Feb. 23, 1954 W. E. K. TROTMAN 2,669,910

CYLINDER MOLD FOR USE IN PAPERMAKING

Filed Aug. 8, 1950 3 Sheets-Sheet 1

FIG. 1.

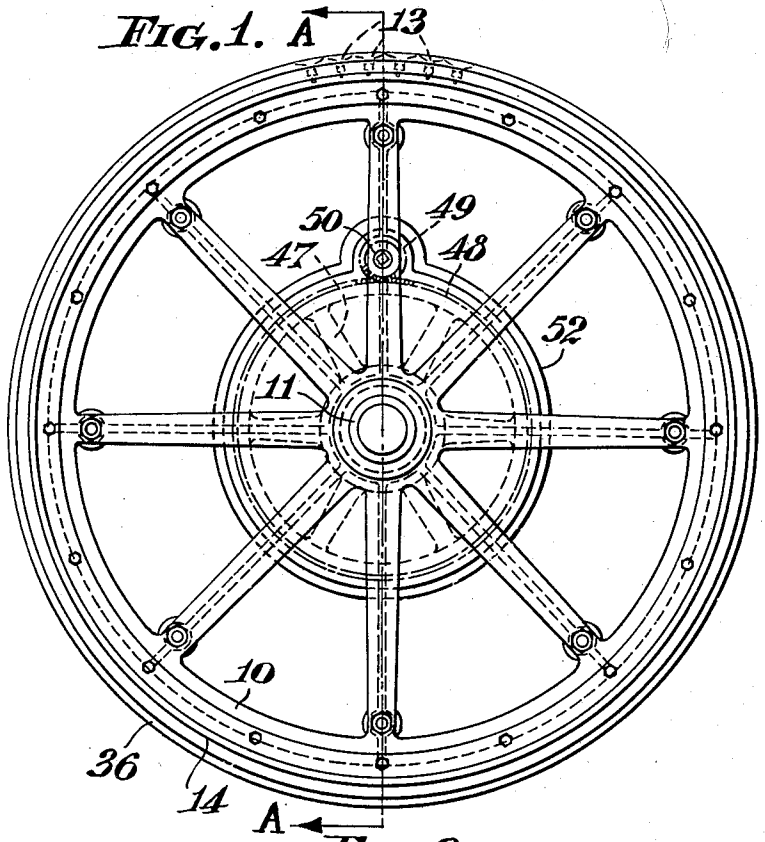
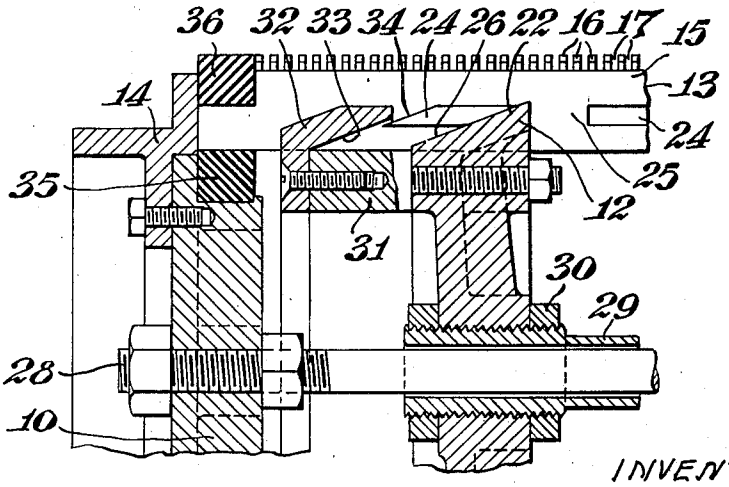


FIG. 3.



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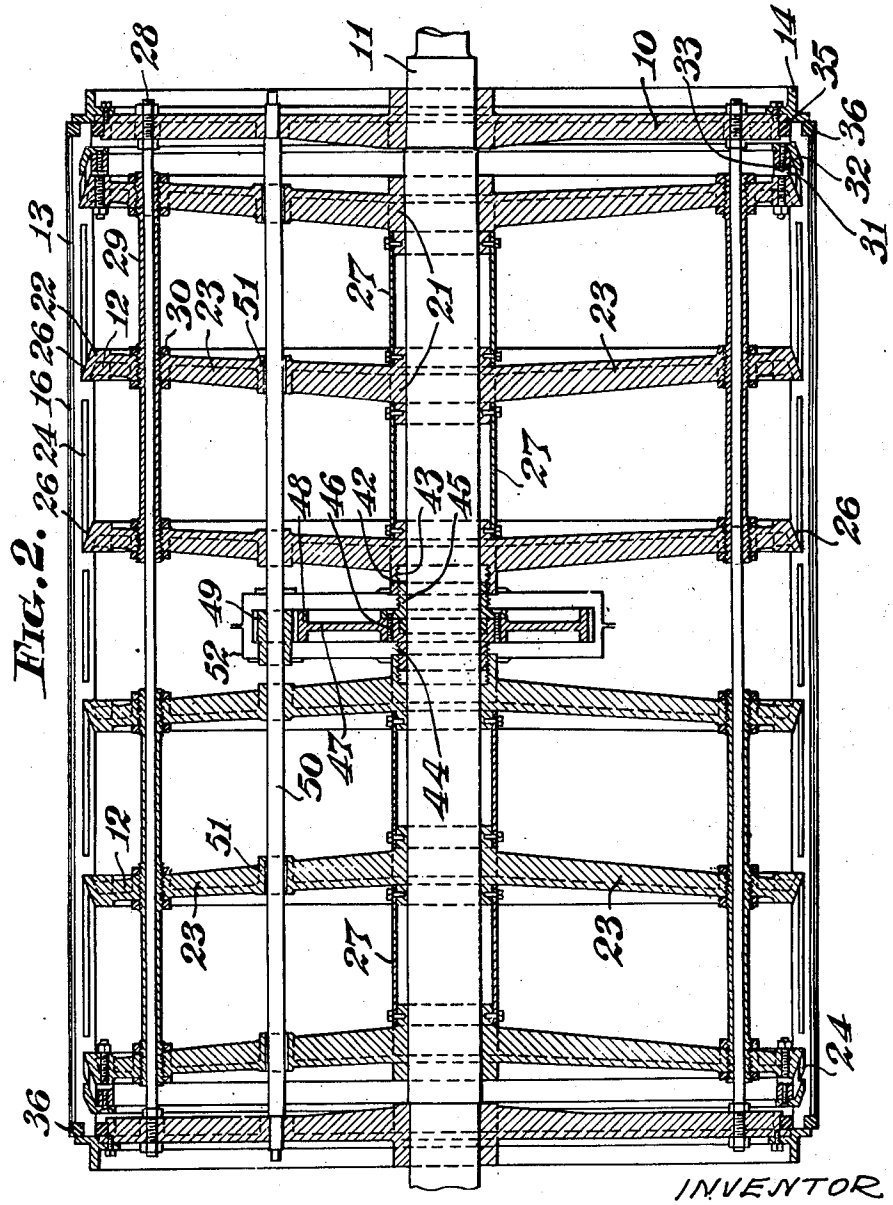

FIG. 2.

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FIG. 4.

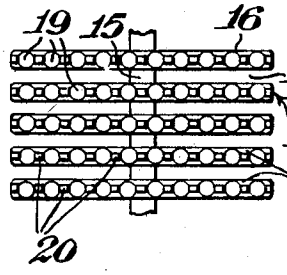


FIG. 5.

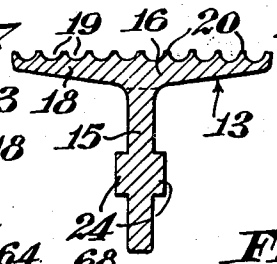


FIG. 6.

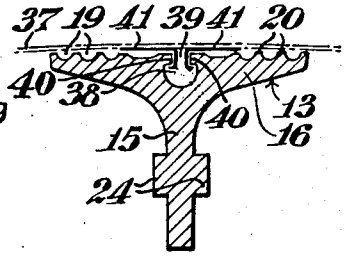
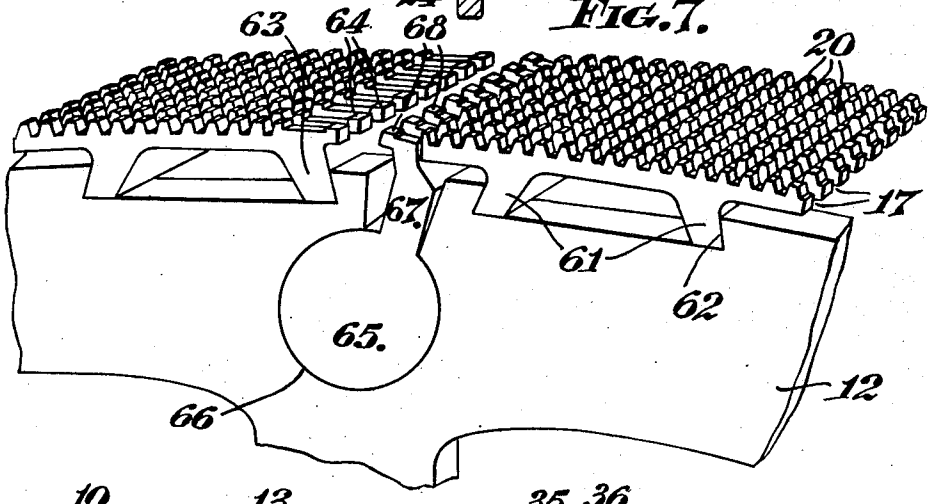


FIG. 7.



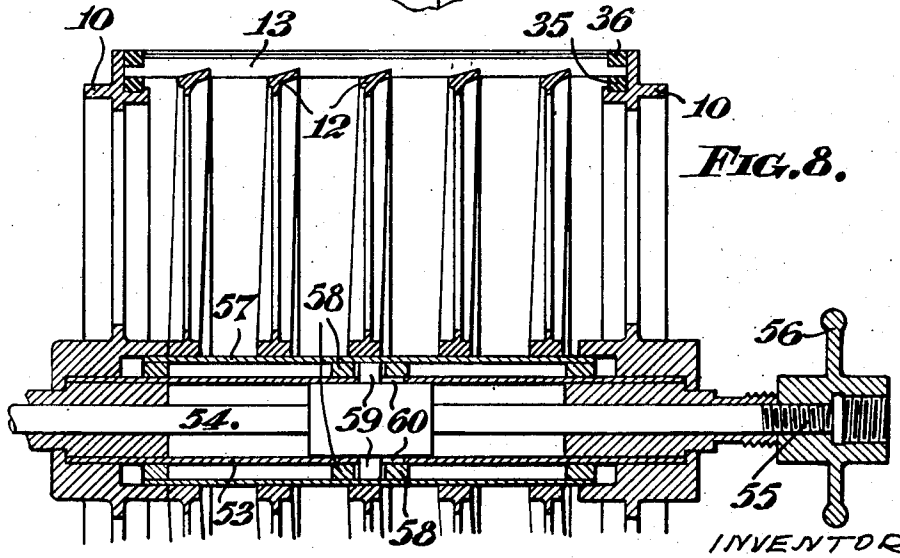


FIG. 8.

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Patented Feb. 23, 1954

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UNITED STATES PATENT OFFICE

2,669,910

CYLINDER MOLD FOR USE IN PAPERMAKING

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Application August 8, 1950, Serial No. 178,293

9 Claims. (Cl. 92—43)

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This invention relates to cylinder moulds for use in paper-making.

A cylinder mould may be described as a rotary sieve that is used in the manufacture of high class paper and board paper. The cylinder mould is partly immersed and rotates in a vat of water containing a small proportion of suspended fibre and by the action of the water draining through the outer mesh covering of the cylinder mould, fibres are deposited on the outer cover to form a sheet of paper. It is therefore most essential that there shall be even drainings through the outer mesh cover if streaks in the "look through" of the paper are to be avoided. The cylinder mould constitutes the lower roll of a press, the top roll being felt-covered and pressing upon the cylinder mould sufficiently heavily to suck off the paper deposited upon the cylinder mould and carry it away for further treatment such as rolling, drying and finishing. The top roll always stretches the outer mesh covering and the latter can rarely in practice be stretched sufficiently tightly in its initial fitting over the supporting framework to prevent movement of the covering with consequent tearing of the covering and damage to the surface and quality of the paper.

As previously constructed, a cylinder mould consisted of a number of rings mounted on a common shaft said rings being connected together by means of a number of closely spaced parallel rods to form a skeleton cylinder. An endless coil of wire was then wound helically on to said skeleton, said helical wire forming a support for a number of woven wire mesh covers of decreasing mesh which in turn formed a support for the outer cover of woven wire mesh having about 2500 holes to the square inch. The provision of a number of wire mesh covers between the helical wire and the outer cover was essential in order to provide regular drainage beneath the outer cover and to reduce the streaky effect that would otherwise be caused by the helical wire. As may be appreciated, the construction and maintenance of cylinder moulds of such complicated formation is a matter requiring considerable skill and experience, and the principal object of the present invention is to provide a form of cylinder mould which is at least as efficient as the previous forms of cylinder mould but which is considerably simpler in construction with the elimination of the wire stitches. It is another important object of the invention to provide a cylinder mould wherein the outer covering assumes a true circle in cross-section and further to provide for the variation of the periphery of the

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mould within appreciable limits while maintaining such true circular cross-section. Other objects and advantages of the invention will appear hereinafter.

According to the invention, the outer covering of a cylinder mould is supported by means of a plurality of bars having supporting surfaces formed with intersecting grooves or passages thereby providing multi-point support for the outer covering and a plurality of interconnected drainage channels beneath the covering.

Said supporting bars advantageously comprise a head and a stem or stems by means of which the bars are supported. The bars may conveniently be supported by means of rings mounted upon a central shaft.

According to a further feature of the invention, the bars may be supported so that they may be adjusted radially of the cylinder mould whereby they may be moved into contact with the outer covering to maintain same in a taut and tightly stretched condition. Such adjustment of the supporting bars may conveniently be effected by means of rings upon which the bars are supported, said rings having rims forming tapers or ramps which engage the stems of the bars, so that movement of one or more of said rings will cause the bars to be displaced radially in order to vary the effective circumference of the cylinder mould. The rims of the rings are conveniently slotted for engagement by the stems of the bars in order to prevent circumferential displacement of said bars and the parts of the tapers or ramps may co-operatively engage members or parts of the bars. Thus, the ramps may engage rollers mounted on each side of the stem of the bar, or the stem of the bar may be formed with abutments having surfaces inclined to mate with the ramps of the rings.

The surface of the head of the bar that contacts the outer covering is radiused to conform to the curvature of the covering and is fashioned to provide multi-point support for the covering and efficient and regular drainage therebeneath. Thus, for example, the head may be divided into a number of parallel cross-pieces by the formation of parallel passages through the head at right angles to its length, said parallel cross-pieces being themselves given a wavy or undulating formation by the formation of parallel grooves along the length of the head. The result is a large number of regularly spaced point supports for the outer covering and a series of interconnecting channels and passageways communicating with the interior of the cylinder mould

and providing efficient and regular drainage beneath the outer covering. The spacing of the points of support is such that at the maximum expansion of the mould, the outer covering can bridge and support itself between the points of support of adjacent T-section bars. In cases where a larger movement of the T-section bars might leave gaps, the bars are staggered or overlap.

The invention will now be described by way of example with reference to the accompanying drawings, wherein:

Figure 1 is an end view of an adjustable cylinder mould,

Figure 2 is a vertical section on the line A—A of Figure 1,

Figure 3 is a fragmentary section on an enlarged scale,

Figures 4 and 5 are corresponding plan and end views of a supporting bar,

Figure 6 illustrates one method of securing the outer cover,

Figure 7 illustrates a fixed cylinder mould and shows the method of securing the outer cover, and

Figure 8 illustrates an alternative method of adjusting the supporting bars.

In general, the cylinder mould comprises a pair of end rings 10 mounted on a central shaft 11 so as to be adjustable thereon, a large number of cover supporting bars 13 carried by the rings 12, a pair of sealing rings 14 for holding the bars 13 in position, and means to be later described for adjusting the rings 12 on the shaft 11.

Referring more particularly to Figures 4 and 5, the bars 13 are of T-section and comprise a stem 15 extending radially inward of the cylinder mould and a head 16 formed with transverse channels 17, forming ribs 18, and longitudinal grooves 19. The supporting surface of the head 16 is therefore made up of a plurality of small surfaces 20 upon which the outer covering of the mould is supported, while said points of support are surrounded by the intersecting grooves and channels 19 and 17 which ensure quick and efficient drainage into the interior of the mould. The rings 12 are of spider form and comprise a hub 21, an outer rim 22 and radial arms 23. The stems 15 of the bars 13 are formed with ribs 24 which are interrupted at intervals 25 for engagement by tapered periphery 26 of the rims 22, the adjacent ends of the rib being correspondingly tapered. The rims 22 are slotted for engagement with the stems 15 of the bars 13. The hubs 21 of the rings 12 are connected together by means of spacer tubes 27 and the rings 12 are assembled on a number of longitudinal tie bars 28 secured between the end rings 10 and passing through the radial arms 23 of the rings 12. Additional spacing members 29 and 30 for the rings 12 are carried by the tie bars 28. The end rings of the rings 12 are fitted with plugs 31 to which are fitted bar retaining rings 32 which are formed with tapered annular surfaces 33 for engagement with correspondingly tapered surfaces 34 on the ends of the ribs 24. The ends of the bars 13 rest upon rubber rings 35 fitted into a groove in the end rings 10, the end parts of the bars 13 being cut away to receive a second rubber ring 36, the assembly of bars and rings being held in position by means of the sealing rings 14. It will be understood that an outer covering 37 of fine mesh gauge is applied over the cylindrical surface presented by the large number of bars 13.

One method of locking the cover in position

is shown in Figure 6. One of the bars 13 is modified so as to constitute a locking bar by the formation of a central longitudinal channel 38 having a restricted outlet 39 forming shoulders 40. The ends of the covering 37 are fitted with clips 41 which are adapted to be engaged with the shoulders 40.

The provision of the interrupted ribs 24 for engagement by the tapered surfaces 25 is for the purpose of effecting adjustment of the bars 13 radially with respect to the cylinder mould in order to stretch the outer covering 37 to maintain it in a taut condition. It will be seen that the rings 12 are connected together in two sets by means of the various spacing members and that the tapered surfaces 26 slope downwardly away from the vertical centre plane of the mould. The innermost rings 12 are formed with hollow bosses 42 which are internally threaded at 43 for engagement by externally threaded sleeves 44 and 45 secured together by means of bolts 46, the compound member being formed with radial vanes 47 and a toothed rim 48 which is adapted to mesh with a pinion 49 keyed to an actuating shaft 50 which passes freely through bosses 51 on the arms 23 and out through the end rings 10 for connection to suitable actuating means which may be automatic or hand-operated. The bosses 42 and sleeves 44 and 45 are threaded in such manner that by rotation of the sleeves 44 and 45, the sets of rings 12 are moved in opposite directions either towards or away from the centre of the mould. The actuating mechanism comprising the sleeves 44 and 45 and pinion 49 is enclosed within a casing 52.

An alternative method of adjusting the rings 12 is illustrated in Figure 8. The end rings 10 are mounted on a hollow shaft 53 through which passes a shaft 54 threaded at its end 55 for engagement with an operating handwheel 56. The rings 12 are secured to a hollow shaft 57 slidably mounted on the shaft 53 and provided internally with stop rings 58. The shaft 54 is provided with abutments 59 which extend through slots 60 in the shaft 53 and enter the space between the rings 48. It will be seen that rotation of the shaft 54 will cause the shaft 57 with the associated rings 12 to be moved longitudinally.

It is not always necessary for the bars 13 to be adjustable radially of the cylinder mould and a form of bar suitable for use in a stationary mould is illustrated in Figure 7. The surface of the bars is formed as previously described to present the drainage channels beneath the outer-covering of the mould but the bar is formed with a pair of outwardly directed stems 61 which make sliding engagement within dovetail channels 62 in the bar supporting rings 12. In a stationary mould of this kind, the outer cover may be secured by means of a pair of locking bars. One of the locking bars 63 is formed with teeth 64 while the other locking bar consists of a cylindrical bar 65 which fits within a channel 66 in the rings 12, the bar 65 being formed with an arm 67 which is formed with teeth 68 along its upper edge which mesh with the teeth 64 of bars 63 to clamp the ends of the outer cover together.

It is to be emphasised that the sole support for the outer covering is constituted by the bars 12, which provide a supporting surface that is a very close approximation to an engineering circumference so that when the cylinder mould contacts the couch roll, the resulting paper is of more regular texture and thus of better quality. The

new form of support also obviates the loss and damage caused in the use of the previous forms of cylinder mould due to a large number of small fibres becoming trapped between the various layers of the mesh support.

I claim:

1. A cylinder mould comprising a central shaft, a plurality of rings mounted upon said shaft, said rings having slotted peripheries, a large number of bars supported by said slotted rings and extending therebetween over substantially the full width of the mould, said bars each having a stem portion by means of which they are supported by engagement with the slotted peripheries of said rings and a radiused head portion, the width of said head portions being such that together they constitute a cylindrical surface and said head portions being formed with intersecting grooves and passages whereby said cylindrical surface is made up of a plurality of small spaced surfaces and a plurality of drainage channels are provided through said cylindrical surface, and an outer covering supported by said plurality of small spaced surfaces.

2. A cylinder mould comprising a central shaft, a plurality of rings mounted upon said shaft, said rings being formed with slotted outer rims and with inclined peripheral surfaces, a large number of bars extending transversely over substantially the full width of the mould, said bars being of T-section, the stems of the bars engaging the slots in the outer rims of said rings, while the heads of the bars are radiused such that together they constitute a cylindrical surface and are formed with intersecting grooves and passages whereby said cylindrical surface is made up of a plurality of small spaced surfaces and a plurality of drainage channels are provided through said cylindrical surface, interrupted ribs on the stems of said bars, said ribs having inclined surfaces for cooperation with said inclined peripheral surfaces of said rims, an outer covering supported by the heads of said bars, and means for adjusting said rings longitudinally along said central shaft whereby to effect radial adjustment of said bars by cooperation between the inclined surfaces of said ribs and the inclined peripheral surfaces of said rings.

3. A cylinder mould comprising a central shaft, a plurality of rings mounted upon said shaft, said rings being formed with slotted outer rims and with inclined peripheral surfaces sloping downwardly away from the vertical centre plane of the mould, a large number of bars extending transversely over substantially the full width of the mould, said bars being of T-section, the stems of the bars engaging the slots in the outer rims of said rings, while the heads of the bars are radiused such that together they constitute a cylindrical surface and are formed with intersecting grooves and passages whereby said cylindrical surface is made up of a plurality of small spaced surfaces and a plurality of drainage channels are provided through said cylindrical surface, interrupted ribs on the stems of said bars, said ribs having inclined surfaces for cooperation with said inclined peripheral surfaces of said rims, an outer covering supported by the heads of said bars, and means carried by said shaft for adjusting said rings longitudinally along said shaft away from and towards the vertical centre plane of the mould whereby to effect radial adjustment of said bars by cooperation between the inclined surfaces of said ribs and the inclined peripheral surfaces of said rings.

4. A cylinder mould comprising a central hollow shaft, a plurality of rings mounted upon said shaft, said rings being formed with slotted outer rims and with inclined peripheral surfaces, a large number of bars extending transversely over substantially the full width of the mould, said bars being of T-section, the stems of the bars engaging the slots in the outer rims of said rings, while the heads of the bars are radiused such that together they constitute a cylindrical surface and are formed with intersecting grooves and passages whereby said cylindrical surface is made up of a plurality of small spaced surfaces and a plurality of drainage channels are provided through said cylindrical surface, interrupted ribs on the stems of said bars, said ribs having inclined surfaces for cooperation with said inclined peripheral surfaces of said rims, an outer covering supported by the heads of said bars, and means operated from said central hollow shaft for adjusting said rings longitudinally along said central hollow shaft whereby to effect radial adjustment of said bars by cooperation between the inclined surfaces of said ribs and the inclined peripheral surfaces of said rings.

5. A cylinder mould comprising a central shaft, a plurality of rings mounted upon said shaft, said rings having slotted peripheries, a large number of bars supported by said slotted rings and extending transversely over substantially the full width of the mould, said bars each having a stem portion by means of which they are supported by engagement with the slotted peripheries of said rings and a radiused head portion, the width of said head portions being such that together they constitute a continuous cylindrical surface and said head portions being formed with parallel equispaced passages passing right through the head portions and with parallel equispaced grooves at right angles to said passages whereby said cylindrical surface is made up of a plurality of small equispaced surfaces and a plurality of interconnected drainage channels are provided through said cylindrical surface, and an outer covering supported by said plurality of small equispaced surfaces.

6. A cylinder mould comprising a central shaft, a plurality of rings mounted upon said shaft, said rings being formed with dovetail channels in their outer peripheries, a large number of bars extending transversely over substantially the full width of the mould, said bars each being formed with a pair of outwardly divergent stems which make sliding engagement with said dovetail channels, and with a radiused head portion, the width of said head portions being such that together they constitute a cylindrical surface and said head portions being formed with intersecting grooves and passages whereby said cylindrical surface is made up of a plurality of small spaced surfaces and a plurality of drainage channels are provided through said cylindrical surface, and an outer covering supported by said cylindrical surface.

7. A cylinder mould according to claim 1, wherein the ends of said bars are held between inner and outer resilient rings.

8. A cylinder mould comprising a central shaft, a plurality of rings mounted on said shaft, a large number of bars extending transversely over substantially the full width of the mould, said bars each having a stem portion by means of which they are supported by said rings and a radiused head portion, said head portions together constituting a continuous cylindrical sur-

face, and being formed with intersecting grooves and passages whereby said cylindrical surface is made up of a plurality of small spaced surfaces and a plurality of drainage channels are provided through said cylindrical surface, an outer covering supported by said plurality of small equispaced surfaces, retaining rings having inclined annular surfaces, inclined surfaces on the stem portions of said bars, said inclined surfaces being engaged by said inclined annular surfaces on said retaining rings thereby to restrain said bars against radial movement, and end retaining rings engaging the ends of said bars for restraining said bars against longitudinal movement.

9. A cylinder mould comprising a plurality of rings, a number of bars supported by said rings and extending therebetween over substantially the full width of the mould, said bars each having a stem portion by means of which they are supported by said rings and a radiused head portion, the width of said head portions being such that

together they constitute a cylindrical surface and said head portions being formed with intersecting grooves and passages whereby said cylindrical surface is made up of a plurality of small spaced surfaces and a plurality of drainage channels are provided through said cylindrical surface, and an outer covering supported by said cylindrical surface.

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