This invention relates to machines for generating foam from a foaming solution, for use in various industrial operations such as in the immobilization of wallboard into a sheet for drywall finishes. In the making of gypsum wallboard, foam is introduced into the plaster mix to lighten and improve the texture of the set gypsum. The foam is normally produced from a soap solution by introducing air thereto. This is often done by using a series of pumps and air injection regulators.

The invention is concerned with providing an exceptionally efficient, single unit for promptly generating profuse quantities of fine-textured foam of desired weight per unit volume. A principal feature of this foam generating machine is the close tolerance mounting of an annular rotor, having a circumferential series of restrictive passages, within a circular chamber whose peripheral defining walls are provided with one or more restrictive passages within a localized area and in communication with the series of passages in the rotor during rotation of the latter. A foam-forming solution having air or other suitable gas entrained therein is introduced into the rotor as it rotates and is ejected through the restrictive passages to produce a fine-textured foam whose weight per unit volume is dependent upon the quantity of air entrained in the feed solution.

Another feature is the provision of an eccentric, foam-receiving chamber surrounding the walls of the rotor chamber so as to have a narrow foam-receiving portion merging into a relatively wide foam-discharging portion, there being an outlet for foam leading from this latter portion. In this way, a supply of foam is constantly being crowded from the narrow portion into the wide portion and to discharge.

There is shown in the accompanying drawings a specific embodiment of the invention representing what is presently regarded as the best mode of carrying out the generic concepts in actual practice. From the detailed description of this presently preferred form of the invention, other more specific objects and features will become apparent.

In the drawings:

FIG. 1 represents an elevation of the machine as installed for use;

FIG. 2, a longitudinal section taken on the line 2—2 of FIG. 1;

FIG. 3, a fragmentary section taken on the line 3—3 of FIG. 2;

FIG. 4, a transverse section through the rotor, rotor chamber, and foam-receiving chamber as taken on the line 4—4 of FIG. 1 and drawn to a larger scale;

FIG. 5, an axial section through the same structure as taken on the line 5—5 of FIG. 4; and

FIG. 6, a fragmentary section taken on the line 6—6 of FIG. 4.

Referring to the drawings:

In the illustrated form of the machine, a housing 10 has opposing walls 11 and 12 of disk formation and an annular wall 13 peripherally thereof and interposed therebetween to define a closed chamber 14. Within this chamber, on a central bearing 15, is rotatably mounted a rotor 16 having an annular wall 16a. This rotor has a close tolerance fit, e.g. 0.01 inch, with the defining walls 11, 12, and 13 of chamber 14.

Rotor 16 is rigidly affixed to a shaft 17, which extends through a journal seal 18 in wall 11 and is connected by any suitable drive arrangement (not shown) to some power means, such as an electric motor.

Annular wall 16a of the rotor is provided with a circumferential series of mutually spaced, restrictive passages 19 extending therethrough. As illustrated, these are preferably closely spaced, narrow, axially extending, radial slots. For cooperation with such passages in producing foam from a foam-forming solution introduced into the space within annular wall 16a of the rotor, restrictive passage means are provided within and extending through a localized area of annular wall 13 of housing 10. As illustrated, such restricted passage means preferably takes the form of at least one slot 20 corresponding to the rotor slots 19. In the present instance, there are two such slots 20 extending through housing wall 13 from top to bottom thereof.

For enabling the foam generating capacity of the machine to be changed from time to time as desired, means are provided for closing off a selected portion of each slot 20 to reduce the capacity from its design maximum. As shown this is conveniently accomplished by providing a bore hole 21, FIG. 4, longitudinally of each slot intermediate its inflow and discharge openings and positioning a pin 22 of selected length within such hole. To this end, the walls of housing 10 are removably held together fluid tight in any suitable manner, for example, by cap screws 23 passing through interposed gaskets (not shown) in conventional fashion.

The foam-forming solution is introduced into rotor 16 by way of a passage 24 through housing wall 11 and a conduit 25, see especially FIGS. 2 and 5. For the sake of symmetry, the conduit extends radially of the housing, and is covered by a disk 26 supported by radial members 27, shaft 17 being accommodated by an aperture 28 therethrough. The motor (not shown) is conveniently mounted on disk 26.

In order to entrain the necessary air in the foam-forming solution introduced into the rotor through conduit 25, an injection nozzle 29 is advantageously employed. This comprises an air supply pipe 30, concentrically mounted within the through passage of a T pipe fitting 31 and of a nipple 32 and having a restricted injection orifice 30a at its discharge end. A supply pipe 33 for a soap solution is connected to the lateral 31a of the fitting 31. The solution is advantageously fed into supply pipe 33 by means of a variable speed, metering pump (not shown) to insure the desired volumetric rate of supply per unit time. An air regulator (not shown) is advantageously utilized to regulate the quantity of air in accordance with whether a light or heavy foam is desired. Thus, although a foam having a fine and uniform texture is always produced by the machine, its characteristics can be controlled and changed as desired.

Although the restricted passages 20 could discharge the generated foam into any container, it is much preferred that housing 10 include walls surrounding the rotor chamber walls so as to define a foam-receiving chamber therearound. As illustrated, housing disks 11 and 12 are of greater diameter than annular wall 13, and the axis of rotor 16 and center of rotor chamber 14 are offset relative to the center of such disks. A circumferential wall 34 completes the defining of an eccentric foam-receiving chamber 35 having a narrow portion 35a, into which restricted passages 20 discharge the generated foam, and a relatively wide portion 35b, from which a foam outlet 36 leads.

By reason of the eccentric formation of chamber 35, foam is crowded from the narrow portion thereof into the relatively wide portion and so to discharge into any
suitable conduit (not shown) connected to outlet 36 for delivery to the point of use. Whereas there is here illustrated and specifically described a certain preferred construction of apparatus which is presently regarded as the best mode of carrying out the invention, it should be understood that various changes may be made and other constructions adopted without departing from the inventive subject matter particularly pointed out and claimed herebelow.

I claim:

1. A foam generating machine, comprising a housing having walls defining a closed, circular chamber having closed top and bottom and a substantially imperforate annular wall; an annular rotor fitted into said chamber with close tolerance, said rotor having a circumferential series of mutually spaced, restrictive passages extending therethrough; restrictive passage means within and extending through a localized area of the said annular wall from communication with said series of passages, as the rotor rotates, to the outside of said chamber; means for introducing within the rotor as it rotates, a foam-forming solution having a gas entrained therein; and means for rotating the rotor.

2. The machine of claim 1, wherein the restrictive passages through the rotor are radial slots extending axially of the rotor.

3. The machine of claim 2, wherein the restrictive passage means through a localized area of the annular wall comprise at least one slot substantially corresponding to those through the rotor; and wherein there is additionally provided, for each slot, means for closing off a selected portion of the slot to reduce the foam-generating capacity of the machine.

4. The machine of claim 1, wherein the housing also has walls surrounding the chamber-defining walls to define a foam-receiving chamber.

5. The machine of claim 4, wherein the walls surrounding the chamber-defining walls are eccentrically disposed with respect to said chamber-defining walls and the foam-receiving chamber is eccentrically annular with a narrow portion merging into a wide portion, the restrictive passage means for generated foam leading into the narrow portion; and wherein there is provided a foam outlet leading from the wide portion of the foam-receiving chamber.

References Cited by the Examiner

UNITED STATES PATENTS

2,627,394 2/1953 Spencer 259—9
3,050,188 8/1962 Nisser et al. 259—96 X

FOREIGN PATENTS

664,464 1/1952 Great Britain.

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