4 **REGENERATOR**
5 .Cleaning
6 .Movable heat storage mass with enclosure
7 ..With fluid handling system
8 ..Rotary heat collector
9 ...Seals
9.1 .Checker brick structure
9.2 ..Gradated flow area, heat capacity or heat resistance
9.3 ..Having gas supply or exhaust manifold structure
9.4 ..In casing
10 .Heat collector
11.1 **WITH ALARM, INDICATOR, SIGNAL, REGISTER, RECORDER, TEST OR INSPECTION MEANS**
11.2 .Remotely controlled inspection means
200 **WITH TIMER, PROGRAMMER, TIME DELAY, OR CONDITION RESPONSIVE CONTROL**
201 .Having heating and cooling capability
202 ..Vehicle installation
203 ...Plural temperature regulators for plural zones
204 ...Flow control of chest, foot, or defrost air in vehicle
205 ..Plural temperature regulators for plural zones
206 ...Nonbuilding system (e.g., machine tool, chemical analyzer, etc.)
207 ...Refrigeration system having an evaporator or condenser in each zone
208 ...Central system prioritizes heating and cooling requests from zones
209 ...Supervisory central control means overrides zone controller
210 ...Heat balancing using waste heat or cold (e.g., heat reclaim, etc.)
211 ...Different conditioning means for perimeter zone and core zone
212 ...Central temperature conditioned air supplied to each zone
213 ....Mixing within zone of recirculated zone air and supply air adjacent zone air inlet (e.g., induction unit, etc.)
214 .....Including a fan (e.g., fancoil unit, etc.)
215 ....Reheat adjacent zone air inlet
216 ....Mixing of separate centrally supplied hot and cold stream before discharge into each zone (e.g., dual-duct, etc.)
217 ....Volume flow of discharged air at discharge into zone modulated by zone heating or cooling load (e.g., variable air volume, etc.)
218 ...Central temperature conditioned liquid supplied to each zone
219 ....Separate supply and return mains (e.g., two pipe system, etc.)
220 .....Additional supply main (e.g., three pipe system, etc.)
221 ......Additional return main (e.g., four pipe system, etc.)
222 ..Humidity control
223 ...Humidity sensor measures humidity of air in conditioned space
224 ....Additional humidity sensor (e.g., located outside of conditioned space, etc.)
225 ....Humidity sensor controls indirect-contact cooling means
226 .....Liquid spray onto indirect-contact cooling means
227 .....Air bypass of indirect-contact cooling means
228 .....Reheat of cooled air downstream of indirect-contact cooling means
229 ....Humidity sensor controls humidifier
230 ...Dewpoint controlled (e.g., control of cooling means by downstream temperature sensor to maintain controlled dewpoint of downstream air, etc.)

231 ..Congealed material (e.g., frost, etc.) or condensation removal or prevention
232 ...Operated by timer or programmer
233 ...Operated by temperature sensor
234 ..Control of static pressure of conditioned space
235 ...Space is within aircraft
236 ..Control of heat storage
237 ..Means responsive to occupancy of space
238 ..Means storing set point for particular time of day (e.g., clock thermostat, etc.)
239 ...Means to compute time required to reach certain temperature by certain time of day (e.g., morning warm-up, etc.)
240 ..Heat pump and supplemental heat source
241 ...Change-over from heat pump operation to supplemental heat source operation alone
242 ....Responsive to outdoor temperature
243 ..Means to reset supply air temperature or supply water temperature as function of heat load
244 ..Means to control fan or pump to regulate supply air flow or supply water flow
245 ...Low flow during heating and high flow during cooling
246 ...Responsive to pressure
247 ...Responsive to temperature
248 ..Flow of air from outdoors controlled (e.g., minimum outside air, etc.)
249 ...Proportion of outdoor air and return air controlled
250 ....Outdoor air used in lieu of operating heating or cooling means (e.g., economy cycle, etc.)
251 .....Enthalpy sensor
252 ...Pre-heat or pre-cool of outdoor air before mixing with returned air
253 ..Temperature sensor controlling temperature
254 ...System selects heating or cooling mode automatically (e.g., responsive to season, ambient light, temperature in conditioned area, etc.)
255 ....Dead band between heating and cooling
256 ....Variable rate of heating or cooling (e.g., plural stages, etc.)
257 ....Room and ambient temperature sensors
258 ....Separate heating and cooling thermostats
259 ....Single temperature sensing means
260 ...Variable rate of heating or cooling (e.g., plural stages, etc.)
261 ....Sequentially activated heat sources or cool sources
262 .....Timer
263 ...Area receives conditioning from simultaneously operated heating and cooling means (e.g., opposed and compensating heating and cooling, etc.)
264 ....Simultaneous heating and cooling only in limited range around set point temperature
265 ...Manual changeover between heating and cooling modes (e.g., manual override, etc.)
266 .Pre-heat or pre-cool of space or device during start-up
267 .Means to heat or cool for predetermined periods of time (e.g., duty cycle, time-temperature profiler, etc.)
268 ..Predetermined time variable set point
269 ..Duty cycle (e.g., pulse duration or pulse frequency modulation, etc.)
270 .Time delay
271 .Vehicle or engine speed responsive
272 .Control of heat pipe heat transfer characteristics
273 ..Control of quantity of inert gas

274 ..Control of vapor or liquid flow between evaporator and condenser sections (e.g., by variable restrictions, check valves, etc.)
275 .Control of amount of conductive gas in confined space between heat source and heat sink
276 .Control of variable thermal conductivity systems (e.g., heat valves, etc.)
277 ..Solid heat transfer path
278 .Vent of system (e.g., overpressure, overtemperature, removal of noncondensable, etc.)
279 .Pressure and temperature responsive or control
280 ..Bypass of heat exchanger responsive to both temperature and pressure
281 .Fluid pressure responsive or control
282 ..Branched flow of heat exchange material
283 ...Bypass of heat exchanger
284 ....Differential pressure operated bypass
285 ..Flow of one heat exchange material controlled by the pressure of another
286 ..Flow of one heat exchange material controlled by its own pressure
287 .Temperature responsive or control
288 ..Plural temperature sensors
289 ...Means to maintain a constant temperature difference between a measured temperature and a controlled temperature
290 ...Temperature sensor within or near an area to be conditioned, another tempeerature sensor near the conditioning equipment (e.g., shallow/deep, etc.)
291 ...Temperature sensor inside conditioned space, another temperature sensor outdoor (e.g., indoor set point adjusted by outdoor conditions, etc.)
292 ...Temperature sensor in treated fluid, another temperature sensor in treating fluid
293 ...Temperature sensor prior to heat exchanger and one after
294 ...Branched flow of heat exchange material
295 ..Including mass flow sensor
296 ..Branched flow of heat exchange material
297 ...Bypass of heat exchanger
298 ....Mixture temperature sensing
299 ..Flow of one heat exchange material controlled by temperature of another
300 ..Flow of one heat exchange material controlled by its own temperature
301 .Liquid-level responsive or control means
302 ..Condenser or evaporator
303 .Cleaning
41 **WITH VEHICLE FEATURE**
42 .Heating and cooling
43 ..Vehicle contained common power and heat supply
44 .Utilizing motion of vehicle
45 **GEOGRAPHICAL**
46 **FLEXIBLE ENVELOPE OR COVER TYPE**
47 **STRUCTURAL INSTALLATION**
48.1 .Heating and cooling
48.2 ..Solar
49 ..Radiant building panel
50 ..Room heat exchangers with central fluid supply
51 .Engine
52 ..Exchange between engine supply and exhaust lines
53 .Related to wall, floor or ceiling structure of a chamber
54 ..In a chamber connected passage traversing the structure
55 ..Projecting shield forms passage with the structure
56 ..Hollow or recess in the structure connected for exchange fluid flow
57 ...Ported to the chamber
58 **HEATING AND COOLING**
59 .With ventilation
60 .Gas-liquid contactor
61 .Heating and cooling of the same material
62 ..Refrigerating system conversion
63 ..Refrigeration producer
64 ..Heat generator
65 ..Heater and cooler serially arranged

66 ...Heat exchange between supply and exhaust lines
67 **WITH EXTERNAL SUPPORT**
68 .Legs
69 **RESILIENT VIBRATION DAMPER ISOLATING EXCHANGER ELEMENT**
70 **WITH LEAKAGE COLLECTOR**
71 **WITH PURGE, OR DRAINAGE, COCK OR PLUG**
72 **COVERED ACCESS OPENING**
73 .Cover is, or carries, heat exchanging means
74 ..Heat exchanging means projects into the covered chamber
75 .Heating or cooling means within the covered chamber
76 **WITH REPAIR OR ASSEMBLY MEANS**
77 .Hinge
78 .Guide
79 .Positioner or retainer for settable material
80.1 **WITH RETAINER FOR REMOVABLE ARTICLE**
80.2 .Electrical component
80.3 ..Air cooled, including fins
80.4 ..Liquid cooled
80.5 .Including liquid heat exchange medium
81 **EXPANSION AND CONTRACTION RELIEVING OR ABSORBING MEANS**
82 .Relieving or absorbing means supports temperature modifier in heat exchanger
83 ..Flexible fluid confining wall
84 **WITH MEANS FLEXING, JARRING OR VIBRATING HEAT EXCHANGE SURFACE**
85 **AGITATOR OR IMPELLER MOTOR OPERATED BY EXCHANGE FLUID**
86 **MOVABLE HEATING OR COOLING SURFACE**
87 .Hollow screw type impeller
88 .Rotor carrying separate chambers for two exchanging fluents
89 .Rotary drum
90 ..With means applying fluids for exchange through drum wall
91 ...With drum surface scraper
92 .Hollow strirrer or scraper
93 ..Material advancer in shelf to shelf device
94 **WITH SCRAPER REMOVING PRODUCT FROM TEMPERATURE MODIFYING SURFACE**
95 **WITH CLEANING MEANS FOR HEAT EXCHANGER**
96 **WITH ADJUSTOR FOR HEAT, OR EXCHANGE MATERIAL, FLOW**
97 .Flow reversed or crossed within temperature modifying zone
98 .Adjustable radiator face covering means
99 ..Discharge grille or diffuser
100 .Branched flow
101 ..Controls flow through parallel heating or cooling means
102 ..Tortuous and straight through branches within heating or cooling drum
103 ..By pass of heating or cooling means
104.11 **INTERMEDIATE FLUENT HEAT EXCHANGE MATERIAL RECEIVING AND DISCHARGING HEAT**
104.12 .Reversible chemical reaction
104.13 .Plural intermediate fluent heat exchange materials
104.14 ..Always out of direct contact with each other
104.15 .Solid fluent heat exchange material
104.16 ..Fluidized bed
104.17 ..Utilizing change of state
104.18 ..Including means to move heat exchange material
104.19 .Liquid fluent heat exchange material
104.21 ..Utilizing change of state
104.22 ...Including means to move heat exchange material in liquid state
104.23 ....By direct application of electrical energy to heat exchange material
104.24 ....By application of heat other than in heat receiving area
104.25 ....By application of mechanical energy
104.26 ...Utilizing capillary attraction
104.27 ...With pressurizing means or degassifying means
104.28 ..Including means to move heat exchange material
104.29 ...Utilizing formed bubble
104.31 ...By application of mechanical energy
104.32 ..With pressurizing means or degassifying means
104.33 ..Cooling electrical device

104.34 .Including means to move gaseous heat exchange material
108 **RECIRCULATION**
109.1 **WITH AGITATING OR STIRRING STRUCTURE**
110 **WITH FIRST FLUID HOLDER OR COLLECTOR OPEN TO SECOND FLUID**
111 .Separate external discharge port for each fluid
112 ..With downstream pressure or temperature modifier
113 ...Surface-type heat exchanger
114 ..With baffle at inlet to less dense fluid discharge port
115 .Trickler
116 ..Shelf to shelf
117 ..Pipe exterior to pipe exterior
118 ..Vertical cone or drum
119 **WITH SOLIDS SEPARATOR FOR EXCHANGE FLUID**
120 **WITH IMPELLER OR CONVEYOR MOVING EXCHANGE MATERIAL**
121 .Mechanical gas pump
122 ..Heating or cooling means and gas pump in housing
123 ...With injector-type gas pump
124 ...Verging gas flow
125 ....Radial flow through annular heating or cooling means
126 ....Single inlet, plural outlets
127 .....Gas pump for each outlet stream
128 **THERMOSYPHONIC FLUE TYPE**
129 .Heating or cooling means within distinct flue forming enclosure
130 .Flue formed between facing second fluid containing conduits
131 .Flues formed by vertical corrugations of heat transmitter
132 **HEATING OR COOLING MEANS IN OPEN COMMUNICATION WITH RESERVOIR**
133 **WITH COATED, ROUGHENED OR POLISHED SURFACE**
134.1 **WITH PROTECTOR OR PROTECTIVE AGENT**
135 **WITH THERMAL OR ACOUSTICAL BLOCKER**
136 .Insulation and temperature modifier within barrier member
137 **CONVERTIBLE**
138 **COMBINED**
139 **INTERNALLY BRANCHED FLOW, EXTERNALLY PORTED**
140 **THREE NON-COMMUNICATING FLUIDS**
141 .Concentric flow chambers
142 **SPUR TUBE PROJECTS INTO ENCLOSURE**
143 **PLURAL CASING-CONDUIT UNITS, LINE OR COMMON HEADER CONNECTED**
144 **LINE CONNECTED CONDUIT ASSEMBLIES**
145 .In common casing
146 **GRADATED HEAT TRANSFER STRUCTURE**
147 .Tapered conduit means
148 **RADIATOR CORE TYPE**
149 .With edge cover or frame means
150 .Serially connected tube sections
151 .Side-by-side tubes traversing fin means
152 .Deformed sheet forms passages between side-by-side tube means
153 ..With tube manifold
154 **NON-COMMUNICATING COAXIAL ENCLOSURES**
155 .With communicating coaxial enclosure
156 .Helical conduit means
157 **CASING OR TANK ENCLOSED CONDUIT ASSEMBLY**
158 .Manifold formed by casing section and tube sheet of assembly
159 .With distinct flow director in casing
160 ..Longitudinal
161 ...Additional transverse baffle
162 .With support in casing
163 .Conduit coiled within casing
164 **FLOW PASSAGES FOR TWO CONFINED FLUIDS**
165 .Interdigitated plural first and plural second fluid passages
166 ..Stacked plates or shells form interplate passages
167 ...With plate traversing passages interconnecting alternate spaces
168 **CONDUIT WITHIN, OR CONFORMING TO, PANEL OR WALL STRUCTURE**
169 .Wall forms enclosure
170 .Opposed plates or shells
171 .Means spanning side-by-side tube elements
172 **SIDE-BY-SIDE TUBULAR STRUCTURES OR TUBE SECTIONS**
173 .With manifold type header or header plate

174 ..With internal flow director
175 ..Inlet and outlet header means
176 ...Side by side
177 **TUBULAR STRUCTURE**
178 .With support or flow connector
179 .Projecting internal and external heat transfer means
180 .Diverse materials
181 .With discrete heat transfer means
182 ..With means spacing fins on structure
183 ..Longitudinal extending
184 ...Helical
185 **HEAT TRANSMITTER**
186 **MISCELLANEOUS**

CROSS-REFERENCE ART COLLECTIONS

900 **COOLING TOWERS**
901 **HEAT SAVERS**
902 **HEAT STORAGE**
903 **CONVECTION**
904 **RADIATION**
905 **MATERIALS OF MANUFACTURE**
906 **REINFORCEMENT**
907 **POROUS**
908 **FLUID JETS**
909 **REGENERATION**
910 **TUBE PATTERN**
911 **VAPORIZATION**
912 **COMBINED OR CONVERTIBLE HEAT EXCHANGE MODES**
913 **CONDENSATION**
914 **FILMING**
915 **FOAMING**
916 **OIL COOLER**
917 **PRESSURIZATION AND/OR DEGASSIFICATION**
918 **HEATED AND COOLED FOOD CABINETS AND/OR TRAYS**
919 .Wheeled
920 **PARTICULATE HEAT EXCHANGE**
921 **DEW POINT**

FOREIGN ART COLLECTIONS

FOR 000 **CLASS-RELATED FOREIGN DOCUMENTS**

Any foreign patents or non-patent literature from subclasses that have been reclassified have been transferred directly to FOR Collections listed below. These Collections contain ONLY foreign patents or non-patent literature. The parenthetical references in the Collection titles refer to the abolished subclasses from which these Collections were derived.

FOR 100 **PROCESS (165/1)**
FOR 101 .Heating and cooling (165/2)
FOR 102 ..Humidity adjusting (165/3)
FOR 103 **TIME OR PROGRAM ACTUATOR (165/12)**
FOR 104 **AUTOMATIC CONTROL (165/13)**
FOR 105 .Heating and cooling (165/14)
FOR 106 ..With cabin pressure control (165/15)
FOR 107 ..With ventilation control (165/16)
FOR 108 ..Defrosting (165/17)
FOR 109 ..With control of heat storage (165/18)
FOR 110 ..With gas and liquid contact fluid flow control (165/19)
FOR 111 ...By humidity sensor (165/20)
FOR 112 ..With humidity sensor controlling humidity (165/21)
FOR 113 ..Correlation of plural zone controls and central system control (165/22)
FOR 114 ..Responsive to vehicle body motion (165/23)
FOR 115 ..With manual control (165/124)
FOR 116 ...Manual selector modifies automatic control (165/25)
FOR 117 ..Single sensor controls both heating and cooling (165/26)
FOR 118 ..Selective heating or cooling (165/27)
FOR 119 ...Room and ambient temperature sensors (165/28)
FOR 120 ..Heat pump with supplemental heat (165/29)
FOR 121 ..Opposed compensating heating and cooling (165/30)
FOR 122 ..Pressure response or control (165/31)
FOR 123 .Temperature or pressure (165/32)
FOR 124 ..With correlated manual actuation (165/33)
FOR 125 ..Branched flow of exchanging fluid (165/34)

FOR 126 ...By-pass of heat exchanger (165/35)
FOR 127 ....Mixture temperature sensing (165/36)
FOR 128 .....With pressure response (165/37)
FOR 129 ....Pressure controlled (165/38)
FOR 130 ..Flow of one heat exchanging material controlled by the condition of another (165/39)
FOR 131 ..Flow of heat exchanging material controlled by its own condition (165/40)

DIGESTS

DIG 1 **WITH ALARM, INDICATOR, RECORDER, TEST, OR INSPECTION MEANS**
DIG 2 .Energy, efficiency, performance or malfunction
DIG 3 .Remote control inspection means
DIG 4 .Sight glass
DIG 5 .Fluid level or amount
DIG 6 .Temperature
DIG 7 .Flow or valve position
DIG 8 .Leakage
DIG 9 **HAVING A SOLID HEAT STORAGE MASS FOR ABSORBING HEAT FROM ONE FLUID AND RELEASING IT TO ANOTHER (I.E. REGENERATOR)**
DIG 10 .Cleaning storage mass
DIG 11 ..Reciprocating cleaner device (e.g. scraper, sprayer)
DIG 12 ..Spray nozzle cleaner
DIG 13 .Movable heat storage mass with enclosure
DIG 14 ..Reciprocated linearly
DIG 15 ..With pump
DIG 16 ..Rotary storage mass
DIG 17 ...With thermal expansion compensating means
DIG 18 ...Having means controlling direction or rate of flow
DIG 19 ....Plate type shutter associated with face of storage mass
DIG 20 ...Seal and seal-engaging surface are relatively movable
DIG 21 ....Seal engaging a face of cylindrical heat storage mass
DIG 22 .....Seal defining sector-shaped flow area
DIG 23 .....Brush-type seal
DIG 24 ....Circumferential seal
DIG 25 ....Heat resistant material seal
DIG 26 ...Seal attached to and rotating with storage mass
DIG 27 ...With particular rotary bearing or drive means
DIG 28 ....Ring gear surrounding cylindrical storage mass
DIG 29 ...Cylindrical storage mass with axial flow passages
DIG 30 .Mass formed of modules arranged in three dimensional matrix ("Checkerwork")
DIG 31 ..Gradated flow area, heat capacity or conductivity
DIG 32 ..Having gas supply or exhaust manifold structure
DIG 33 ...With flow control device (i.e. valve)
DIG 34 ...With flow distributing baffle
DIG 35 ..In casing
DIG 36 ..Distinct passages formed in individual modules
DIG 37 .Having flow diverting means (e.g. valve) to selectively control flow through storage mass
DIG 38 ..Correlated control of plural diverting means
DIG 39 ...Synchronously rotated flow guiding hoods disposed on opposite sides of fixed regenerator
DIG 40 ...Linearly movable diverting means
DIG 41 ..Rotary diverting means
DIG 42 .Particular structure of heat storage mass
DIG 43 ..Element for constructing regenerator rotor
DIG 44 **HAVING FLEXIBLE HEAT EXCHANGE SURFACE CONFORMING TO A SOLID STRUCTURE (E.G., APPLICATOR, ETC.)**
DIG 45 .Conform to head, neck, or face
DIG 46 .Heat exchange body suit
DIG 47 .For cooling
DIG 48 ..Electrical component
DIG 49 ..Or for heating
DIG 50 ...Including a pump or valve
DIG 51 **HAVING EXPANSION AND CONTRACTION RELIEVING OR ABSORBING MEANS**
DIG 52 .For cylindrical heat exchanger
DIG 53 ..Flexible or movable header or header element

DIG 54 ...Movable header (e.g., floating header, etc.)
DIG 55 ....Including guiding means for movable header
DIG 56 .....Fluid sealing means between movable header and enclosure
DIG 57 ...Flexing tubesheet
DIG 58 ...Movable tubesheet (e.g., floating tubesheet, etc.)
DIG 59 ....Tubesheet connected to enclosure by expansion joint
DIG 60 ..Expandable casing for cylindrical heat exchanger
DIG 61 ...For plural cylindrical heat exchangers
DIG 62 ...Having particular external casing support means
DIG 63 ..Cylindrical heat exchanger fixed to fixed end supports
DIG 64 ...Including intermediate support
DIG 65 ...Bent cylindrical heat exchanger
DIG 66 ....Coiled
DIG 67 ..Cylindrical heat exchanger rectilinearly slidable relative to its support
DIG 68 ...Including fluid seal
DIG 69 ..Pivotal support for cylindrical heat exchanger
DIG 70 ..Resilient fluid seal
DIG 71 .Resilient fluid seal for plate-type heat exchanger
DIG 72 **AGITATOR OR IMPELLER MOTOR OPERATED BY FIRST HEAT EXCHANGE FLUID**
DIG 73 .To agitate or move second heat exchange fluid
DIG 74 ..Agitator structure confines first heat exchange fluid
DIG 75 ..Agitator structure confines second heat exchange fluid
DIG 76 **WITH SCRAPER FOR REMOVING PRODUCT FROM HEAT TRANSFER SURFACE**
DIG 77 .Screw shaped scraper
DIG 78 .Linearly operated scraper
DIG 79 ..Reciprocated linearly
DIG 80 .Plural scrapers for spaced shelves or chambers
DIG 81 .Rotary heat exchange scraper or scraper for rotary heat exchange surface
DIG 82 ..Grooved drum surface
DIG 83 ..Scraper attached to or formed part of rotary heat exchange fluid surface
DIG 84 ..Scraper within annular space formed by concentric cylinders or concentric conical surfaces
DIG 85 ..Scraper for cleaning inner surface of rotary heat exchange surface
DIG 86 ..Weight operated scraper
DIG 87 ..Spring pressed scraper
DIG 88 ..Adjustable scraper
DIG 89 ..For scraping flat horizontal surface
DIG 90 ..Scraper blade movable relative to scraper blade support (e.g., pivoting blade, rocking blade, etc.)
DIG 91 ..For scraping wall of cylindrical heat exchanger
DIG 92 **WITH VALVE OR MOVABLE DEFLECTOR FOR HEAT EXCHANGE FLUID FLOW**
DIG 93 .Adjustable radiator face covering means (e.g., adjustable shield for car radiator, heater core, etc.)
DIG 94 ..Windowshade type (i.e. sheet feeds off roller)
DIG 95 ..Rectilinear sliding movement of adjustable cover
DIG 96 ..Pivotal movement of adjustable cover
DIG 97 ...Plural parallel pivotable shutters
DIG 98 ....One shutter section having different flow area or flow direction with another shutter section
DIG 99 ....With fan
DIG 100 .Flow direction reversed through heat exchanger
DIG 101 .For controlling supply of heat exchange fluid flowing between hydraulically independent heat exchange sections
DIG 102 ..Hydraulically independent single-confined-fluid radiator sections for heating ambient air
DIG 103 ...Valves each controls a radiator section
DIG 104 ..Hydraulically independent heat exchange sections connected in parallel
DIG 105 ...Correlated valves
DIG 106 ...Valves each controls a heat exchange section

DIG 107 ....Hydraulically independent heat exchange tubes disposed in housing (e.g., tank, casing, etc.)
DIG 108 .....Coiled tubes
DIG 109 .With by-pass of heat exchanger or heat exchanger section
DIG 110 ..Bypass within or surrounds heat exchanger
DIG 111 ...Heat exchanger enclosing a fluid conduit confining second heat exchange fluid
DIG 112 ....Stove pipe drum having air draft passage for heating ambient air
DIG 113 ...Bypass centrally located in heat exchanger
DIG 114 ....Having perforated wall
DIG 115 ....Surrounding by a helical flow channel
DIG 116 ....Plural adjacent flow channel parallel to central bypass
DIG 117 .....Arranged for series flow therethrough
DIG 118 ...Serpentine heat exchange flow path
DIG 119 ...Bypass controlled by pivotal damper
DIG 120 ..U or serpentine heat exchange flow path
DIG 121 ...Serpentine heat exchange flow path
DIG 122 ...U heat exchange flow path and linear bypass
DIG 123 .Heat exchange flow path through heat exchanger altered (e.g., crossed, etc.)
DIG 124 ..Stove pipe drum
DIG 125 ...Valve mounted on fixed deflector
DIG 126 .Total flow rate through heat exchanger controlled by valve
DIG 127 ..Stove pipe drum
DIG 128 ...Including air draft passage for heating ambient air
DIG 129 ..Valve regulates flow through housing enclosing heat exchanger
DIG 130 ...Including valve regulating flow through heat exchanger
DIG 131 ..Single-confined-fluid radiator for heating ambient air
DIG 132 **WITH ADJUSTOR FOR HEAT FLOW**
DIG 133 .Conduction rate
DIG 134 ..By varying thickness of conductive layer (e.g., air gap, etc.)
DIG 135 **MOVABLE HEAT EXCHANGER**
DIG 136 .Movable belt or strip transfers heat to or from objects or material thereon
DIG 137 .Unconstrained movement (e.g., float, etc.)
DIG 138 .Partially rotable (e.g, rocking, pivoting, oscillation, tilting, etc.)
DIG 139 .Fully rotatable
DIG 140 ..Rotating heat exchanger having rotating flow confining structures or chambers for two separate heat exchange fluids
DIG 141 ...Concentric flow confining structures or chambers
DIG 142 ....Jacketed shell
DIG 143 ...Discrete tubing having length extending along a longitudinal axis of rotating heat exchanger
DIG 144 ....Helical
DIG 145 ..Radially extending hollow arm on rotating shaft traverses furnance shelf (e.g., rabble arm, etc.)
DIG 146 ...Angled blade suspended from arm for advancing material
DIG 147 ..Fluid impeller or material advancer
DIG 148 ...Auger
DIG 149 ....Having hollow blade
DIG 150 ...Radial or axial impeller
DIG 151 ....Having hollow blade
DIG 152 ..Rotating agitator
DIG 153 ...Flow space or fluid chamber defined between two relatively movable, closely spaced coextensive surfaces
DIG 154 ...Hollow tubing rotates in vessel to stir contents
DIG 155 ....Tubing has radially or axially extending sections
DIG 156 ..Hollow cylindrical member (e.g., drum, etc.)
DIG 157 ...Fluid sprayed onto surface of rotatable cylinder
DIG 158 ...Having stationary material removal means
DIG 159 ...With particular flow path or defined fluid chamber (e.g., annulus, spiral, etc.)

DIG 160 ....Concentric shells define annular flow space
DIG 161 .....With means defining particular flow path (e.g., baffle, etc.)
DIG 162 **ONLY DIRECT-CONTACT HEAT EXCHANGE BETWEEN TWO SEPARATELY SUPPLIED FLUIDS**
DIG 163 **INCLUDING A MEANS TO FORM FLUID FILM ON HEAT TRANSFER SURFACE (E.G., TRICKLE)**
DIG 164 .Film flow constrained to spiral path
DIG 165 .Film formed on spirally coiled member
DIG 166 .Vertically spaced pipe sections contact liquid in underlying troughs
DIG 167 .Liquid film flows sequentially along upper surfaces of vertically spaced trays (i.e. shelf-to-shelf)
DIG 168 .Film formed on interior surface of container or pipe
DIG 169 ..Inside of vertical pipe
DIG 170 ...Distributor "cap" mounted in top end of pipe
DIG 171 .Including means at top end of vertical pipe to distribute liquid film on pipe exterior
DIG 172 .Film flows along exterior of plural pipe sections
DIG 173 ..Pipe exterior surfaces about to form continuous surface
DIG 174 ..Intervening members extend between spaced pipe sections to form continuous surface
DIG 175 ..Horizontally extending, parallel sections disposed in vertical array (i.e. one pipe directly above another)
DIG 176 ...With means suspended beneath pipe surface to guide liquid droplets
DIG 177 .Film flows along upper surface of tray
DIG 178 ..Parallel corrugated vertical sheets formed fluid passage therebetween
DIG 179 ..Container enclosed by casing
DIG 180 ..Vertically disposable elongated member
DIG 181 ..Horizontally disposable elongated member
DIG 182 **INDIRECT-CONTACT COOLING TOWER**
DIG 183 **INDIRECT-CONTACT EVAPORATOR**
DIG 184 **INDIRECT-CONTACT CONDENSER**
DIG 185 .Having stacked plates forming flow channel therebetween
DIG 186 ..Stacked plates surrounded by housing confining another fluid
DIG 187 .Having pump downstream of condenser
DIG 188 ..Pump to remove only uncondensed vapor or air
DIG 189 ...From a first-stage direct-contact condenser
DIG 190 ...Including second-stage indirect-contact condenser
DIG 191 ...Including second-stage direct-contact condenser
DIG 192 .Including means to heat collected condensate
DIG 193 .First-stage condenser serially connected to second-stage condenser
DIG 194 ..First stage direct-contact condenser
DIG 195 .Including condensate collecting tray connected to condensate drain conduit to divert condensate around a section of heat transfer surface
DIG 196 .Baffle defines flow passage within header for condensate to bypass portion of vapor flow path
DIG 197 .Including means for (removing) condensate (from vapor flow path) to bypass portion of vapor flow path
DIG 198 .Condensate guiding means attached to heat transfer surface
DIG 199 ..Heat transfer tube surrounds by jacket condensate guiding means
DIG 200 ..Condensate guiding means forms inside heat transfer tube
DIG 201 ..Including fin member associated with condensate guiding means
DIG 202 .Vapor flow passage between vapor inlet and outlet has decreasing cross- sectional area
DIG 203 ..Coolant tubes arranged in groups to form vapor flow lanes of decreasing cross-sectional area

DIG 204 .Including a direct-contact heat exchange chamber
DIG 205 .Space for condensable vapor surrounds space for coolant
DIG 206 ..Including coiled heat exchange tube
DIG 207 ..Distinct outlets for separated condensate and gas
DIG 208 ...Including vapor guide plate extending across vapor inlet
DIG 209 ...Including tube banks arranged in undulating pattern (e.g., w shape)
DIG 210 ...Including perforated baffle completely surrounding a group of coolant tube
DIG 211 ...Including concave member adjacent to vapor outlet and partially covering a group of coolant tubes
DIG 212 ...Including inclined flat condensate guiding means
DIG 213 ...Including baffle partially covering a group of coolant tubes
DIG 214 ...Including baffle structure for reversing flow direction of vapor
DIG 215 ..Having longitudinal partition extending parallel to longitudinal axis of coolant tube
DIG 216 ..Having partition transverse to longitudinal axis of coolant tube
DIG 217 .Space for coolant surrounds space for vapor
DIG 218 ..Condensor adapted to cover opening at top of vapor generator
DIG 219 ...Radiator cap condenser
DIG 220 ..U-shaped or spur tubes connected to adjacent inlet and outlet headers
DIG 221 ..Vapor is the only confined fluid
DIG 222 ...Plural parallel tubes confining vapor connecting between spaced headers
DIG 223 ..Vapor tube enclosed by coolant confining shell
DIG 224 **INCLUDING A MEANS TO FORM A FLUID JET**
DIG 225 **WITH SOLID CONVEYOR**
DIG 226 .Screw conveyor
DIG 227 .Belt conveyor
DIG 228 **WITH FAN OR PUMP**
DIG 229 .Screw conveyor in pipe or tank
DIG 300 .Injector-type pump
DIG 301 ..Having nested nozzles
DIG 302 .Rotary gas pump
DIG 303 ..Annular heat exchanger
DIG 304 ...Axial impeller
DIG 305 ....Located at heat-exchange housing inlet
DIG 306 ....Located at heat-exchange housing outlet
DIG 307 ..Including plural impellers
DIG 308 ...Coaxial impellers
DIG 309 ....Radial impeller
DIG 310 ..Heat exchanger located at housing inlet or outlet
DIG 311 ..Including particular flow deflector (e.g., shroud, diffuser, etc.)
DIG 312 ...Plural parallel deflectors
DIG 313 ...Deflector with curved surface
DIG 314 ..Radial impeller
DIG 315 ...Located at heat-exchange housing inlet
DIG 316 ..Axial impeller located at heat-exchange housing inlet
DIG 317 ..Axial impeller located at heat-exchange housing outlet
DIG 318 **WITH DRIVEN AGITATOR**
DIG 319 .Linearly moving agitator
DIG 320 .Fully rotary agitator
DIG 321 ..Generating toroidal flow
DIG 322 ..Including heat exchange jacket-walls
DIG 323 ...Heating or cooling coil disposed between jacket-walls
DIG 324 ...Agitator having blade sections mounted along rotating shaft
DIG 325 ..Blade sections mounted along rotating shaft
DIG 326 ..Agitator and heating or cooling coil disposed in same housing
DIG 327 **THERMOSYPHONIC HAVING VERTICAL AIR DRAFT PASSAGE**
DIG 328 .Air draft passage confined entirely or in part by fin structure
DIG 329 ..Corrugated fin attached to heat transfer surface
DIG 330 ..Air draft passage is parallel to flow direction of heating or cooling means

DIG 331 .Air draft passage confined entirely by heat transfer surface
DIG 332 ..Coaxial ducts define air draft passage and annular passage for heat exchange fluid
DIG 333 ...Including baffle
DIG 334 ....Baffle located in annular passage
DIG 335 ..Plural air draft passages enclosed by casing
DIG 336 ...Angled air draft passage
DIG 337 .Heating or cooling means entirely surrounded by air draft passage forming casing
DIG 338 ..Nested or concentric members define annular air draft passage and heating or cooling conduit
DIG 339 ...With baffle
DIG 340 ..Including flow baffle in casing
DIG 341 ..Parallel heating or cooling tubes or tubular sections (e.g., coil, serpentine, etc.)
DIG 342 **TANK WITH HEAT EXCHANGER**
DIG 343 .Heat exchanger forms all or portion of tank
DIG 344 ..Spiral coil forms hemispherical vessel
DIG 345 ..Jacketed vessel
DIG 346 ...Flow baffle or fin in annular flow space
DIG 347 .Heat exchanger forms cover for tank
DIG 348 .Heat exchanger within tank
DIG 349 ..Supported by cover for tank
DIG 350 ..Tubing removably coupled to inlet and outlet at tank wall
DIG 351 ..Spaced from tank wall
DIG 352 ..Flow directing baffle associated with heat exchanger tubing
DIG 353 .Tube coil bonded directly to tank exterior
DIG 354 .Heat exchanger serially connected to tank
DIG 355 **HAVING SEPARATE FLOW PASSAGE FOR TWO DISTINCT FLUIDS**
DIG 356 .Plural plates forming a stack providing flow passages therein
DIG 357 ..Forming annular heat exchanger
DIG 358 ...Radially arranged plates
DIG 359 ..Including means for modifying thermal stress in heat exchange plate
DIG 360 ..Stacked plates having plurality of perforations
DIG 361 ..Circular flow passages between plates
DIG 362 ..Heat exchange liquids separated by double walls
DIG 363 ..Slotted plates forming grid
DIG 364 ..With fluid traversing passages formed through the plate
DIG 365 ...Including peripheral seal element forming flow channel bounded by seal and heat exchange plates
DIG 366 ....Rigid or semi-rigid peripheral seal frame
DIG 367 ....Peripheral seal element between corrugated heat exchange plates
DIG 368 .....Including angled corrugations with respect to flow direction
DIG 369 ....Including seal to plate attachment means
DIG 370 ...Unitary heat exchange plate and projecting edge
DIG 371 ...Including mating flanges around fluid traversing passage
DIG 372 ...Adjacent heat exchange plates having joined bent edge flanges for forming flow channels therebetween
DIG 373 ..Adjacent heat exchange plates having joined bent edge flanges for forming flow channels therebetween
DIG 374 ...Liquid to air heat exchanger having liquid passage formed by joined sheets
DIG 375 ....Transverse air tubes
DIG 376 ....Air passages defined by spacing projections of sheets
DIG 377 .....Spacing projections formed by folded sheet portions
DIG 378 ......Including intermediate sheet supporting opposed spacing projections
DIG 379 ....Including corrugated air fin passages between adjacent liquid passages

DIG 380 .....Air fin conforms to joined corrugated sheets forming plural liquid chambers
DIG 381 .....Including air fin apertures
DIG 382 ...Overlapping flanges
DIG 383 ...Interlocking flanges
DIG 384 ...Thermally bonded side edges
DIG 385 ..Bent sheet forming a single tube
DIG 386 ...To form only air passages
DIG 387 ..Including side-edge seal or edge spacer bar
DIG 388 ...Including spacer bar transverse to plate stack
DIG 389 ...Flow enhancer integral with side-edge seal or edge spacer bar
DIG 390 ...Flange element to connect two adjacent heat exchange plates
DIG 391 ...Including intermediate corrugated element
DIG 392 ...Unitary heat exchange plate and projecting edge
DIG 393 ..Including additional element between heat exchange plates
DIG 394 ...Corrugated heat exchange plate
DIG 395 .Monolithic core having flow passages for two different fluids (e.g., one- piece ceramic, etc.)
DIG 396 ..Plurality of stacked monolithic cores
DIG 397 ..Including conduits embedded in monolithic block
DIG 398 .Spirally bent heat exchange plate
DIG 399 .Corrugated heat exchange plate
DIG 400 .Shell enclosed conduit assembly
DIG 401 ..Including tube support or shell-side flow director
DIG 402 ...Manifold for shell-side fluid
DIG 403 ...Preheater for shell-side fluid for preventing thermal shock to tube sheet
DIG 404 ...Serially connected separate shells
DIG 405 ...Extending in a longitudinal direction
DIG 406 ....Helically or spirally shaped
DIG 407 ....Internal casing or tube sleeve
DIG 408 .....Tube sleeve
DIG 409 .....Including transverse element (e.g., fin, baffle, etc.)
DIG 410 ......Movable internal casing connecting to transverse element
DIG 411 ....Connecting to shell by specific structure
DIG 412 ....Including transverse element (e.g., fin, baffle, etc.)
DIG 413 ....For directing flow along the length of tube
DIG 414 ....For supporting coil tubes
DIG 415 ....Including perforations
DIG 416 ...Extending transverse of shell (e.g., fin, baffle, etc.)
DIG 417 ....Including spacer or support for transverse tube support or shell-side flow director
DIG 418 .....Tubular spacer sleeve
DIG 419 .....Spacer or support connected to shell
DIG 420 ....Segmented plate
DIG 421 ....Disc and donut plates
DIG 422 ....Unitary tube support or shell-side flow director carried by single tube
DIG 423 ....Bar
DIG 424 .....Forming grid structure
DIG 425 .....Having ends connected to ring element
DIG 426 ....Clamped tube spacer or support
DIG 427 ..Manifold for tube-side fluid (i.e., parallel)
DIG 428 ...Including flow director in manifold
DIG 429 ...Line-connected conduit assemblies
DIG 430 ....Manifolds connected in parallel (e.g., Multi-stage, etc.)
DIG 431 ....Manifolds connected in series
DIG 432 ...Including a tube sheet
DIG 433 ....Tubes-tubesheet connection
DIG 434 .....Plural strips forming tubesheet
DIG 435 ...Plural bonded conduit end portions (i.e., tubesheet not needed)
DIG 436 ...Bent conduit assemblies
DIG 437 ....Coiled
DIG 438 .....Helical
DIG 439 ..Serially connected conduit assemblies (i.e., no manifold)
DIG 440 ..Coiled conduit assemblies
DIG 441 ...Helical
DIG 442 .Conduits

DIG 443 ..Adjacent conduits with transverse air passages (e.g., radiator core type, etc.)
DIG 444 ...Including transversely stacked fin sheets
DIG 445 ...Including transverse corrugated fin sheets
DIG 446 ...Including intermediate sheet between adjacent tubes forming air fin passages
DIG 447 ....Corrugated sheet
DIG 448 ..Air conduits (e.g., radiator core type, etc.)
DIG 449 ..Vertically stacked conduits
DIG 450 ...Including integral abutting or interlocking elements
DIG 451 ..Including bent conduits
DIG 452 ..Including fins
DIG 453 .Plural elements arranged to form a fluid passage
DIG 454 **HAVING SIDE-BY-SIDE CONDUITS STRUCTURE OR CONDUIT SECTION**
DIG 455 .Readily detachable tubes having ends with distinct fluid coupling members engaging corresponding coupling members on manifold
DIG 456 .Readily and independently detachable sections
DIG 457 ..Individual manifolds for each section
DIG 458 .Self-contained sections hydraulically connected in series
DIG 459 .Strips with shaped, interfitted edges form heat exchanger core with plural passages
DIG 460 ..With spacers interposed between adjacent passages
DIG 461 .Plate fins formed with tubular projections which join with projections of adjacent plates to form parallel conduits
DIG 462 ..Tapering, nested projections
DIG 463 ...Conduits oblong in cross section
DIG 464 .Conduits formed by joined pairs of matched plates
DIG 465 ..Manifold space formed in end portions of plates
DIG 466 ...Manifold spaces provided at one end only
DIG 467 ..With turbulence enhancing pattern embossed on joined plates
DIG 468 .Core formed by stack tubular members with abutting edges
DIG 469 .Reinforcing rod or strip extends across parallel fin edges
DIG 470 .Tensioning member within manifold
DIG 471 .Plural parallel conduits joined by manifold
DIG 472 ..U-shaped conduits connected to side-by-side manifolds
DIG 473 ..With clamping member at joint between header plate and header tank
DIG 474 ...With compressible seal at joint
DIG 475 ...Header plate and tank of dissimilar materials
DIG 476 ..Fusion joint (e.g., solder, braze) between tube plate and header tank
DIG 477 ..Elastic seal element between conduit ends and receiving holes in header plate
DIG 478 ..Separate means employed for mechanical attachment and hydraulic seal of conduit ends to header plate
DIG 479 ..Tubes joined to tube plate with adhesive (e.g., glue or braze compound)
DIG 480 ..Elongated support members extending between spaced manifolds
DIG 481 ..Partitions in manifold define serial flow pattern for conduits/conduit groups
DIG 482 ...Partitions are separate members
DIG 483 ..Flow deflecting/retarding means in header for even distribution of fluid to plural tubes
DIG 484 ...Orifices mounted at conduit ends
DIG 485 ..Unitary ("one-piece") header structure
DIG 486 ..Corrugated fins disposed between adjacent conduits
DIG 487 ...Louvered
DIG 488 ..Header is rounded in cross section (e.g., circular, oval)
DIG 489 ..Two piece header structure
DIG 490 ..Noncircular tube cross section (oval, triangular, etc.)

DIG 491 ..Manifolds formed in core-enclosing frame
DIG 492 .Plural conduits with ends connected to tube plate
DIG 493 ..Welded or fused joint between conduit end and plate
DIG 494 ..Conduit end deformed (e.g., expanded) to affix to plate
DIG 495 .Single unitary conduit structure bent to form flow path with side-by-side sections
DIG 496 ..Spiral or helical coil
DIG 497 ..Serpentine flow path with straight side-by-side sections
DIG 498 ...Fin assembly extends across side-by-side sections
DIG 499 .With parallel tubes or tube sections having ends joined to opposed frame members
DIG 500 .Side-by-side conduits with fins
DIG 501 ..Plate fins penetrated by plural conduits
DIG 502 ...Lanced
DIG 503 ....Angled louvers
DIG 504 ...Contoured fin surface
DIG 505 ..Corrugated strips disposed between adjacent conduits
DIG 506 .Side-by-side conduits with means (e.g., support grid) holding them in spaced relation
DIG 507 .Straight side-by-side conduits joined for flow of one fluid
DIG 508 ..Side-by-side conduits penetrate parallel plate-type fins
DIG 509 ..Side-by-side conduits lie in common plane
DIG 510 **HAVING HEAT EXCHANGE SURFACE TREATMENT, ADJUNCT OR ENHANCEMENT**
DIG 511 .Polished heat transfer surface
DIG 512 .Coated heat transfer surface
DIG 513 ..Corrosion resistant
DIG 514 ..Hydrophilic/hydrophobic coating
DIG 515 .Patterned surface (e.g., knurled, grooved)
DIG 516 ..Subsurface pockets formed
DIG 517 .Roughened surface
DIG 518 .Conduit with discrete fin structure
DIG 519 ..porous or mesh
DIG 520 ..Internal and external
DIG 521 ...Pin fins penetrating conduit wall
DIG 522 ..Transverse fins spaced along conduit
DIG 523 ...Separated by integral flanges engaging conduit exterior
DIG 524 ..Longitudinally extending
DIG 525 ...Helical
DIG 526 ....Spine or loop fins
DIG 527 ...Integrally formed
DIG 528 ..Fin and conduit of diverse materials
DIG 529 .With structure for promoting turbulence and/or breaking up laminar flow adjacent heat transfer surface
DIG 530 ..Conduit insert
DIG 531 .With wicking structure
DIG 532 **HEAT EXCHANGE CONDUIT STRUCTURE**
DIG 533 .Composite of diverse materials
DIG 534 ..Concentric layers
DIG 535 .Helically formed
DIG 536 .Noncircular cross-section
DIG 537 ..Oblong or elliptical
DIG 538 .With particular flow connecting structure
DIG 539 **HAVING A HEAT STORAGE MASS**