surface ~~(312)~~ located upstream ~~(306)~~ of the discontinuity ~~(110)~~ to a respective trailing edge ~~(402)~~ of the fairing surface ~~(312)~~ located downstream of the leading edge ~~(400)~~ at least as far as the discontinuity ~~(110);~~ wherein:

at the leading edge ~~(400),~~ the fairing surface ~~(312)~~ is tangent the channel surface ~~(304, 308);~~

at the trailing edge ~~(402),~~ the fairing surface ~~(312)~~ is tangent the channel surface ~~(304, 308);~~ and

the fairing surface ~~(312)~~ follows a curve that smoothly transitions between the leading edge ~~(400)~~ and the trailing edge ~~(402);~~ ;

~~wherein~~ the fairing ~~(302)~~ comprises a pin ~~(900),~~ and the fairing ~~(302)~~ is configured to pivot about the pin ~~(900).~~.

~~25.~~16. A device for increasing flow capacity of a fluid channel ~~(300)~~ in a downstream direction ~~(310),~~ the fluid channel having a channel surface ~~(304, 308)~~ configured for liquid flow there along, the channel surface including a discontinuity ~~(110),~~ the device comprising:

a fairing ~~(302)~~ defining a respective fairing surface ~~(312),~~ the fairing surface:

being located entirely in the fluid channel ~~(300);~~

being configured for liquid flow there along; and

extending from a respective leading edge ~~(400)~~ of the fairing surface ~~(312)~~ located upstream ~~(306)~~ of the discontinuity ~~(110)~~ to a respective trailing edge ~~(402)~~ of the fairing surface ~~(312)~~ located downstream of the leading edge ~~(400)~~ at least as far as the discontinuity ~~(110);~~ wherein:

at the leading edge ~~(400),~~ the fairing surface ~~(312)~~ is tangent the channel surface ~~(304, 308);~~

at the trailing edge ~~(402),~~ the fairing surface ~~(312)~~ is tangent the channel surface ~~(304, 308);~~ and

the fairing surface ~~(312)~~ follows a curve that smoothly transitions between the leading edge ~~(400)~~ and the trailing edge ~~(402);~~ ;

~~wherein~~ the fairing ~~(302)~~ defines ~~a~~as hollow portion ~~(1000)~~ and an aperture ~~(1002)~~ between the hollow portion ~~(1000)~~ and the fluid channel ~~(300),~~ wherein the hollow portion ~~(1000)~~ and the aperture ~~(1002) forming a Helmholtz resonator, wherein the hollow portion (1000) and the aperture (1002)~~ are configured to emit an oscillating acoustic signal in response to a ~~liquid~~fluid flow across the aperture ~~(1002).~~.

~~26.~~17. A device for increasing flow capacity of a fluid channel ~~(300)~~ in a downstream direction ~~(310),~~ the fluid channel having a channel surface ~~(304, 308)~~ configured for liquid flow there along, the channel surface including a discontinuity ~~(110),~~ the device comprising:

a fairing ~~(302)~~ defining a respective fairing surface ~~(312),~~ the fairing surface:

being located entirely in the fluid channel ~~(300);~~

being configured for liquid flow there along; and

extending from a respective leading edge ~~(400)~~ of the fairing surface ~~(312)~~ located upstream ~~(306)~~ of the discontinuity ~~(110)~~ to a respective trailing edge ~~(402)~~ of the fairing surface ~~(312)~~ located downstream of the leading edge ~~(400)~~ at least as far as the discontinuity ~~(110);~~ wherein:

at the leading edge ~~(400),~~ the fairing surface ~~(312)~~ is tangent the channel surface ~~(304, 308);~~

at the trailing edge ~~(402),~~ the fairing surface ~~(312)~~ is tangent the channel surface ~~(304, 308);~~ and

the fairing surface ~~(312)~~ follows a curve that smoothly transitions between the leading edge ~~(400)~~ and the trailing edge ~~(402);~~ ;

~~wherein~~ the fairing ~~(302)~~ defines a bladder ~~(1102)~~ in fluid communication with a control port ~~(1106)~~ and configured to change the shape of the surface ~~(312)~~ of the fairing ~~(302)~~ in response to inflation of the bladder ~~(1102).~~.

~~27.~~18. A device according to claim ~~27,~~17, wherein the fairing ~~(302)~~ defines at least one pressure sensing port ~~(1108)~~ fluidically coupled to a respective gauge port ~~(1110).~~.

~~28.~~19. A device according to claim ~~28,~~18, wherein the gauge port ~~(1110)~~ is fluidically coupled to the control port ~~(1106).~~.

20. A method according to claim 1, wherein the fairing defines at least one passage through the fairing, each passage fluidically connecting a respective upstream portion to a respective downstream portion of the fairing, each passage defining a respective upstream opening and a respective downstream opening, each passage being configured to permit at least a portion of liquid flowing in the fluid channel to bypass full profile of the fairing.

~~29.~~21. A device for increasing flow capacity of a fluid channel ~~(300)~~ in a downstream direction ~~(310),~~ the fluid channel having a channel surface ~~(304, 308)~~ configured for liquid flow there along, the channel surface including a discontinuity ~~(110),~~ the device comprising:

a fairing ~~(302)~~ defining a respective fairing surface ~~(312),~~ the fairing surface:

being located entirely in the fluid channel ~~(300);~~

being configured for liquid flow there along; and

extending from a respective leading edge ~~(400)~~ of the fairing surface ~~(312)~~ located upstream ~~(306)~~ of the discontinuity ~~(110)~~ to a respective trailing edge ~~(402)~~ of the fairing surface ~~(312)~~ located downstream of the leading edge ~~(400)~~ at least as far as the discontinuity ~~(110);~~ wherein:

at the leading edge ~~(400),~~ the fairing surface ~~(312)~~ is tangent the channel surface ~~(304, 308);~~

at the trailing edge ~~(402),~~ the fairing surface ~~(312)~~ is tangent the channel surface ~~(304, 308);~~ and

the fairing surface ~~(312)~~ follows a curve that smoothly transitions between the leading edge ~~(400)~~ and the trailing edge ~~(402);~~

~~wherein~~ the fairing ~~(302) defines at least one passage (1200-1202) through the fairing (302), each passage (1200-1202) fluidically connecting a respective~~comprises an upstream portion ~~to~~and a ~~respective~~ downstream portion ~~of the fairing (302), each passage (1200-1202) defining a respective~~ joined together by a pivot hinge, wherein an upstream ~~opening (1204-1206) and a respective downstream opening (1208-1210), each passage (1200-1202) being~~end of the upstream portion is translatably attached to the channel surface, and the two portions and are configured to ~~permit at least a portion of liquid flowing~~pivot in response to translation of the upstream end of the upstream portion and thereby extend the pivot hinge, the downstream end of the upstream portion and the upstream end of the downstream portion further into the fluid channel ~~(300) to bypass full profile of the fairing (302).~~, the fairing further comprising a spring configured to urge the upstream end of the upstream portion to a neutral position.

~~30.~~22. A device for increasing flow capacity of a fluid channel ~~(300)~~ in a downstream direction ~~(310),~~ the fluid channel having a channel surface ~~(304, 308)~~ configured for liquid flow there along, the channel surface including a discontinuity ~~(110),~~ the device comprising:

a fairing ~~(302)~~ defining a respective ~~fairing surface (312), the~~ fairing surface~~:~~, the fairing surface:

being located entirely in the fluid channel ~~(300);~~

being configured for liquid flow there along; and

extending from a respective leading edge ~~(400)~~ of the fairing surface ~~(312)~~ located upstream ~~(306)~~ of the discontinuity ~~(110)~~ to a respective trailing edge ~~(402)~~ of the fairing surface ~~(312)~~ located downstream of the leading edge ~~(400)~~ at least as far as the discontinuity ~~(110);~~ wherein:

at the leading edge ~~(400),~~ the fairing surface ~~(312)~~ is tangent the channel surface ~~(304, 308);~~

at the trailing edge ~~(402),~~ the fairing surface ~~(312)~~ is tangent the channel surface ~~(304, 308);~~ and

the fairing surface ~~(312)~~ follows a curve that smoothly transitions between the leading edge ~~(400)~~ and the trailing edge ~~(402);~~

the fairing defines:

a first bladder in fluid communication with a port downstream of the fairing in the fluid channel; and

a second bladder in fluid communication with a port upstream of the fairing in the fluid channel;

wherein the ~~fairing (302) comprises an upstream portion (1300) and a downstream portion (1302) joined together by a pivot hinge (1304), wherein an upstream end of the upstream portion (1300) is translatably attached to the channel surface (304), and the upstream and downstream portions (1300, 1302) are configured to pivot in response to translation of the upstream end of the upstream portion (1300) and thereby extend the pivot hinge (1304), a downstream end of the upstream portion (1300) and an upstream end of the downstream portion (1302) further into the fluid channel (300), the fairing (302) further comprising a spring (1318) configured to urge the upstream end of the upstream portion (1300) to a neutral position~~first and second bladders are configured to automatically regulate shape of the fairing, based on respective pressures at the ports.

~~31.~~23. A ~~device for increasing flow capacity of a fluid channel (300) in a downstream direction (310),~~method according to claim 1, wherein the ~~fluid channel having a~~ channel surface ~~(304, 308) configured for liquid flow there along, the channel surface including a~~includes a second discontinuity ~~(110),~~ the ~~device~~method further comprising:

~~a~~disposing a second fairing ~~(302)~~ defining a respective second fairing surface ~~(312),~~ the second fairing surface:

being located entirely in the fluid channel ~~(300);~~;

being configured for liquid flow there along; and

extending from a respective leading edge ~~(400)~~ of the second fairing surface ~~(312)~~ located upstream ~~(306)~~ of the discontinuity ~~(110)~~ to a respective trailing edge ~~(402)~~ of the second fairing surface ~~(312)~~ located downstream of the leading edge ~~(400)~~ at least as far as the discontinuity ~~(110);~~; wherein:

at the leading edge ~~(400),~~ the second fairing surface ~~(312)~~ is tangent the channel surface ~~(304, 308);~~;

at the trailing edge ~~(402),~~ the second fairing surface ~~(312)~~ is tangent the channel surface ~~(304, 308);~~; and

the second fairing surface ~~(312)~~ follows a curve that smoothly transitions between the leading edge ~~(400)~~ and the trailing edge ~~(402);~~.

24. A method according to claim 1, wherein the fairing ~~(302) defines:~~surface is dimpled, rough or patterned.

~~a first bladder (1402) in fluid communication with a port (1410) downstream of the fairing (302) in the fluid channel (300); and~~

~~a second bladder (1404) in fluid communication with a port (1412) upstream of the fairing (302) in the fluid channel (300); wherein the first and second bladders (1402-1404) are configured to automatically regulate shape of the fairing 302, based on respective pressures at the ports (1410-1412).~~

25. ~~A device according to any of claims 24, 26 to 31,~~A method according to claim 24, wherein the fairing surface defines a surface pattern configured to cause, in response to flow of fluid there along, emission of an acoustic signal indicative of a predetermined flow characteristic of the fluid.

26. A method according to claim 1, wherein the fairing ~~(302) defines a~~comprises a pin, and the fairing is configured to pivot about the pin.

~~32.~~27. A method according to claim 1, wherein the fairing defines as hollow portion ~~(1000)~~ and an aperture ~~(1002)~~ between the hollow portion ~~(1000)~~ and the fluid channel ~~(300),~~, wherein the hollow portion ~~(1000)~~ and the aperture ~~(1002) forming a Helmholtz resonator, wherein the hollow portion (1000) and the aperture (1002)~~ are configured to emit an oscillating acoustic signal in response to a ~~liquid~~fluid flow across the aperture ~~(1002).~~.

~~33.~~28. A ~~device~~method according to ~~any of claims 24, 25, 29, 30,~~claim 1, wherein the fairing ~~(302)~~ defines a bladder ~~(1102)~~ in fluid communication with a control port ~~(1106)~~ and configured to change the shape of the surface ~~(312)~~ of the fairing ~~(302)~~ in response to inflation of the bladder ~~(1102).~~.

29. A ~~device~~method according to ~~any of claims 24-28,~~claim 28, wherein the fairing ~~(302)~~ defines at least one ~~passage (1200-1202) through the fairing (302), each passage (1200-1202)~~pressure sensing port fluidically ~~connecting a respective upstream portion~~coupled to a respective ~~downstream portion of the fairing (302), each passage (1200-1202) defining a respective upstream opening (1204-1206) and a respective downstream opening (1208-1210), each passage (1200-1202) being configured to permit at least a portion of liquid flowing in the fluid channel (300)~~gauge port.

~~34.~~30. A method according to claim 29, wherein the gauge port is fluidically coupled to ~~bypass full profile of the fairing (302).~~the control port.

~~35.~~31. A ~~device~~method according to ~~any of claims 24-29,~~claim 1, wherein the fairing ~~(302)~~ comprises an upstream portion ~~(1300)~~ and a downstream portion ~~(1302)~~ joined together by a pivot hinge ~~(1304),~~, wherein an upstream end of the upstream portion ~~(1300)~~ is translatably attached to the channel surface ~~(304),~~, and the ~~upstream and downstream~~two portions ~~(1300, 1302)~~and are configured to pivot in response to translation of the upstream end of the upstream portion ~~(1300)~~ and thereby extend the pivot hinge ~~(1304), a~~, the downstream end of the upstream portion ~~(1300)~~ and ~~an~~the upstream end of the downstream portion ~~(1302)~~ further into the fluid channel ~~(300),~~, the fairing ~~(302)~~ further comprising a spring ~~(1318)~~ configured to urge the upstream end of the upstream portion ~~(1300)~~ to a neutral position.

~~36.~~32. A ~~device~~method according to ~~any of claims 24, 25, 29, 30,~~claim 1, wherein the fairing ~~(302)~~ defines:

a first bladder ~~(1402)~~in fluid communication with a port downstream of the fairing in the fluid channel; and

a second bladder in fluid communication with a port ~~(1410) downstream~~upstream of the fairing ~~(302)~~ in the fluid channel ~~(300); and~~

~~a second bladder (1404) in fluid communication with a port (1412) upstream of the fairing (302) in the fluid channel (300);~~; wherein the first and second bladders ~~(1402-1404)~~ are configured to automatically regulate shape of the fairing ~~302~~, based on respective pressures at the ports ~~(1410-1412).~~ .