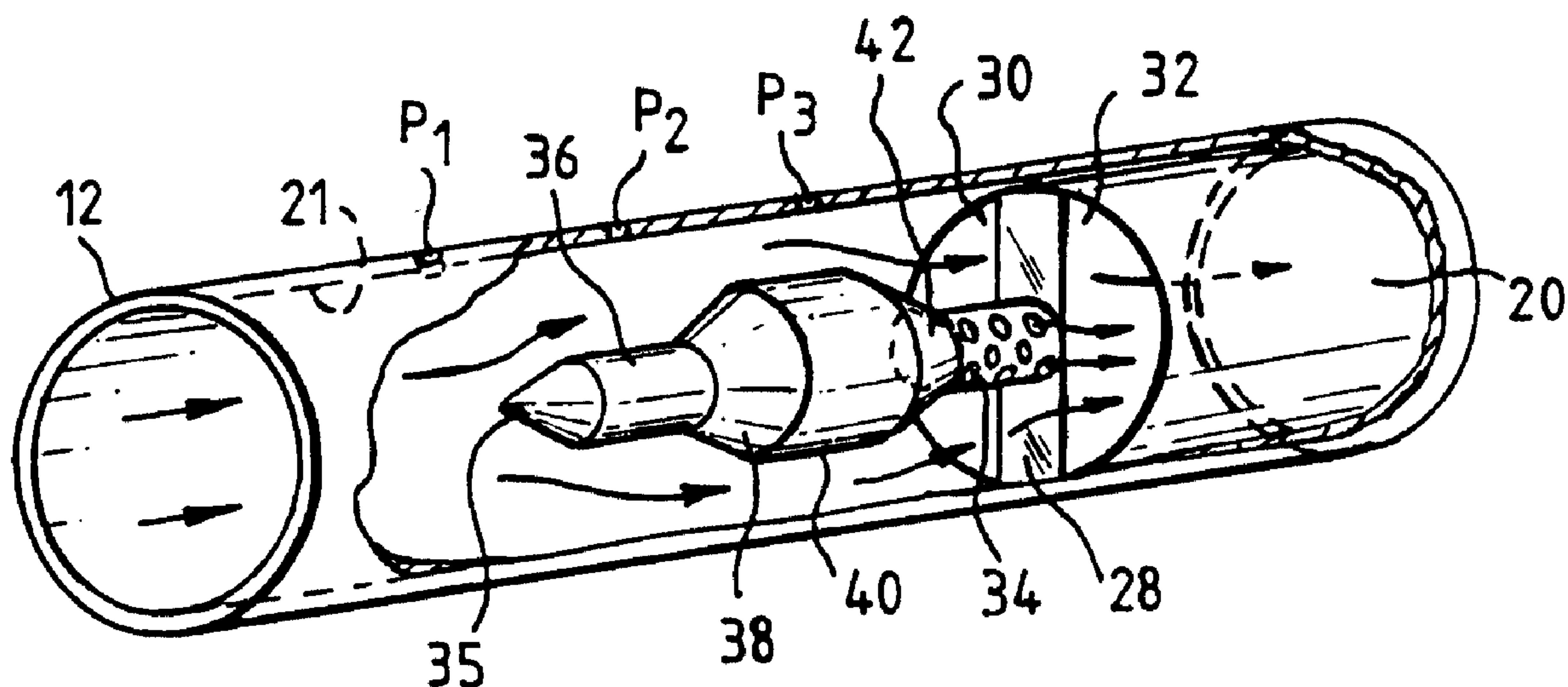




(86) Date de dépôt PCT/PCT Filing Date: 1997/09/02
(87) Date publication PCT/PCT Publication Date: 1998/03/12
(45) Date de délivrance/Issue Date: 2004/02/10
(85) Entrée phase nationale/National Entry: 1999/02/24
(86) N° demande PCT/PCT Application No.: GB 1997/002351
(87) N° publication PCT/PCT Publication No.: 1998/010249
(30) Priorité/Priority: 1996/09/03 (9618344.7) GB

(51) Cl.Int.⁶/Int.Cl.⁶ G01F 1/36, G01F 1/44, G01F 1/40
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(54) Titre : APPAREIL DE CONTROLE AMELIORE D'ECOULEMENT ANNULAIRE
(54) Title: IMPROVED ANNULAR FLOW MONITORING APPARATUS



(57) Abrégé/Abstract:

An improved annular flow monitoring apparatus is described which improves flow monitoring accuracy by taking account of scale thickness when calculating flowrate measurement. This is achieved, in one aspect of the invention, by providing a flow restrictor insert (14) into the bore of a conduit or pipe (12) with the flow restrictor insert being arranged so as to create an annular flowpath around the insert, the flow restrictor insert having at least two substantially co-axial portions (36, 40) of different diameters with sufficient pressure monitoring stations (P1, P2, P3) being provided so as to allow the calculation of at least two pressure differentials. This can be implemented by providing three absolute pressure gauges which may be located at three appropriate locations (P1, P2, P3) in the bore of a carrier or by using two differential sensors connected to the monitoring stations to calculate pressure differentials from the three bores. The three pressure monitoring bores and two differential pressure sensors (43, 45) may be located within the flow restrictor insert (14), and the pressure sensors being located in respective co-axial portions. In another embodiment a multiple venturi flowmeter (5) is used to calculate scale deposition with the same type and number of measurements. Using standard fluid mechanics analysis, a mathematical model is derived which computes gross flowrate from the three pressure measurements (non-differential) in a scaling environment. For each embodiment, a value of scale thickness is a byproduct of the calculation and this is used as the basis for a downhole scale indicator.



