

This heading is primarily concerned with processes and apparatus for mixing fluent (*including* plastic) materials. The heading also includes certain agitating processes and apparatus *for purposes other than mixing* (See note on "affinitive subject matter" *below*)

Explanation of heading subject matter and relationships with other headings

Nature of mixing operation

Mixing is the operation of physically combining fluent materials (or distinguishable components or regions of a single material) so as to intermingle or distribute them within one another *eg* to produce a more uniform mass or flow. Mixing resolves into the employment of one or both of the following component operations:

1. contacting fluent materials from discrete sources
2. agitating a body or flow of material

Much of this heading will be concerned with improvements in agitating and contacting techniques (and apparatus) essentially designed for mixing

Affinitive subject matter

Contacting and agitating operations are also widely employed in other fields where fluent materials are manipulated or "worked" *eg* in abrading, catalysing, comminuting, conveying, drying, humidifying, laundering, polishing, separating, heating and cooling. Whilst particular applications generally impose constraints upon the form that these operations take there will be affinities between some of the more basic contacting and agitating techniques and apparatus employed in these other fields and those employed for mixing. Clearly there is also a transitional area where classification (with the existing heading structure) is necessarily somewhat arbitrary, usually on the basis of the exemplified application(s)

These factors should be borne in mind when formulating search strategy and search extended to other fields where appropriate

General disclosures in agitating, where field of use is not stated or is not significant, and agitating disclosures for which no provision exists elsewhere, are classified in this heading

Extent of heading

Since mixing is a component of, or an adjunct to, so many operations, this heading can be concerned *only* with disclosures in which the mixing operation itself (or the means of effecting it) is of interest

Associations between mixing and other operations are generally classified as follows:

1. Where the mixing action is clearly subordinate to, or forms a step in, some other operation or process (*eg* a water purification process)—classification is made elsewhere according to the other operation or process concerned (in the example given—C1C, Treating water, sewage &c)
2. Where the other operation is clearly subordinate to a mixing operation (*eg* is used to enable or promote efficient mixing)—classification is made in this heading (See Classifying Schedule 1)
3. Where neither operation is subordinate *eg* the operations are available alternatively (as in a food processing machine which is convertible to enable both mixing and other operations) or to have a mutually complementary relationship (as with apparatus in which mixing and pulping are effected by a single "agitator" *or* in a mixing device mounted on a vehicle so that mixing and transporting may take place simultaneously and/or using a single power unit)—classification is made, in an appropriate heading, for each operation in which there is interest *per se*. Where no operation is of interest *per se* classification is necessarily somewhat arbitrary and consideration should be given both to this heading and to the heading(s) for the associated operation(s) in cases of doubt

Mixing by the use of apparatus or devices normally classified *per se* in other headings (*eg* pumps, injectors and valves) is found here only when the mixing action (or an associated mixing process) is of interest. If mixing is achieved in the normal course of operation of such an apparatus or device (as in the case of a pump or valve with multiple inlets) and there is no improvement in the mixing action itself, classification is made in the heading for the apparatus or device *per se*

Explanation of heading—contFlow control

Methods, systems, apparatus and devices for controlling or regulating one or more flows of material are classified in this heading only when they wholly or partly determine the structure of (or process performed in) a mixing zone. Other flow control subjects are met in such headings as B8N, Metering fluent material &c; B8S, Shoots and hoppers &c; F2V, Fluid pressure control valves &c and G3H, Modifying fluid flow

Excluded mixing processes and apparatus

The following mixing processes and apparatus are classified elsewhere as indicated:

- . mixing syringes for medical, dental or veterinary use—A5R, Medical, dental and veterinary equipment
However other mixing syringes are classified in this heading
- . mixing by passing through sieves or strainers—B1D, Filtering and settling; B2H, Separating solids
- . liquid - liquid contacting operations in which one liquid is temporarily dispersed in another—B1F, Chemical contact apparatus &c; B1X, Miscellaneous chemical apparatus &c
- . mixing or incorporating by grinding—B2A, Comminuting
- . mixing articles by handling them individually—relevant article handling heading *eg* shuffling cards—B8R, Handling thin material
- . mixer-settler apparatus—C1C, Treating water; sewage &c
- . carburetting apparatus—
 - . . in gas manufacture—C5E, Destructive pyrolysis, gas, hydrocarbons &c
 - . . for internal combustion engines—F1B, Internal combustion engines &c; F1H, Spray carburetters
- . textile fibres, mixing, separating and sorting—D1F, Spinning processes
- . gazogenes, saltzogenes and siphon bottles—F1R, Raising and discharging liquids &c
- . mixing pulverulent fuel with air for supplying to furnaces and kilns—F4T, Burners &c
- . diffusion apparatus for mixing gases—G1B, Chemical analysis, testing &c
- . rocking dishes for photographic and other chemical operations—G2X, Miscellaneous photographic processes and apparatus

The exclusion references listed in this heading are not exhaustive. Reference should be made to the appropriate general heading/s for processes, materials, elements or devices which may be more widely applicable than can appropriately be classified in this heading

Definitions and interpretations

The following terms and expressions are used herein with the meanings assigned below:

"container": any device which acts to contain or hold the charge or flow of material at the mixing point or zone *eg* drum, tank or barrel. The term also includes stators or shrouds for shear-type mixers

"inserted disturber": a device inserted into the charge or flow of material in order to agitate, disrupt or disturb the charge or flow and so promote or cause mixing *eg* stirrers and static flow breaking baffles. Also included within this term are:

- . jets, diffusers and manifolds employed to cause disturbance by emitting a stream of fluid into a body of fluid
- . rollers and other squeezing or kneading means *not* acting to contain or hold the flow or charge being mixed

Notes on Classifying and Indexing
Classifying Schedule 1

Classifying Schedule 1 is concerned with mixing processes, techniques and procedures. Also found here are those aspects of *apparatus* which embody an improvement in a mixing process, technique or procedure *including, inter alia*:

- . organisation of apparatus to provide a particular sequence of operations *eg* mixing systems employing a plurality of supplies delivered at various times to a mixing zone
- . organisation of mixing zone and/or supply thereto to provide a particular circulation or other movement of materials therein
- . organisation of plural supplies to cause materials to flow into contact in a particular manner

However, improvements in the mixing action achieved essentially through individual ones of the apparatus functions, sub-systems and elements specified in Schedule 2 are classified in Schedule 2 except where indicated otherwise in the Schedule itself by the expression "Schedule 1 takes priority". For example, improvements in the mixing action achieved solely by a particular mixing drum movement are classified under term CADA in Schedule 2 and these achieved solely by a new design of stirrer are classified under term CAU of that Schedule

Classifying Schedule 2

Classifying Schedule 2 is concerned with all aspects of mixing apparatus *other than process or technique oriented aspects* (which are provided for in Schedule 1—*See note above*). It should be noted that many disclosures directed *prima facie* to structural organisation of the mixing zone are in fact concerned with improving the mixing action itself and as such are subject matter for Schedule 1. It follows therefore that care should be exercised in the use of terms CABA and CABB from the Schedule. Improvements in the mixing action achieved essentially through individual ones of the apparatus functions, sub-systems and elements provided for in this Schedule are, however, classified here

Notes on the Use of Indexing terms

1. The assigning of terms from certain of the Indexing Schedules is non-discretionary following the assigning of some classifying terms and this is indicated by the note "See Indexing Schedule —" or "See terms—in Indexing Schedule —" following the classifying terms concerned
2. The terms of the Indexing Schedules (with the exception of those terms marked with an asterisk) are otherwise assignable in a discretionary manner with all classifying terms to identify the presence of corresponding features
3. Terms marked with an asterisk are assigned only for substantial disclosure of corresponding matter which is novel or of significance *per se*

Indexing Schedules

The Indexing Schedules are concerned with various aspects of mixing processes and apparatus as follows:
Indexing Schedule 1—general character of mixing apparatus
Indexing Schedule 2—contacting techniques
Indexing Schedule 3—control, regulation and adjustment
Indexing Schedule 4—field of use of mixing operation
Indexing Schedule 5—structural details of mixing apparatus

Relationship with the Universal Indexing Schedules (heading U1S)

In addition to recording the nature of broader processes or apparatus with or in which inventions classified here may be used, U1S is used, subject to its indexing rules, to index materials operated on and useful products obtained

Operative date for Key entries

The operative date for the terms of this heading is Edition D

Classifying Schedule 1Mixing processes, techniques and procedures including related apparatus subjects

- CPA See Indexing Schedules 1-5
associations with functionally different operations *which are not subordinate* to the mixing operation
- CPB control, regulation or adjustment of particular process parameters *eg* temperature, pressure, flow rate, dwell time
- general character or organisation of mixing processes, techniques and procedures, involving—
- . association between one or more agitating and/or contacting operations and one or more subordinate (*eg* perfecting) operations such as operations for conditioning source materials, promoting mixing, improving properties of mixed product, the said subordinate operation(s) being performed—
 - . . on source or starting material(s)
 - . . on intermediate product (*eg* a pre-mix)
 - . . during an agitating/contacting step
 - . . on the final mixed product
 - . . on any combinations of the above, *including diverse* subordinate operations performed at different stages
- CPA . associations between distinguishable contacting and/or agitating stages only, *including* transfer of material between stages (processes where materials are fed to a mixing zone at different times are classified here)
- CPB . single contacting and/or agitating stage only, *including* continuous use of a single stage on a flow of material
- CPJA . . involving defined circulation or other movement of material(s) being treated
- CPJB . . other than the above
- CPX mixing process, technique or procedure subjects *not provided for above*

Classifying Schedule 2Mixing apparatus other than process or technique related aspects provided for in Schedule 1

- CAA . See Indexing Schedules 1-5
structural association with other apparatus or devices *including* vehicles but *not including* mere provision of wheels (*See* term CAQ *below*)
. See Indexing Schedules 1, 2 and 3
- general or overall arrangement of apparatus (*including* associations between particular functions, sub-systems and elements)—
- . See Indexing Schedules 1, 2 and 3
- CABA . essentially involving distinct contacting and/or agitating zones
- CABB . other than the above
- CAC control, regulation and adjustment of particular apparatus features *eg* supply or discharge devices
. See Indexing Schedules 1, 2 and 3
- unit functions, sub-systems and elements; ancillary and perfecting features—
- . motion and movement—
 - . See terms C611-C614 and C641-C664 in Indexing Schedule 5
- CADA . . of container
- CADB . . of inserted disturber
- CADC . . of combinations of the above
. driving, *including* bearings and mountings associated therewith—
. See terms C611-C614 and C641-C664 in Indexing Schedule 5
. . to produce particular movements of container and/or inserted disturber of interest *per se*—*See* terms CAD—*above*
. . stabilising and balancing moving parts—*See* terms CAK—*below*
- CAEA . . of container
- CAEB . . of inserted disturber *including* both container and inserted disturber
- CAEC . . of supply means
- CAED . . of discharge means *including* both supply and discharge means
- CAEX . . of other devices
- CAEY . . of any combinations of the above *not specifically provided for*
- CAF . loading and/or unloading mixing zone in batch form at start or finish of operation (*affinity exists with* B8E, Loading and unloading)
. . See terms C681-C689 and C671 in Indexing Schedule 5

Classifying Schedule 2—cont

- . supply and discharge arrangements *not provided for above*, the concern being with—(*Schedule 1 takes priority—See introductory note*)
- . . See terms C681-C689 and C671 in Indexing Schedule 5
- . . construction of jets, diffusers and manifolds—*See term CAU below*
- . . supply only —
- CAGA . . . plural supply
- CAGB . . . other than the above
- CAGC . . discharge only
- CAGD . . associations between supply and discharge *including* recycling arrangements
- CAH . . associations between supply and/or discharge and the movement of materials through the mixing zone (*Schedule 1 takes priority—See introductory note*)
- . . See terms C681-C689 and C671 in Indexing Schedule 5
- CAY . . pressurising and/or venting mixing zone
- . . sealing therefor—*See term CAJA below*
- . . sealing, *including* eliminating and preventing escape of hazardous substances—
- CAJA . . of container, *eg* lids and doors
- CAJB . . other than the above, *eg* supply lines (*affinity exists with F2B, Seals*)
- . . stabilising and balancing movement of—
- CAKA . . container
- CAKB . . inserted disturber *including* both container *and* inserted disturber
- CAKC . . other parts
- CAL . . heating and cooling arrangements
- CAM . . assembly, dismantling, folding and collapsing, *including* rearrangement of parts for storage and provision for partial separation of parts *eg* to permit cleaning and servicing
- . . to permit loading or unloading of batch at start or finish of operation—*See term CAF above*
- . . cleaning and clearing *not provided for above* (*affinity exists with A4F, Cleaning &c*)—
- . . by means (*eg* a scraper) integrated with inserted disturber—*See term CAU below*
- . . of supply or discharge passages and/or source material stores
- CANA . . of container
- CANB . . of other parts
- CANC . . supporting and mounting *not provided for above*—
- CAPA . . of container
- CAPB . . of inserted disturber *including* mounting both container and inserted disturber
- CAPC . . of other parts
- CAPD . . of any combinations of the above *not specifically provided for*
- . . carrying and transporting, *including* adaptations for hand use—
- . . mounting on vehicles—*See term CAA above*
- CAQA . . provision of wheels, skids or equivalent means
- CAQB . . provision of handles, hand holes or equivalent means
- CAQC . . other provisions, *including* combinations of the above
- CAR . . lubricating
- CAV . . observing and monitoring operation, *eg* provisions of windows or indicators
- . . in control, regulation or adjustment—*See term CAC above*
- CAS . . safety arrangements, *not provided for above*
- . . machinery guards—*See F2J, Machinery guards &c*
- CAT . . container *per se not provided for above*
- . . See terms C615 to C620, C631, C632 and C691 to C696 in Indexing Schedule 5
- CAU . . inserted disturber *per se not provided for above*, *including* arrangements of plural disturbers and *also including* jet diffusers and manifolds used as disturbers (*affinity exists with F1V, Bladed rotors and stators*)
- . . See terms C621 to C630, C633 and C691 to C696 in Indexing Schedule 5
- . . associations between disturber structure and movement thereof—*See terms CAD—above*
- . . pneumatic fluidiser elements—*See B1F, Chemical contact apparatus &c*
- . . wall formations on container—*See term CAT above*
- . . structural associations with housings, shrouds or other stator members—*See terms CAB—above*
- . . spoons in general—*See A4A, Portable vessels, table articles &c*
- . . spatulas—*See A4V, Toiletry &c*
- CAW . . source material storage devices *per se not provided for above*, *including* means therein for maintaining condition of source materials (mere heating and cooling devices—*See term CAL above*) and devices usable also as the mixing chamber *eg* by rupturing wall between components to be mixed. (*affinities exist with B8C, Packaging &c; B8N, Metering fluent material &c; B8S, Shoots and hoppers &c and E1T, Tanks, silos &c*)
- CAX . . other unit functions &c

Indexing Schedule 1General character of apparatus

- apparatus in which agitation is produced by movement of parts but in which there is no appreciable squeezing, shearing or kneading of the material treated—
- C101 . moving (*including* vibrating) container only
 - C102 . inserted disturber only
 - . combined inserted disturber and moving container—
 - C103 . . the container only moving
 - C104 . . other than the above
- apparatus in which agitation is produced by movement of parts to produce an appreciable squeezing, shearing or kneading of the material treated—
- C111 . rotor/stator apparatus
 - C112 . nip apparatus *eg* intermeshing screws, co-operating platens, belts, rollers, roller and platen, roller and belt
 - C115 . other apparatus of this type *including* apparatus combining the above characteristics
- apparatus in which agitation is produced without movement of parts—
- C121 . apparatus using inserted static disturber devices
 - C122 . apparatus comprising a passage or chamber (*including* a specially shaped chamber) into which a fluid or fluids is or are injected *eg* via one or more nozzles, *including* apparatus employing diffusers or manifolds to bubble gases into liquids
 - C123 . apparatus combining the above characteristics
 - C125 . other apparatus of this type
 - C126 . apparatus in which there is no induced agitation *eg* components permitted to mingle freely on contact
 - C127 . agitating apparatus of other or unspecified application or for applications *other* than mixing

Special Note

Apparatus having the characteristics of more than one of the above "no-dot" categories is indexed in each relevant category *eg* a mixing zone *including* a rotary impeller (non-shear type) and a gas inlet manifold designed to cause additional disturbance by inrush of gas (both inside a stationary container) is indexed C102 and C122

Indexing Schedule 2

- contacting techniques—
- . merging or mingling generally continuous plural streams—
 - C2011 . . wherein at least one of the streams has an unusual or significant form *eg* a spray, curtain or vortex
 - C2012 . . other than the above
 - C202 . introducing one or more generally continuous streams into a static or circulating body of material *including* a fluidised body
 - C203 . combining batches (or "shots") *including* introducing "shots" into larger batches
 - C204 . releasing batches (or "shots") into a generally continuous stream
 - C205 . contacting a flow with the surface only of a bulk or mass of material to thereby dose the flow with material "eroded" from the bulk or mass
 - C208 . employing carrier material to bring one component into intimate contact with another
 - C209 . disturbing the surface of a generally static body of one component at its interface with a generally static body of another component (*eg* as in surface aeration)
 - C210 . other techniques

Indexing Schedule 3

- control, regulation and adjustment—
- C351 . purely manual
 - C355 . purely programmed
 - C360 . purely condition responsive
 - C370 . any combination of manual/programmed and C/R control
- parameters controlled regulated or adjusted—
- C301 . drive or movement of container
 - C302 . drive or movement of inserted disturber
 - C303 . set relative position of container and inserted disturber *or* of plural disturbers
 - C304 . configuration of container
 - C305 . configuration of inserted disturber
 - C306 . loading and/or unloading in batch form at start or finish of operation
- supply, discharge, throughflow of fluids during operation—
- C3071 . . supply only
 - C3072 . . discharge only *including* reverse or backflow from mixing zone
 - C3073 . . flow through mixing zone only
 - C3074 . . any combinations of supply, discharge and throughflow
- C308 . balance of moving parts
 - C309 . temperature of mixing zone
 - C310 . pressure in mixing zone
 - C312 . mixing zone parameters *other than the above*
 - C315 . other parameters
- conditions sensed—
- C321 . temperature
 - C322 . pressure
 - C323 . drive speed *eg* of agitators
 - C324 . passage of time
 - C325 . static mass *eg* of charge
 - C326 . fluid flow rate (mass or volume)
 - C327 . resistance to movement
 - C329 . static volume
 - C330 . mere presence or absence of one or more components
 - C328 . other or unspecified conditions

Indexing Schedule 4

- mixing operation used in, or associated with—
- C501 . gassing *eg* aerating or carbonating
 - . . foaming—*See* term C523 *below*
 - C502 . heating and/or cooling
 - C523 . foaming

Indexing Schedule 5Details of mixing apparatus

- container details—
- C611 . drum (*eg* cylinders) rotating about its longitudinal axis
- C612 . drum rotating about a transverse or eccentric axis *eg* end-over-end
- C613 . reciprocating, oscillating or vibrating container
- C614 . container having combined or compound motion
- C615 . with helical vanes or ribs
- C616 . with vanes, ribs or partitions *other than the above*
- C618 . with other specific wall formations
- C619 . with downcomer tube or the like
- C620 . with venting means
- * C631 . overall shape of container
- * C632 . other container details
- inserted disturbers, overall form of—
- C621 . plain or toothed roller *including* gears or like members
- C622 . plate-like *other than* disc-like
- C623 . strip-like *eg* belt, chain or filament
- C624 . helical *including* propeller-like
- C625 . disc-like *including* studded aperatured or vaned discs
- C626 . having paddles or arms *other than* propeller-like
- C627 . openwork frames and cages
- * C628 . diffusers, jets and manifolds
- * C630 . other or unspecified form
- * C633 inserted disturbers, surface details, *eg* pitted
- inserted disturbers, movement of—
- . . . rotary, rotating about—
- . . . single axis (*including* plural co-axial disturbers)
- . . . in two or more independently movable sections
- . . . other than the above
- . . . plural independent axes—
- . . . parallel axes
- . . . other than the above
- . . . plural interconnected axes, *including* planetary arrangements—
- . . . parallel axes
- . . . axes at right angles
- . . . other than the above
- C651 . reciprocating (*ie* forward and return paths linear)
- C652 . oscillating (*ie* forward and return paths arcuate)
- C653 . continuous unidirectional movement *other than* rotary
- C654 . high frequency vibration or oscillation
- C655 . other types of movement *including* combinations of the above movements
- driving arrangements for container or disturber—
- * C661 . mechanical
- * C662 . electrical or magnetic
- * C663 . hydraulic or pneumatic
- * C664 . other, *including* combinations of above
- supply and discharge—
- C681 . source materials supplied in sequence
- C682 . source materials or mixed product recycled
- C685 . employing conveyers or other displacement devices integral with container
- C686 . employing conveyers or other displacement devices integral with inserted disturber
- C687 . employing discrete conveyers or other displacement devices
- C688 . supply of source material(s) through moving disturber
- C689 . weirs
- C671 . backflow prevention means
- special materials used in construction—
- * C691 . natural or synthetic resins
- * C692 . wood
- * C693 . metals and alloys
- * C694 . glass and ceramics
- * C695 . stone
- * C696 . other than the above