84.21 - Centrifuges, including centrifugal dryers; filtering or purifying machinery and apparatus for liquids or gases.

- Centrifuges, including centrifugal dryers :

8421.11 - - Cream separators

8421.12 - - Clothes-dryers

8421.19 - - Other

- Filtering or purifying machinery and apparatus for liquids :

8421.21 - - For filtering or purifying water

8421.22 - - For filtering or purifying beverages other than water

8421.23 - - Oil or petrol-filters for internal combustion engines

8421.29 - - Other

- Filtering or purifying machinery and apparatus for gases :

8421.31 - - Intake air filters for internal combustion engines

8421.39 - - Other

- Parts :

8421.91 - - Of centrifuges, including centrifugal dryers

8421.99 - - Other

This heading covers :

(I) Machines which, by the use of centrifugal force, completely or partly separate substances according to their different specific gravities, or which remove the moisture from wet substances.

(II) Filtering or purifying machinery and apparatus for liquids or gases, **other than**, e.g., filter funnels, milk strainers, strainers for filtering paints (generally **Chapter 73**).

(I) CENTRIFUGES, INCLUDING CENTRIFUGAL DRYERS

Most of these machines consist essentially of a perforated plate, drum, basket or bowl, etc., revolving at great speed in a stationary collector, usually cylindrical, against the walls of which the expelled materials are projected by centrifugal force. In some types the substances of different specific gravities are collected at different levels by means of a series of inverted separator cones. In other types the solid ingredients are retained in the perforated revolving drum, basket, etc., and the liquid ingredients expelled. Machines of this latter type may also be used to force liquids to penetrate thoroughly into materials (e.g., in dyeing or cleaning).

The heading includes :

(1) Centrifugal driers for laundries, dyeworks, pulp mills, flour mills, etc.

(2) Sugar refining centrifuges.

(3) Cream separators and centrifugal clarifiers for milk.

(4) Centrifuges for clarifying oils, wines, spirits, etc.

(5) Centrifuges for dehydrating or de-waxing petroleum products.

(6) Centrifuges for dehydrating wines, tallow, starches, etc.

(7) Nitrating centrifuges for gun-cotton manufacture.

(8) Separators for yeast cultures.

(9) Centrifuges for the chemical industry (e.g., high-speed extractors for antibiotics).

(10) Centrifuges, mainly used in laboratories, in which liquids are separated in superimposed layers ready for decantation.

(11) Centrifuges for separating the plasma from blood.

(12) Centrifuges for drying radioactive precipitates.

(13) Centrifuges for extracting honey.

PARTS

Subject to the general provisions regarding the classification of parts (see the General Explanatory Note to Section XVI), parts of centrifuges are also classified here (e.g., plates, drums, baskets, bowls and collectors).

*
* *

The heading **excludes** certain other types of machines operating on the centrifugal principle, e.g. :

(a) Special centrifuges, called "gas" centrifuges, for the separation of uranium isotopes (**heading 84.01**).

(b) Centrifugal pumps for liquids (**heading 84.13**).

(c) Centrifugal air pumps and blowers (**heading 84.14**).

(d) Centrifugal bolting (or sifting) machines for the milling industry (**heading 84.37**).

(e) Centrifugal casting machines for metal (e.g., for cast iron tubes) (**heading 84.54**), or for unhardened cements (e.g., for casting concrete tubes) (**heading 84.74**).

(f) Centrifugal grinding machines (**heading 84.74**).

(g) Centrifugal spin dryers for semiconductor wafer manufacturing (**heading 84.86**).

(II) FILTERING OR PURIFYING MACHINERY AND APPARATUS, FOR LIQUIDS OR GASES

Much of the filtration or purification plant of this heading is purely static equipment with no moving parts. The heading covers filters and purifiers of all types (physical or mechanical, chemical, magnetic, electro-magnetic, electrostatic, etc.). The heading covers not only large industrial plant, but also filters for internal combustion engines and small domestic appliances. The heading **does not**, however, **include** filter funnels, milk strainers, vessels, tanks, etc., simply equipped with metallic gauze or other straining material, nor general purpose vessels, tanks, etc., even if intended for use as filters after insertion of a layer of gravel, sand, charcoal, etc.

In general, filtering machinery and plant of this heading is of two distinct types according to whether it is intended for liquids or gases.

(A) **Filtering and purifying machinery, etc., for liquids, including water softeners.**

The liquid filters of this group separate solid, fatty, colloidal, etc., particles from a liquid, for example, by passing it through a sheet, membrane or mass of porous material (e.g., cloth, felt, wire-cloth, skin, stoneware, porcelain, kieselguhr, sintered metallic powders, asbestos, paper pulp, cellulose, charcoal, animal black, sand). In the treatment of drinking water, some of these materials (e.g., porcelain and charcoal) remove bacteria, etc., in the process of filtration; filters using these materials are therefore sometimes called "water purifiers". Filters are also used to eliminate liquids from materials in the form of a slurry (e.g., from ceramic materials or ore concentrates). The heading covers liquid filters whether of the gravity, suction (or vacuum) or pressure types.

It includes, *inter alia* :

(1) **Domestic type water filters**. Pressure type domestic filters are designed for fitting to the mains pipes or to the tap, and usually consist of a cylindrical ceramic filtering element enclosed in a metal container. Gravity types are similar but often larger. But the heading **excludes** filters made mainly of ceramics or glass (**Chapter 69** or **70**, respectively).

(2) **Filter candles for man-made textile manufacture**. These consist of a non-corrosive container housing a textile element which filters the spinning solution.

(3) **Oil filters for internal combustion engines, machine-tools, etc.** They are of two main types :

(i) Those containing a filtering element, usually of superimposed layers of felt, metallic gauze, steel wool, etc.

(ii) Those containing permanent magnets or electromagnets for the extraction of ferrous particles from the oil.

(4) **Filters for boiler water**. These usually consist of a large vessel fitted internally with several superimposed layers of filtering materials and, in addition to the inlet and outlet tubes, a system of pipes and valves for cleaning the filtering elements by a cross-current of water.

(5) **Filter presses**. These consist of a horizontal series of filtering chambers formed by readily detachable vertical filter plates and frames; these are covered by a filtering medium (cloth, cellulose, etc.), and are held in place by a screw or press mechanism. The liquid is forced through the cells by a pump, and the chambers may be heated internally by steam, etc. The filtrate is drawn from the press and the residue collects in cakes between the plates. Filter presses are used for filtering or clarifying many liquids (e.g., in the chemical industry, the sugar industry, in brewing, wine making, oil purification, ore concentration, in the manufacture of ceramics, man-made textiles, etc.).

(6) **Rotary drum vacuum filters**. These comprise a cylinder covered with filter cloth or gauze and mounted in the tank containing the liquid to be filtered. The liquid is sucked into the drum, and mechanical devices remove the solid residue from the periphery.

(7) **Intermittent vacuum filters**. These consist of a number of "leaves" or chambers each covered with filter cloth and connected to a common vacuum line. The filter is submerged in the feed tank and the vacuum applied.

(8) **Chemical water purifiers**, e.g., permutite or zeolite softeners and lime water purifiers.

(9) **Electro-magnetic water purifiers**. In these purifiers the action of an alternating magnetic field prevents the calcareous salts in the water from crystallising and forming deposits on the walls of the tubes; instead, the salts separate as sludges which can readily be removed.

The heading also covers **dialysers**, special type filters consisting essentially of a semi-permeable membrane through which liquids can pass by diffusion and thus be separated from colloidal particles.

(B) **Filtering or purifying machinery, etc., for gases**

These gas filters and purifiers are used to separate solid or liquid particles from gases, either to recover products of value (e.g., coal dust, metallic particles, etc., recovered from furnace flue gases), or to eliminate harmful materials (e.g., dust extraction, removal of tar, etc., from gases or smoke fumes, removal of oil from steam engine vapours).

They include :

(1) **Filters and purifiers acting solely by mechanical or physical means**; these are of two types. In the first type, as in liquid filters, the separating element consists of a porous surface or mass (felt, cloth, metallic sponge, glass wool, etc.). In the second type, separation is achieved by suddenly reducing the speed of the particles drawn along with the gas, so that they can then be collected by gravity, trapped on an oiled surface, etc. Filters of these types often incorporate fans or water sprays.

Filters of the first type include :

(i) **Intake air filters for internal combustion engines**. These often combine the two systems described above.

(ii) **Bag filters**. These consist of a series of bag shaped cloth filtering elements, and often incorporate a shaker mechanism to cause the trapped particles to fall through the bottom of the bags.

(iii) **Screen filters**. These consist of an endless filtering gauze running on two rollers and stretched across the chamber through which the gases are passed. The screen is cleaned by a scraper mechanism.

(iv) **Rotary drum filters**, e.g., as used in sand blasting plant. They usually consist of a filter drum into which the air is drawn by suction. The drum revolves against a scraper which frees the drum of the residue.

Filters of the second type include :

(v) **Dust extractors, smoke filters, etc.**, fitted with various types of obstructing elements to reduce the speed of the particles in the gas stream, e.g., baffle plates, partitions perforated with non-corresponding orifices, circular or spiral circuits fitted with baffles, and cones of superimposed baffle rings.

(vi) **Cyclones**, usually consisting essentially of sheet metal cones enclosed in a cylindrical tank. The gases are fed into the narrower part of the cone by a tangential pipe and the turbulent currents thus set up decrease sharply as the gases approach the broader section of the cone, so that the dust falls to the bottom of the tank.

(2) **Electrostatic filters for air or other gases** in which the essential element is usually a series of vertical wires charged with static electricity. The dust in the air passing through the apparatus is attracted to and retained on the wires from which it is removed periodically.

(3) **Gas scrubbers or absorption towers**. These are used for purifying producer gas, coal gas, etc.; they consist of tall metal columns containing coke or other fillings, and fitted at the top with water sprays.

(4) **Other chemical filters and purifiers for air or other gases** (including catalytic converters which change carbon monoxide in the exhaust gases of motor vehicles).

*
* *

This group also includes the following machinery employed in the nuclear industry : air filters specially designed to eliminate radioactive dust (physical or electrostatic types); active-charcoal purifiers for retaining radioactive iodine; ion-exchange apparatus for the separation of radioactive elements, including such apparatus operating by electrodialysis; separators for irradiated fuels or for processing effluents, whether operating by ion-exchange or operating chemically (by means of solvents, precipitation, etc.).

PARTS

Subject to the general provisions regarding the classification of parts (see the General Explanatory Note to Section XVI), the heading covers parts for the above-mentioned types of filters and purifiers. Such parts include, *inter alia* :

Leaves for intermittent vacuum filters; chassis, frames and plates for filter presses; rotary drums for liquid or gas filters; baffles and perforated plates, for gas filters.

It should be noted, however, that filter blocks of paper pulp fall in **heading 48.12** and that many other filtering elements (ceramics, textiles, felts, etc.) are classified according to their constituent material.

*
* *

The heading also **excludes** :

(a) Gas diffusion apparatus for the separation of uranium isotopes (**heading 84.01**).

(b) Air conditioning machines of **heading 84.15** or air de-humidifiers of **heading 84.79**.

(c) Wine-presses, cider-presses, etc. (**heading 84.35**).

(d) Artificial kidney (dialysis) apparatus (**heading 90.18**).