SECTION F — MECHANICAL ENGINEERING; LIGHTING; HEATING; WEAPONS; BLASTING

F28 HEAT EXCHANGE IN GENERAL

F28F DETAILS OF HEAT-EXCHANGE OR HEAT-TRANSFER APPARATUS, OF GENERAL APPLICATION (heat-transfer, heat-exchange or heat-storage materials C09K 5/00; water or air traps, air venting F16)

Subclass index

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 material....21/00, 23/00
  - component parts of trickle coolers....25/00

MODIFYING HEAT-TRANSFER; CONTROL OF APPARATUS....13/00, 27/00
SUBJECT MATTER NOT PROVIDED FOR IN OTHER GROUPS OF THIS SUBCLASS....99/00

1/00 Tubular elements; Assemblies of tubular elements (specially adapted for movement F28F 5/00) **[1, 2006.01]**

1/02 • Tubular elements of cross-section which is non-circular (F28F 1/08, F28F 1/10 take precedence) **[1, 2006.01]**

1/04 • • polygonal, e.g. rectangular **[1, 2006.01]**

1/06 • • crimped or corrugated in cross-section **[1, 2006.01]**

1/08 • Tubular elements crimped or corrugated in longitudinal section **[1, 2006.01]**

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, 2006.01]**

1/12 • • the means being only outside the tubular element **[1, 2006.01]**

1/14 • • • and extending longitudinally (F28F 1/38 takes precedence) **[1, 2006.01]**

1/16 • • • • the means being integral with the element, e.g. formed by extrusion (F28F 1/22 takes precedence) **[1, 2006.01]**

1/18 • • • • • the element being built-up from finned sections **[1, 2006.01]**

1/20 • • • • the means being attachable to the element (F28F 1/22 takes precedence) **[1, 2006.01]**

1/22 • • • • the means having portions engaging further tubular elements **[1, 2006.01]**

1/24 • • • and extending transversely (F28F 1/38 takes precedence) **[1, 2006.01]**

1/26 • • • • the means being integral with the element (F28F 1/32 takes precedence) **[1, 2006.01]**

1/28 • • • • • the element being built-up from finned sections **[1, 2006.01]**

1/30 • • • • the means being attachable to the element (F28F 1/32 takes precedence) **[1, 2006.01]**

1/32 • • • • the means having portions engaging further tubular elements **[1, 2006.01]**

1/34 • • • and extending obliquely (F28F 1/38 takes precedence) **[1, 2006.01]**

1/36 • • • • the means being helically-wound fins or wire spirals **[1, 2006.01]**

1/38 • • • and being staggered to form tortuous fluid passages **[1, 2006.01]**

1/40 • • the means being only inside the tubular element **[1, 2006.01]**

1/42 • • the means being both outside and inside the tubular element **[1, 2006.01]**

1/44 • • • and being formed of wire mesh **[1, 2006.01]**

3/00 Plate-like or laminated elements; Assemblies of plate-like or laminated elements (specially adapted for movement F28F 5/00) **[1, 2006.01]**

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) **[1, 2006.01]**

3/04 • • the means being integral with the element **[1, 2006.01]**

3/06 • • the means being attachable to the element **[1, 2006.01]**

3/08 • Elements constructed for building-up into stacks, e.g. capable of being taken apart for cleaning **[1, 2006.01]**

3/10 • • Arrangement for sealing the margins **[1, 2006.01]**

3/12 • Elements constructed in the shape of a hollow panel, e.g. with channels **[1, 2006.01]**

3/14 • • by separating portions of a pair of joined sheets to form channels, e.g. by inflation (manufacture thereof B23P) **[1, 2006.01]**

5/00 **Elements specially adapted for movement** (arrangements for moving the elements, see the appropriate subclass for the apparatus concerned) **[1, 2006.01]**
5/02 • Rotary drums or rollers **[1, 2006.01]**
5/04 • Hollow impellers, e.g. stirring vane **[1, 2006.01]**
5/06 • Hollow screw conveyors **[1, 2006.01]**

7/00 **Elements not covered by group F28F 1/00, F28F 3/00, or F28F 5/00 [1, 2006.01]**
7/02 • Blocks traversed by passages for heat-exchange media **[1, 2006.01]**

9/00 **Casings; Header boxes; Auxiliary supports for elements; Auxiliary members within casings [1, 2006.01]**
9/007 • Auxiliary supports for elements **[6, 2006.01]**
9/013 • • for tubes or tube-assemblies **[6, 2006.01]**
9/02 • Header boxes; End plates **[1, 2006.01]**
9/04 • • Arrangements for sealing elements into header boxes or end plates (joining pipes to walls in general F16L 41/00) **[1, 2006.01]**
9/06 • • • by dismountable joints **[1, 2006.01]**
9/08 • • • • by wedge-type connections, e.g. taper ferrule **[1, 2006.01]**
9/10 • • • • by screw-type connections, e.g. gland **[1, 2006.01]**
9/12 • • • • by flange-type connections **[1, 2006.01]**
9/14 • • • • by force-joining **[1, 2006.01]**
9/16 • • • by permanent joints, e.g. by rolling (metal-working procedures in general B21, B23, particularly B21D 39/06, B23K) **[1, 2006.01]**
9/18 • • • • by welding **[1, 2006.01]**
9/20 • Arrangements of heat reflectors, e.g. separately-insertible reflecting walls **[1, 2006.01]**
9/22 • Arrangements for directing heat-exchange media into successive compartments, e.g. arrangements of guide plates **[1, 2006.01]**
9/24 • Arrangements for promoting turbulent flow of heat-exchange media, e.g. by plates (F28F 1/38 takes precedence; in general F15D) **[1, 2006.01]**
9/26 • Arrangements for connecting different sections of heat-exchange elements, e.g. of radiators (connecting different sections in water heaters F24H 9/14) **[1, 2006.01]**

11/00 **Arrangements for sealing leaky tubes or conduits** (stopping flow from or in pipes in general F16L 55/10) **[1, 2006.01]**
11/02 • using obturating elements, e.g. washers, inserted and operated independently of each other (F28F 11/06 takes precedence) **[1, 2006.01]**
11/04 • using pairs of obturating elements, e.g. washers, mounted upon central operating rods (F28F 11/06 takes precedence) **[1, 2006.01]**
11/06 • using automatic tube-obturating appliances **[1, 2006.01]**

13/00 **Arrangements for modifying heat transfer, e.g. increasing, decreasing** (F28F 1/00-F28F 11/00 take precedence) **[1, 2006.01]**
13/02 • by influencing fluid boundary (boundary-layer control in general F15D) **[1, 2006.01]**
13/04 • by preventing the formation of continuous films of condensate on heat-exchange surfaces, e.g. by promoting droplet formation **[1, 2006.01]**
13/06 • by affecting the pattern of flow of the heat-exchange media **[1, 2006.01]**
13/08 • • by varying the cross-section of the flow channels **[1, 2006.01]**
13/10 • • by imparting a pulsating motion to the flow, e.g. by sonic vibration **[1, 2006.01]**
13/12 • • by creating turbulence, e.g. by stirring, by increasing the force of circulation (F28F 13/08 takes precedence) **[1, 2006.01]**
13/14 • by endowing the walls of conduits with zones of different degrees of conduction of heat **[1, 2006.01]**
13/16 • by applying an electrostatic field to the body of the heat-exchange medium **[1, 2006.01]**
13/18 • by applying coatings, e.g. radiation-absorbing, radiation-reflecting; by surface treatment, e.g. polishing **[1, 2006.01]**

17/00 **Removing ice or water from heat-exchange apparatus [1, 2006.01]**

19/00 **Preventing the formation of deposits or corrosion, e.g. by using filters [1, 2006.01]**
19/01 • by using means for separating solid materials from heat-exchange fluids, e.g. filters **[6, 2006.01]**
19/02 • by using coatings, e.g. vitreous or enamel coatings **[1, 2006.01]**
19/04 • • of rubber; of plastics material; of varnish **[1, 2006.01]**
19/06 • • of metal **[1, 2006.01]**

21/00 **Constructions of heat-exchange apparatus characterised by the selection of particular materials [1, 2006.01]**
21/02 • of carbon, e.g. graphite **[1, 2006.01]**
21/04 • of ceramic; of concrete; of natural stone **[1, 2006.01]**
21/06 • of plastics material **[1, 2006.01]**
21/08 • of metal **[1, 2006.01]**

23/00 **Features relating to the use of intermediate heat-exchange materials, e.g. selection of compositions [1, 2006.01]**
23/02 • Arrangements for obtaining or maintaining same in a liquid state **[1, 2006.01]**

25/00 **Component parts of trickle coolers** (arrangements for increasing heat transfer F28F 13/00; controlling arrangements F28F 27/00) **[1, 2006.01]**
25/02 • for distributing, circulating, or accumulating liquid (spraying or atomising in general B05B, B05D) **[1, 2006.01]**
25/04 • • Distributing or accumulator troughs **[1, 2006.01]**
25/06 • • Spray nozzles or spray pipes **[1, 2006.01]**
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) **[1, 2006.01]**
25/10 • for feeding gas or vapour **[1, 2006.01]**
25/12 • • Ducts; Guide vanes, e.g. for carrying currents to distinct zones **[1, 2006.01]**

27/00 **Control arrangements or safety devices specially adapted for heat-exchange or heat-transfer apparatus [1, 2006.01]**
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) **[1, 2006.01]**

99/00 **Subject matter not provided for in other groups of this subclass [2006.01]**