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Pennington

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[54] **DRUM COMPRISING SUPPORT MOUNTED GRID STRUCTURE**

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[52] **U.S. Cl.** ..... **162/357,** 29/121 R, 162/368, 162/372, 210/402

[51] **Int. Cl.** **D21f 1/60**

[58] **Field of Search** ..... 162/357, 368, 372, 162/314, 217, 210; 210/402, 487; 29/121 A, 121 H, 121 R, 127, 128

[56] **References Cited**

UNITED STATES PATENTS

3,577,315	5/1971	Franklin	162/357
3,105,043	9/1963	Rich et al.	210/402
3,259,961	7/1966	Bryand	29/121 R
3,579,422	5/1971	Minick et al	162/314
3,139,375	6/1964	Bryand	162/372 X
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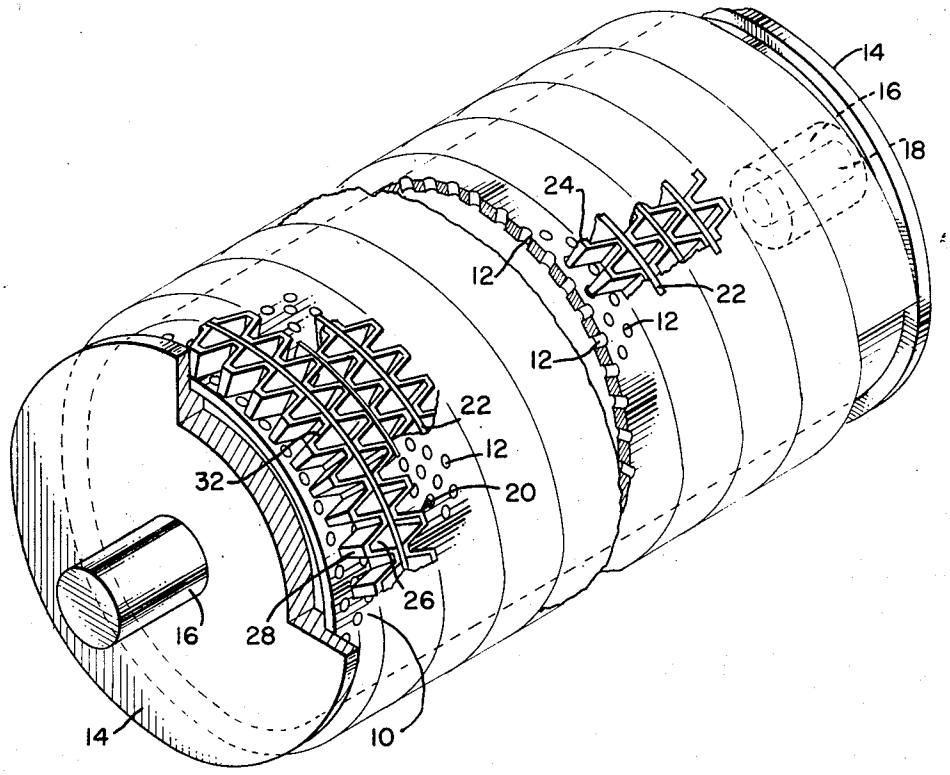
[57] **ABSTRACT**

A drum comprising an annular, perforated, rigid support and an annular honeycomb or grid structure mounted circumferentially around the support. The grid structure includes planar strip means extending circumferentially of the support providing the drum with substantial circumferential rigidity; and the support provides the drum with substantial longitudinal stiffness.

10 Claims, 2 Drawing Figures



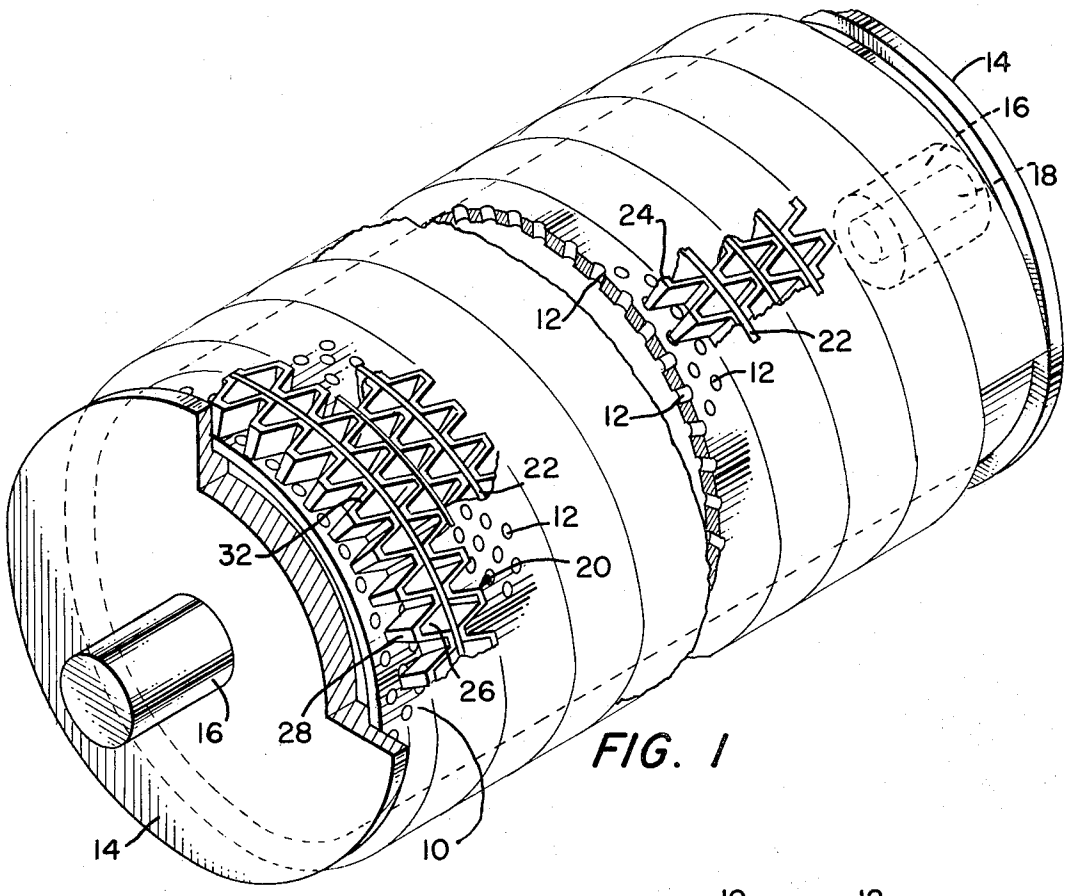


FIG. 1

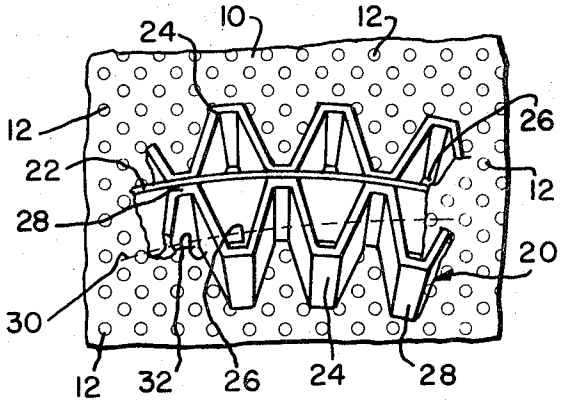


FIG. 2

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DRUM COMPRISING SUPPORT MOUNTED GRID STRUCTURE

The present invention relates to drums formed from annular honeycomb or grid structures such as, for example, employed by the pulp and paper making industry.

Drums of this general type are capable of employment in a wide variety of applications including, by way of illustration, the filtering of slurries and the air drying of paper. Conventionally, these drums sometimes have been constructed from strip material arranged to longitudinally extend length-wise of the drums, but more preferably have been formed from circumferentially wound strip material as this latter construction provides the drums with significantly greater circumferential strength and rigidity. Drums of this latter, more advantageous, construction are, for example, disclosed in U.S. Pat. Nos. 3,105,043 and 3,320,399, both assigned to the assignee of the present invention, which describe drums formed from circumferentially wound, alternately arranged planar and waved strips welded one to the other. The manufacture of such prior drums, however, requires that the welded interconnections of the strips be sufficiently strong and enduring to provide the drums with substantial longitudinal stiffness; and, hence, during the manufacture of these prior drums, difficulties may be encountered in forming the welded interconnections of the strips at a rate sufficiently rapid to produce an economical drum.

The principal object of the present invention is to provide a new and improved drum including honeycomb or grid structure, which drum is particularly constructed and arranged to possess both substantial circumferential rigidity and substantial longitudinal stiffness.

Another object of the invention is to provide a new and improved drum of the type set forth which, although including circumferentially wound strip material, is particularly constructed and arranged to avoid the necessity for reliance on the welded interconnections of the strip material to provide the drum with longitudinal stiffness.

Another object is to provide a new and improved drum of the type set forth which is relatively simple and economical in manufacture.

Further objects and advantages of the invention will be apparent from the following description taken in connection with the accompanying drawings wherein the preferred form of the invention has been given by way of illustration only.

In accordance with the invention, a drum may comprise an annular, rigid support having openings through its thickness and an annular grid structure mounted circumferentially around the support with its inner circumference on the outer circumference of the support, the grid structure including waved strip means extending around the circumference of the support and planar strip means longitudinally extending around the circumference of said support alternately arranged with the waved strip means, and the waved strip means and the planar strip means being interconnected and cooperating to define openings through the grid structure in communication with the openings in the support.

Referring to the drawings:

FIG. 1 is a view in perspective, partially broken away and in section, illustrating one drum embodying the invention; and

FIG. 2 is an enlarged, fragmentary top or plan view of the drum of FIG. 1 showing details of the construction of the grid structure of the drum.

Referring more particularly to the drawings wherein similar reference characters designate corresponding parts throughout the several views, the illustrated drum comprises a rigid, cylindrical support or shell **10** perforated to include openings **12** radially through its thickness at spaced locations throughout its length and arcuate extent. The support **10** is formed from steel or other similar enduring material of significant strength and is of a substantial thickness at the minimum about one-sixteenth of an inch. The openings **12** are unrestricted and of relatively large cross-sectional diameter to freely permit fluid flow to-and-from the interior of the support **10**, the total cross-sectional area of the openings **12** normally being at least about 20 percent of the outer circumference of the support **10**. The ends of the support **10** are closed by end closure plates **14**, welded or otherwise affixed to the support **10**, which carry integral stub shafts **16** adapted for rotatably mounting the ends of the support **10**. As illustrated, the end plates **14** are of diameters substantially greater than the support **10** to have their annular outer circumferences radially outwardly of the outer circumference of the support **10**; and one of the stub shafts **16** is hollow and contains a conduit **18** through which fluid may be drained from the interior of the support **10** or supplied to the latter, depending on the particular application in which the drum is employed.

A cylindrical honeycomb or grid structure, shown fragmentarily in the drawings as **20**, is mounted around the outer circumference of the support **10** with its inner circumference directly supported by the outer circumference of the latter. As illustrated, the grid structure **20** is, per se, of construction described in the aforementioned U.S. Pat. No. 3,105,043 and includes sheet metal, planar and waved strips **22, 24**, respectively, which are helically wound around the support **10** in alternate arrangement throughout the length of the latter. The strips **22, 24** are arranged with their greatest transverse or widthwise dimensions radially of the support **10** and of the grid structure **20**; and, as illustrated, are of such transverse dimensions that the outer circumference of the grid structure **20** is aligned with the outer circumferences of the end closure plates **14**. The strips **22, 24** cooperate to provide the grid structure **20** with a plurality of therebetween openings **26** generally radially through the thickness of the grid structure **20** in communication with the openings **12** in the support **10**, the openings **26** providing the grid structure **20** with a total open area which may be in the range of 70 percent to 90 percent of its total circumferential area. The waved strip **24** is preferably formed to comprise straight parallel connecting portions **28**, alternately arranged on the opposite sides of its central plane **30**, and diagonal portions **32** extending transversely to such central plane **30** interconnecting the portions **28**. However, the portions **28** may, if desired, be formed of truncated triangular construction as described in U.S. Pat. No. 3,105,043.

The inherent longitudinal strength or stiffness of the support **10** provides the aforedescribed drum with significant longitudinal stiffness, thus causing the welds

interconnecting the strips **22, 24** to function solely to interconnect the strips and maintaining such welds substantially unstressed during the employment of the drum. The inherent longitudinal rigidity of the circumferentially wound planar strip **22** provides the drum with notable circumferential rigidity.

The drum may be advantageously manufactured by a method of the type described in co-pending U. S. Pat. application Ser. No. 196,074 entitled METHOD OF MAKING ANNULAR GRID STRUCTURE which was filed by Lawrence A. Carlsmith on the filing date of this application. In this event, the support **10** would be employed as the rotatably driven mandrel and, as described in the aforesaid co-pending patent application, the strips **22, 24** would be helically wound around the support **10** in alternate fashion whereby the planar strip **22** is wound tightly around the support **10** and the wound strips cooperate to progressively form an axial build-up of the grid structure **20** around the support **10.** Adjacent coils of the strips **22, 24** would be interconnected, such as by welding, during the winding such that the planar strip **22** is during the welding substantially heated at the locations of the welds while tightly wound around the support **10.** Then, the heated tightly wound planar strip **22** would be allowed to cool while around the support **10.** If desired, the strips **22, 24** may be welded along their inner circumferences to the outer circumference of the support **10.**

As will be seen, the drum provided by the invention is capable of employment in a wide variety of applications both in the pulp and paper making industry and elsewhere. For example, with particular reference to the pulp and paper making industry, the drum with a covering circumferential filter screen if the openings **26** be too large to serve as filtering openings or without such covering screen if the openings **26** be sufficiently small to function as filtering openings, is readily employable as a rotatably driven filter drum for filtering a slurry such as, by way of illustration, a pulp suspension or an effluent sludge. In this event, liquid drained from the suspension inwardly through the openings **26, 12** in the grid structure **20** and support **10** would be discharged from the interior of the support **10** through the conduit **18.** Also, the drum provided by the invention is capable of employment in the air drying of a paper web passed circumferentially thereover in which event moist air can either be discharged from the interior of the support through the conduit **18** or, alternatively, the drying air can be supplied through such conduit **18** and the interior of the support **10** and communicating openings **12,26.** Moreover, if desired, the drum of the invention, either with or without a circumferential cover around the grid structure **20,** could be employed as a supporting roll.

It will be understood, however, that, although only a single embodiment of the invention has been illustrated and hereinbefore specifically described, the invention is not limited merely to this single embodiment but rather contemplates other embodiments and variations within the scope of the following claims.

Having thus described my invention, I claim:

1. A drum comprising an annular, rigid support having openings through its thickness and an annular grid structure mounted circumferentially around said support with its inner circumference directly supported by the outer circumference of said support, said grid structure including waved strip means extending around the circumference of said support and planar strip means longitudinally extending around the circumference of said support alternately arranged with said waved strip means, and said waved strip means and said planar means being interconnected and cooperating to define openings through said grid structure in communication with said openings in said support.

2. A drum according to claim **1,** wherein said grid structure consists only of said waved strip means and said planar strip means.

3. A drum according to claim **1,** wherein said waved strip means includes alternating generally diagonal segments and therebetween connecting segments on opposite sides of the central plane of said waved strip means, said connecting segments being connected to said planar strip means and said diagonal segments crossing said central plane of said waved strip means.

4. A drum according to claim **1,** wherein said grid structure is welded to said support.

5. A drum according to claim **1,** further comprising end closure means closing the ends of said support, said end closure means including annular outer peripheries aligned with the outer circumference of said grid structure.

6. A drum according to claim **1,** wherein said support is of a radial thickness at least about one-sixteenth of an inch, and the openings in said support provide said support with at least 20 percent open area, and said waved and planar strip means are helically wound around said support.

7. A drum according to claim **1,** wherein said grid structure extends throughout the length of said support.

8. A drum according to claim **1,** wherein said grid structure consists only of said waved strip means and said planar strip means, said support is of a radial thickness at least about one-sixteenth of an inch, the openings in said support provide said support with at least 20 percent open area, and said waved and planar strip means are helically wound around said support, and further comprising end closure means closing the ends of said support, said end closure means including annular outer peripheries aligned with the outer circumference of said grid structure.

9. A drum according to claim **8,** wherein said waved strip means includes alternating generally diagonal segments and therebetween connecting segments on opposite sides of the central plane of said waved strip means, said connecting segments being connected to said planar strip means and said diagonal segments crossing said central plane of said waved strip means.

10. A drum according to claim **9,** wherein said grid structure extends throughout the length of said support.

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