compensated measure that is representative of EM properties of the contents of the pipe portion 15p and 15s. Further details, and the electrical circuit for achieving this, are described below.

In the construction shown in Fig. 2, the screening rings 25 each have the same configuration and are arranged with mirror symmetry about the mid-point between the openings 14s of the casing 10s of the secondary resonator 2. In the direction between the openings 14s of the casing 10s, each has an extent that is less than half the length of the cavity 11s, so that they together have a total extent less than the length of the cavity 11s.

In general, there could be any number of one or more screening rings 25, but the symmetrical arrangement provides the advantage of assisting in the formation of EM modes of the resonant EM field.

In general, the total extent of the screening rings 25 the direction between the openings 14s of the casing 10s could vary. The total extent of the screening rings 25 could be the entire length of the cavity 11s, in which case the entirety of the pipe portion 15s inside the cavity 11s would be screened. That would simplify the calculation of a compensated measure that is representative of EM properties of the contents of the pipe portion 15p and 15s. However, greater sensitivity can be achieved by the total extent of the screening rings 25 being lower, because then the overall EM properties of the primary resonator 1 and the secondary resonator 2 are more similar, and the effect of the screening rings 25 is merely a perturbation, but nonetheless dependent on the EM properties of the contents of the pipe portion 15p and 15s. By way of example, ~~Fig. 4~~ Fig. 3 shows the secondary resonator 2 with modified screening rings 25 that have a lesser extent between the openings 14s to achieve this effect.

In Fig. 2, the screening rings 25 are continuous sheets, but they may have any construction which provides screening of their interiors. Thus, as an alternative the screening rings 25 may have apertures. ~~Fig. 3~~ Fig. 4 shows an example of a screening ring 25 having apertures 26 that may be used in the secondary resonator 2. With such apertures 26, the screening ring 25 still screens its interior from the resonant EM field, because the apertures are small relative to the EM wavelength which is of the order of an overall dimension of the cavity 11s.

A possible electrical circuit 50 of the cavity resonator system connected to the primary resonator 1 and the secondary resonator 2 is shown in Fig. 5 and will now be

Claims

1. A cavity resonator system for measuring electro-magnetic properties of the contents of a pipe portion, comprising

a primary resonator and a secondary resonator each comprising, in the same configuration:

a conductive casing defining a cavity;

insulator material disposed inside the cavity, the casing having a pair of opposed openings for receiving a pipe portion in a configuration extending through the cavity inside the insulator material; and

antennae for generating and detecting a resonant electro-magnetic field inside the cavity,

the secondary resonator further comprising at least one conductive screening ring that extends around the location to be occupied by a pipe portion received in the openings of the secondary resonator for screening the interior of the screening ring from a resonant electro-magnetic field generated inside the cavity by an antenna of the secondary resonator.

2. A cavity resonator system according to claim 1, wherein, in the direction between the openings of the casing of the secondary resonator, the total extent of the at least one screening ring is less than the length of the cavity.

3. A cavity resonator system according to claim 1 or 2, wherein the at least one screening ring comprises plural screening rings.

4. A cavity resonator system according to any one of the preceding claims, wherein the at least one screening ring is arranged with mirror symmetry about the mid-point between the openings of the casing of the secondary resonator.

5. A cavity resonator system according to any one of the preceding claims, wherein the at least one screening ring has plural apertures.

6. A cavity resonator system according to any one of the preceding claims, wherein

14. A cavity resonator system according to any one of the preceding claims, wherein the primary resonator and the secondary resonator are integrated together with their openings aligned to receive pipe portions that are portions of the same pipe.

15. A cavity resonator system according to any one of claims 1 to 13, wherein the openings of the primary resonator and the openings of the secondary resonator receive respective pipe portions that are arranged in series or in parallel with respect to a flow of fluid.

16. A cavity resonator system according to any one of the preceding claims, further comprising a pipe for carrying a fluid, the openings of the primary resonator and the openings of the secondary resonator receiving respective pipe portions that are portions of the pipe.

17. A cavity resonator system according to any one of the preceding claims, further comprising a drive circuit connected to a first antenna of each of the primary resonator and the secondary resonator and arranged to drive the antennae of each of the primary resonator and the secondary resonator to generate a resonant electro-magnetic field inside the respective cavity.

18. A cavity resonator system according to claim 17, further comprising an analysis circuit connected to a second antenna of each of the primary resonator and the secondary resonator, the analysis circuit being arranged:

to derive, in respect of each of the primary resonator and the secondary resonator, a measure of at least one parameter of the resonant electro-magnetic field in the respective cavity that is dependent on electro-magnetic properties of the contents of the respective cavity, and

in respect of the at least one parameter, to combine the derived measures in respect of each of the primary resonator and the secondary resonator to generate a compensated measure representative of electro-magnetic properties of the contents of a pipe portion to be received in the openings that is compensated for dependence of the parameter on EM properties of the cavity outside the pipe portion.