Nov. 8, 1949 D. E. MARNON ET AL 2,487,458

PRECIPITATOR

Filed Jan. 14, 1947

FIG. 1

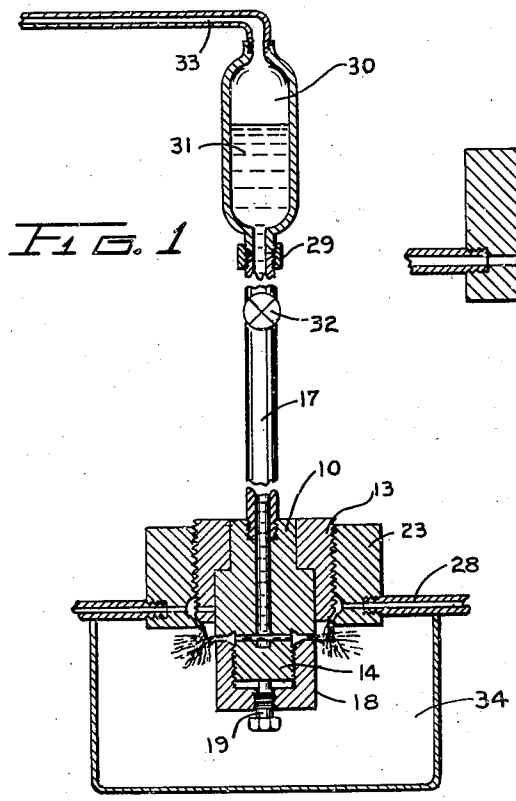


FIG. 2

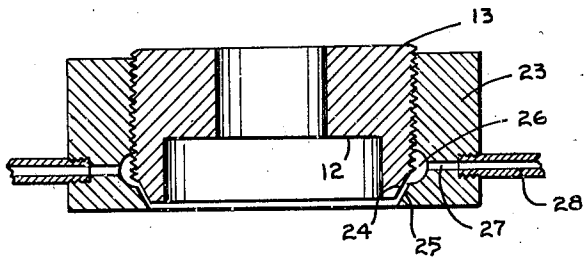


FIG. 3

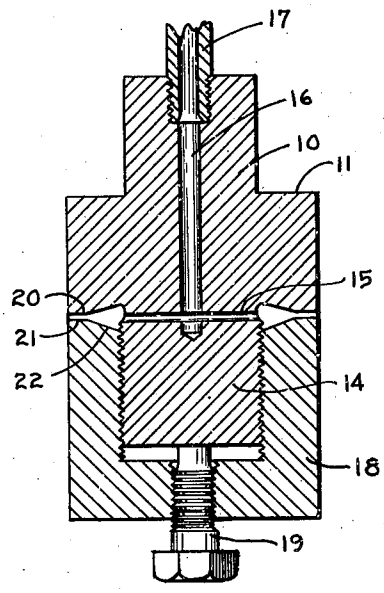
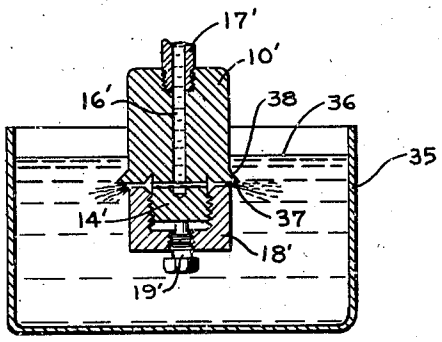


FIG. 4



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PRECIPITATOR

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2 Claims. (Cl. 23—252)

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This invention pertains to a precipitator for general usage, and more specifically, to an instrument of that type such as may be employed for precipitating materials from solvents into liquids in which the material is insoluble and the solvent itself is soluble, e. g., to precipitate dyestuffs from acid solutions by introduction into water or water solutions of organic or inorganic salts, acids or bases on other material such as dispersing agents, emulsifying agents, etc.

Among the objects of the invention is that of devising a precipitator which shall be effective for the purpose above mentioned or for similar purposes, which may be simple in design, inexpensive to manufacture, and which shall function at commercially obtainable pressures to precipitate a wide variety of materials.

It is another object of the invention to devise a precipitator which shall be effective to precipitate certain dyestuffs or other materials at a rapid rate and to give a maximum degree and rate of drowning, thereby precipitating such dyestuffs in very finely divided form.

Other objects will be apparent as the disclosure proceeds.

The invention will be described by reference to the figures of drawing and the accompanying specification in which like reference characters indicate like parts.

In the figures of drawing:

Fig. 1 is a sectional view showing one form which the invention may take.

Fig. 2 is a sectional view of part of the mechanism of Fig. 1 shown to an enlarged scale.

Fig. 3 is a view similar to Fig. 2, but showing another part of the mechanism of Fig. 1 to an enlarged scale.

Fig. 4 is a sectional view showing a modification.

Now referring to Fig. 1, there are two cooperating parts of the device, each of which is independently adjustable, and one of which serves to eject the solute such as dye in solution, and the other of which serves to supply the water or solution in which the dye or other material is to be drowned. The central cylindrical part designated by numeral 10 is turned down at its upper end and has a shoulder 11 against which bears a corresponding shoulder 12 on the ring or collar 13. At its lower end the cylindrical part 10 is also turned to a smaller diameter or stem and is threaded as at the portion 14. A series of radially disposed holes 15 are drilled to meet a centrally disposed larger opening 16 which registers with the center of a tube or conduit 17 threaded into the top of the part 10.

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An internally threaded sleeve 18 is adjustably positioned as shown in Figs. 1 and 2 and may be locked at any desired setting by a locking screw 19. The adjacent faces of the parts 10 and 18 are machined as illustrated, that is, the outermost portion of these faces are machines parallel and are highly ground or polished so as to give a substantially tight fit when the sleeve 18 is tightened to its extreme position at which time the said faces 20 and 21 are in contact. The parallelism is discontinued and the parts diverge inwardly as shown to form an annular space or cavity 22 of triangular or other cross section.

Again referring to Figs. 1 and 2, the collar 13 is threaded at its outer cylindrical surface and has a tapering portion running from the thread down to the lower face. A second ring 23 is threaded on to the said collar and has a cooperating tapered part, the two said tapered portions being designated by numerals 24 and 25. The ring 23 has an annular groove 26 with which register a series of openings 27. To each of these openings 27 is connected a tube 28 through which water or some other solvent or solution is introduced. The ring 23 is fixed in any adjusted position by a locking screw (not shown).

The tube 17 connects by a coupling 29 or by any other suitable means to a suitable receptacle 30 within which material to be precipitated and generally indicated by numeral 31 is contained. For convenience in closing off the flow, any suitable valve 32 may be installed in the tube or at any appropriate point in the line of flow. A connecting tube 33 is attached to a suitable source of pressure, for example, nitrogen or other gases under such pressure as may be found necessary for the precipitation of the particular material for which the device is employed. In operation, the parts assembled as shown in Fig. 1 are adjusted so that a very thin sheet of the solute or other material 31 is ejected under pressure between the parallel faces 20 and 21. The distance apart at which these faces are set depends upon the particular material precipitated and any desired adjustment may be effected by turning the sleeve 18 so that the said faces approach more closely or are spaced farther apart and when a suitable setting has been effected, the parts are then set in position by tightening locking screw 19.

Similarly, the parts 13 and 23 are adjusted so that they open or close the space provided between the conical faces 24 and 25. In actual practice, the setting of the parts 10 and 18 is such that a very thin, disk-like sheet of the material 31 is forced out under relatively high pressure. The parts 13 and 23 are so set that water or other ma-

terial under pressure, but not necessarily under so much pressure as the material 31, is extruded in sufficient quantities so that there results a favorable drowning ratio of solute to precipitant.

Any suitable container such as that designated by numeral 34 may be employed for receiving the precipitated material, the size of said container depending upon quantities of material involved. Of course, in certain installations where continuous flow may be involved, the supply of the material 31 may be continuously forced through the tube 17 and correspondingly, a continuous supply of water or other solvent introduced through the tubes 28 whereupon suitable provision may be made for receiving the continuous delivery from the device.

The solute or other material ejected between the parallel faces 20 and 21 issues in a very thin disk-like sheet and strikes against the converging circular sheet of water or other material coming from between the conically shaped faces 24 and 25. Under high pressure and striking at the angle shown, the particles are broken up and a degree of mixing results which is virtually complete. Under the high pressures employed, this mixing is accomplished very effectively and at a rapid rate of flow. Of course, the size of the installation may be varied and, depending upon the diameter of the parts, various rates of discharge may be obtained.

Now referring to Fig. 4, a modification will be described, this modification being simpler and adapted to function in connection with a container in which water, another solvent or solution is already present. Only the central part of the mechanism need be employed and that includes the same parts described by reference to Figs. 1 and 3, these parts being designated by the same numerals with primes. The precipitator is projected downwardly into a container 35 which contains that liquid or other material into which the material in container 30 or material from some similar source is to be precipitated. The container 35 should be high enough and the liquid surface 36 at such a point that the plane 37 at which the sheet of material to be precipitated issues will be well down within the solvent in the container and so that agitation of the materials will not result in overflow from the container. For further assisting to prevent the undesired condition, a flange 38 extends outwardly above the plane 37 thereby directing the material downwardly and not permitting it to rise toward the surface 36.

In the device as illustrated, the space between the adjacent faces 20 and 21 and 24 and 25 has been greatly exaggerated when considering the conditions under which the device would normally be employed. For most practical purposes, the space between faces 20 and 21 may be set from .001" or less to .005", but it is not intended to limit the use of the device to any particular setting since it may be advantageously employed under widely varying conditions. It is to be understood that the device is to be employed for many different materials and it is not intended to limit its use to any particular field nor is this disclosure to be interpreted in a limiting sense since more or less specific materials are mentioned.

There may be considerable variation in the angles at which the materials are ejected so long as the principles of the invention are applied. The faces 20 and 21 may be conical rather than flat or planar and the angle at which the sheets of material in solution to be precipitated and the water or other solution are caused to impinge on one another may be varied so that they are directed more at right angles, more in opposition or in some instances, it may be desired to have them engage while moving in the same general direction.

While one embodiment and a modification of the invention have been disclosed, it is to be understood that the inventive concept may be carried out in a number of ways. This application is, therefore, not to be limited to the precise details described but is intended to cover all variations and modifications thereof falling within the spirit of the invention and the scope of the claims.

We claim:

1. An orifice device adapted to discharge a liquid in sheet form comprising in combination a container acommodating said device, a body member, a stem thereon with a surrounding shoulder having a plane surface, an annular recess in said plane surface adjacent the stem, a sleeve adjustably mounted on the stem and means for securing the sleeve in adjusted position on the stem, said sleeve having a plane surface in opposed parallel relationship to the plane surface on the shoulder, an annular recess in said surface in opposed relationship to the aforementioned annular recess in the surface of the shoulder, said sleeve being movable to and from the shoulder to form a slit-like orifice in communication with an inner positioned cavity, a passageway in the body member, a plurality of radially disposed passageways through said stem adjacent the point of juncture of the stem with the body member, the passageway in the body member communicating with said radially disposed passageways and the latter with the aforesaid cavity, whereby a liquid may pass therethrough to be extruded in sheet form from the slit-like orifice.

2. An orifice device as defined in claim 1, wherein the body member is of cylindrical construction, and comprising in further combination, a stem on the body member at the end opposite to that carrying the first-mentioned stem, an inner sleeve on said second stem, an outer sleeve on said inner sleeve and adjustably mounted thereon, means for securing said outer sleeve in adjusted position on said inner sleeve, said inner and outer sleeves being provided with annular, conically and inwardly directed, opposed plane surfaces at that end of the sleeves in proximity to the aforementioned slit-like orifice, said outer sleeve being movable lengthwise of the inner sleeve to define an orifice extending in a direction to intercept the plane in which the first mentioned slit-like orifice is positioned, said outer sleeve being further provided with an annular cavity adjacent to and in communication with the orifice defined by the aforementioned conically and inwardly directed plane surfaces on the inner and outer sleeves, and a passageway in said outer sleeve in communication with said second orifice.

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