

microscope lens to pass through the cover to a close proximity of the upper surface of the culture dish, a culture dish being shown in phantom to illustrate this particular feature, and illustrating an alternate method for maintaining controlled temperature environment within the incubator.

### DESCRIPTION OF THE INVENTION

Referring to the drawings, FIG's 1 to 5 show a preferred embodiment of the miniature incubator 10 comprising a base platform 11, having a shallow, upwardly extending, substantially cylindrical outer wall 12, located thereon. A ring-shaped upwardly extending low inner wall 13 is located on platform 11, internally of outer wall 12, forming an annular channel 14 in which moisture soaked annular pads 15 and 16 are located. Platform 11 contains, substantially centrally of low inner wall 13, an observation hole 17 that has a countersink 18 to permit a conventional culture dish 19, shown in phantom, to nest therein. An annular groove 20 is located in upper portion 21 of wall 12 to accommodate a sealing ring such as, for instance, an O-ring 22, groove 20 dividing upper portion 21 into upwardly extending inner lip 23 and upwardly extending peripheral outer lip 24. Inner lip 23 is lower than outer lip 24 to permit a transparent, cylindrical cover plate 25, to be nested within outer lip 23 and rest upon O-ring 22 and thereby seal off upper opening 26 of miniature incubator 10. Handles 27 are located on cover 25 to facilitate removal of cover 25 from incubator 10 as required.

Base platform 11 extends outward from at least one side of wall 12 to provide outward extending portion 28 containing holes 29 to provide means for fastening incubator 10 onto suitable observation means such as, a microscope stage's motion controls (not shown in the drawings). A hollow fiber purging tube 30 is located in annular channel 14, sandwiched between two porous, water-saturated pads 15 and 16, one inlet end 31 of hollow fiber tube 30 being connected to supply tube 32 that passes through wall 12 and is connected externally to supply hose 33 through which suitable gases 33a are fed into hollow fiber purging tube 30. Hollow fiber purging tube 30 extends for a suitable length within annular channel 14, which length can extend for as little as a portion of a turn to more than one full turn to accommodate the particular requirements for humidification. Outlet end 34 of hollow fiber purging tube 30 is connected to purge tube 35 which passes through wall 13 to incubator chamber 36 to supply humidified purge gases 37 into chamber 36 from which purge gases 37 diffuse into aerobic culture dish 19, surplus purge gases escaping through observation hole 17 in base platform 11 by seeping between lower surface 38 of culture dish 19 and countersink 18 that does not form a hermetic seal with lower surface 38 of culture dish 19.

A thermal heating means 39 attached to thermal heating connection 39a which may be, for example, electric, or a warm water jacket joined to a circulating warm water supply, through thermal heater connection 39a, is shown located around wall 12 and in intimate contact therewith, a temperature sensing means 40 such as a thermistor, thermocouple or the like, is located within chamber 36 and held in intimate thermal contact with incubator 10 by clip 41 fastened onto base platform 11, wires 42 extending through wall 12 to suitable external control means for controlling thermal heater 39 to provide suitable survival temperature in incubator 10 to suit

the particular cell culture being studied in culture dish 19.

Water saturated pads 15 and 16 accumulate heat from incubator 10 and act as a heat sink permitting some of the water to evaporate and thereby aid in humidifying atmosphere in chamber 36, pads 15 and 16 also serve to heat the purge gasses 37 up to ambient temperature before entering incubator chamber 36. A spring clip 43 is attached to platform 11 and is biased toward culture dish 19 to hold culture dish 19 firmly in place in countersink 18 to maintain optical alignment of culture cells as incubator 10 is moved back and forth under a microscope lens by microscope stage motion controls. In order to avoid scuffing of under surface 44 of base platform 11, slide strips 44a, for example, in the form of thin adhesive teflon tape, may be located on under surface 44. This also permits incubator 10 to slide freely and easily on a microscope stage as the microscope stage motion controls move incubator 10 back and forth on the microscope stage.

An alternate thermal heating means is shown in FIG. 6 in which a nozzle 45 directs warm air 46 toward and around incubator 10 to provide suitable survival temperature for cell cultures in culture dish 19, temperature of warm air 46 being controlled by temperature sensor 40 that controls amount of heat admitted to nozzle 45.

An alternate cover 47 is shown in FIG. 6, comprising a cover plate 48 having an viewing aperture 49 centered above culture dish 19, permitting a microscope objective lens to penetrate cover 47 to a location close above culture dish 19 to allow the use of a comparatively high power objective lens and still retain the ability to focus on the cell culture in culture dish 19, when used in conjunction with an upright microscope, or conversely to permit focusing a light source with a high numerical aperture lens, by placing it closely above culture dish 19 when used in conjunction with an inverted microscope. A peripheral viewing aperture seal 50 is located beneath cover plate 48 surrounding viewing aperture 49 and contacting upper surface 51 of culture dish 19 to provide a substantially closed chamber 36 in incubator 10, permitting purge gases 37 to seep out of chamber 36 only between lower surface 38 of culture dish 19 and countersink 18 of base platform 11.

What is claimed is:

1. A miniature incubator for light microscopes for use in conjunction with a culture dish, comprising a base platform, an outer peripheral wall extending upward from said base platform, said outer peripheral wall having an upper portion, said platform and said outer peripheral wall providing an incubating chamber having an open end at said upper portion of said wall, cover means for closing said open end, means for nesting and retaining said cover means in said upper portion of said outer peripheral wall, comprising a peripheral recess formed in said upper portion, cover seal means located in said recess between said upper portion and said cover, thermal means for heating said miniature incubator, temperature sensor means for controlling the temperature of said incubator, said temperature sensor means being located within said incubating chamber on said base platform and in intimate contact with said base platform, means for locating said culture dish within said incubator on said base platform, means in said base platform for providing viewing access through the bottom surface of said culture dish, means in said cover for providing viewing access to the top surface of said culture dish, hollow fiber tube purging means in said