

F28 HEAT EXCHANGE IN GENERAL (heat-transfer, heat-exchange or heat-storage materials C09K 5/00; arrangement or mounting of heat-exchangers in air-conditioning, air-humidification or ventilation F24F 13/30)

F28F DETAILS OF HEAT-EXCHANGE OR HEAT-TRANSFER APPARATUS, OF GENERAL APPLICATION (water or air traps, air venting F16)

DETAILS AND THEIR ARRANGEMENTS

Elements for heat exchange or transfer and assemblies thereof

tubular; plate-like; for movement; others..... 1/00; 3/00; 5/00; 7/00

auxiliary supports for elements; sealing..... 9/00; 11/00

Casings and header boxes..... 9/00

Preventing deposits or corrosion..... 17/00, 19/00

Special features of heat-exchange apparatus

characterised by the selection of: constructional material; intermediate heat-exchange material21/00; 23/00

component parts of trickle coolers.....25/00

MODIFYING HEAT-TRANSFER; CONTROL OF APPARATUS13/00; 27/00

SUBJECT MATTER NOT PROVIDED FOR IN OTHER GROUPS OF THIS SUBCLASS99/00

- 1/00 Tubular elements; Assemblies of tubular elements** (specially adapted for movement F28F 5/00)
- 1/02 . Tubular elements of cross-section which is non-circular (F28F 1/08, F28F 1/10 take precedence)
- 1/04 . . polygonal, e.g. rectangular
- 1/06 . . crimped or corrugated in cross-section
- 1/08 . Tubular elements crimped or corrugated in longitudinal section
- 1/10 . Tubular elements or assemblies thereof with means for increasing heat-transfer area, e.g. with fins, with projections, with recesses (crimped or corrugated elements F28F 1/06, F28F 1/08)
- 1/12 . . the means being only outside the tubular element
- 1/14 . . . and extending longitudinally (F28F 1/38 takes precedence)
- 1/16 the means being integral with the element, e.g. formed by extrusion (F28F 1/22 takes precedence)
- 1/18 the element being built-up from finned sections
- 1/20 the means being attachable to the element (F28F 1/22 takes precedence)
- 1/22 the means having portions engaging further tubular elements
- 1/24 . . . and extending transversely (F28F 1/38 takes precedence)
- 1/26 the means being integral with the element (F28F 1/32 takes precedence)
- 1/28 the element being built-up from finned sections
- 1/30 the means being attachable to the element (F28F 1/32 takes precedence)
- 1/32 the means having portions engaging further tubular elements
- 1/34 . . . and extending obliquely (F28F 1/38 takes precedence)
- 1/36 the means being helically-wound fins or wire spirals
- 1/38 . . . and being staggered to form tortuous fluid passages
- 1/40 . . the means being only inside the tubular element

- 1/42 . . the means being both outside and inside the tubular element
- 1/44 . . . and being formed of wire mesh
- 3/00 Plate-like or laminated elements; Assemblies of plate-like or laminated elements** (specially adapted for movement F28F 5/00)
- 3/02 . Elements or assemblies thereof with means for increasing heat-transfer area, e.g. with fins, with recesses, with corrugations (F28F 3/08 takes precedence)
- 3/04 . . the means being integral with the element
- 3/06 . . the means being attachable to the element
- 3/08 . Elements constructed for building-up into stacks, e.g. capable of being taken apart for cleaning
- 3/10 . . Arrangement for sealing the margins
- 3/12 . Elements constructed in the shape of a hollow panel, e.g. with channels
- 3/14 . . by separating portions of a pair of joined sheets to form channels, e.g. by inflation (manufacture thereof B23P)
- 5/00 Elements specially adapted for movement** (arrangements for moving the elements, see the appropriate subclass for the apparatus concerned)
- 5/02 . Rotary drums or rollers
- 5/04 . Hollow impellers, e.g. stirring vane
- 5/06 . Hollow screw conveyers
- 7/00 Elements not covered by group F28F 1/00, F28F 3/00, or F28F 5/00**
- 7/02 . Blocks traversed by passages for heat-exchange media
- 9/00 Casings; Header boxes; Auxiliary supports for elements; Auxiliary members within casings**
- 9/007 . Auxiliary supports for elements [6]
- 9/013 . . for tubes or tube-assemblies [6]
- 9/02 . Header boxes; End plates
- 9/04 . . Arrangements for sealing elements into header boxes or end plates (joining pipes to walls in general F16L 41/00)
- 9/06 . . . by dismountable joints

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- 9/08 by wedge-type connections, e.g. taper ferrule
- 9/10 by screw-type connections, e.g. gland
- 9/12 by flange-type connections
- 9/14 by force-joining
- 9/16 . . . by permanent joints, e.g. by rolling (metal-working procedures in general B21, B23, particularly B21D 39/06, B23K)
- 9/18 by welding
- 9/20 . Arrangements of heat reflectors, e.g. separately-insertible reflecting walls
- 9/22 . Arrangements for directing heat-exchange media into successive compartments, e.g. arrangements of guide plates
- 9/24 . Arrangements for promoting turbulent flow of heat-exchange media, e.g. by plates (F28F 1/38 takes precedence; in general F15D)
- 9/26 . Arrangements for connecting different sections of heat-exchange elements, e.g. of radiators (connecting different sections in water heaters F24H 9/14)
- 11/00 Arrangements for sealing leaky tubes or conduits** (stopping flow from or in pipes in general F16L 55/10)
- 11/02 . using obturating elements, e.g. washers, inserted and operated independently of each other (F28F 11/06 takes precedence)
- 11/04 . using pairs of obturating elements, e.g. washers, mounted upon central operating rods (F28F 11/06 takes precedence)
- 11/06 . using automatic tube-obturating appliances
- 13/00 Arrangements for modifying heat transfer, e.g. increasing, decreasing** (F28F 1/00 F28F 11/00 take precedence)
- 13/02 . by influencing fluid boundary (boundary-layer control in general F15D)
- 13/04 . by preventing the formation of continuous films of condensate on heat-exchange surfaces, e.g. by promoting droplet formation
- 13/06 . by affecting the pattern of flow of the heat-exchange media
- 13/08 . . by varying the cross-section of the flow channels
- 13/10 . . by imparting a pulsating motion to the flow, e.g. by sonic vibration
- 13/12 . . by creating turbulence, e.g. by stirring, by increasing the force of circulation (F28F 13/08 takes precedence)
- 13/14 . by endowing the walls of conduits with zones of different degrees of conduction of heat
- 13/16 . by applying an electrostatic field to the body of the heat-exchange medium
- 13/18 . by applying coatings, e.g. radiation-absorbing, radiation-reflecting; by surface treatment, e.g. polishing

- 17/00 Removing ice or water from heat-exchange apparatus**
- 19/00 Preventing the formation of deposits or corrosion, e.g. by using filters**
- 19/01 . by using means for separating solid materials from heat-exchange fluids, e.g. filters [6]
- 19/02 . by using coatings, e.g. vitreous or enamel coatings
- 19/04 . . of rubber; of plastics material; of varnish
- 19/06 . . of metal
- 21/00 Constructions of heat-exchange apparatus characterised by the selection of particular materials**
- 21/02 . of carbon, e.g. graphite
- 21/04 . of ceramic; of concrete; of natural stone
- 21/06 . of plastics material
- 21/08 . of metal
- 23/00 Features relating to the use of intermediate heat-exchange materials, e.g. selection of compositions** (heat-transfer, heat-exchange or heat-storage materials C09K 5/00)
- 23/02 . Arrangements for obtaining or maintaining same in a liquid state
- 25/00 Component parts of trickle coolers** (arrangements for increasing heat transfer F28F 13/00; controlling arrangements F28F 27/00)
- 25/02 . for distributing, circulating, or accumulating liquid (spraying or atomising in general B05B, B05D)
- 25/04 . . Distributing or accumulator troughs
- 25/06 . . Spray nozzles or spray pipes
- 25/08 . . Splashing boards or grids, e.g. for converting liquid sprays into liquid films; Elements or beds for increasing the area of the contact surface (packing elements in general B01J 19/30, B01J 19/32)
- 25/10 . for feeding gas or vapour
- 25/12 . . Ducts; Guide vanes, e.g. for carrying currents to distinct zones
- 27/00 Control arrangements specially adapted for heat-exchange or heat-transfer apparatus**
- 27/02 . for controlling the distribution of heat-exchange media between different channels (arrangements of guide plates or guide vanes F28F 9/22, F28F 25/12)
- 99/00 Subject matter not provided for in other groups of this subclass [8]**