Sept. 2, 1958 A. HESSE ET AL 2,850,165

CYLINDRICAL SCREEN CAGE

Filed June 22, 1954 3 Sheets-Sheet 1

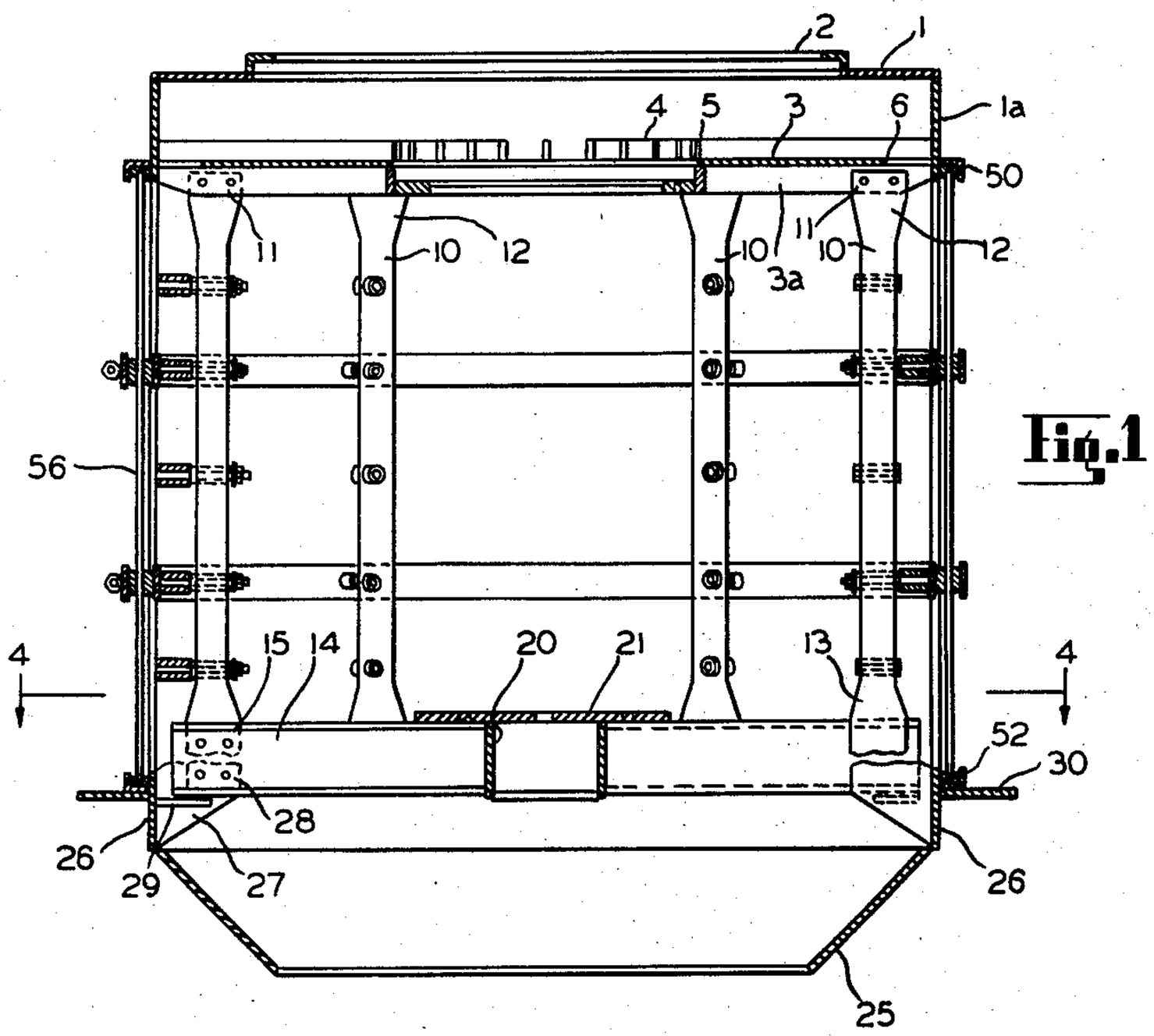

Fig.1

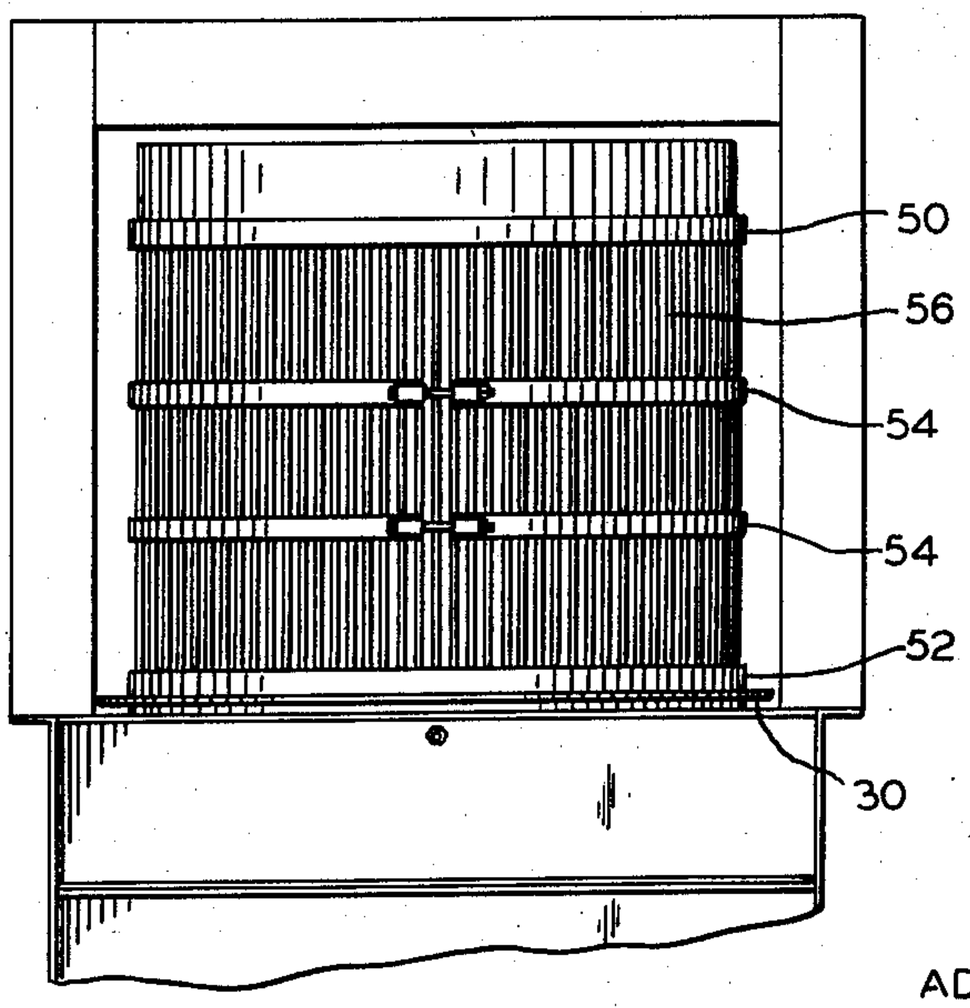

Fig.2

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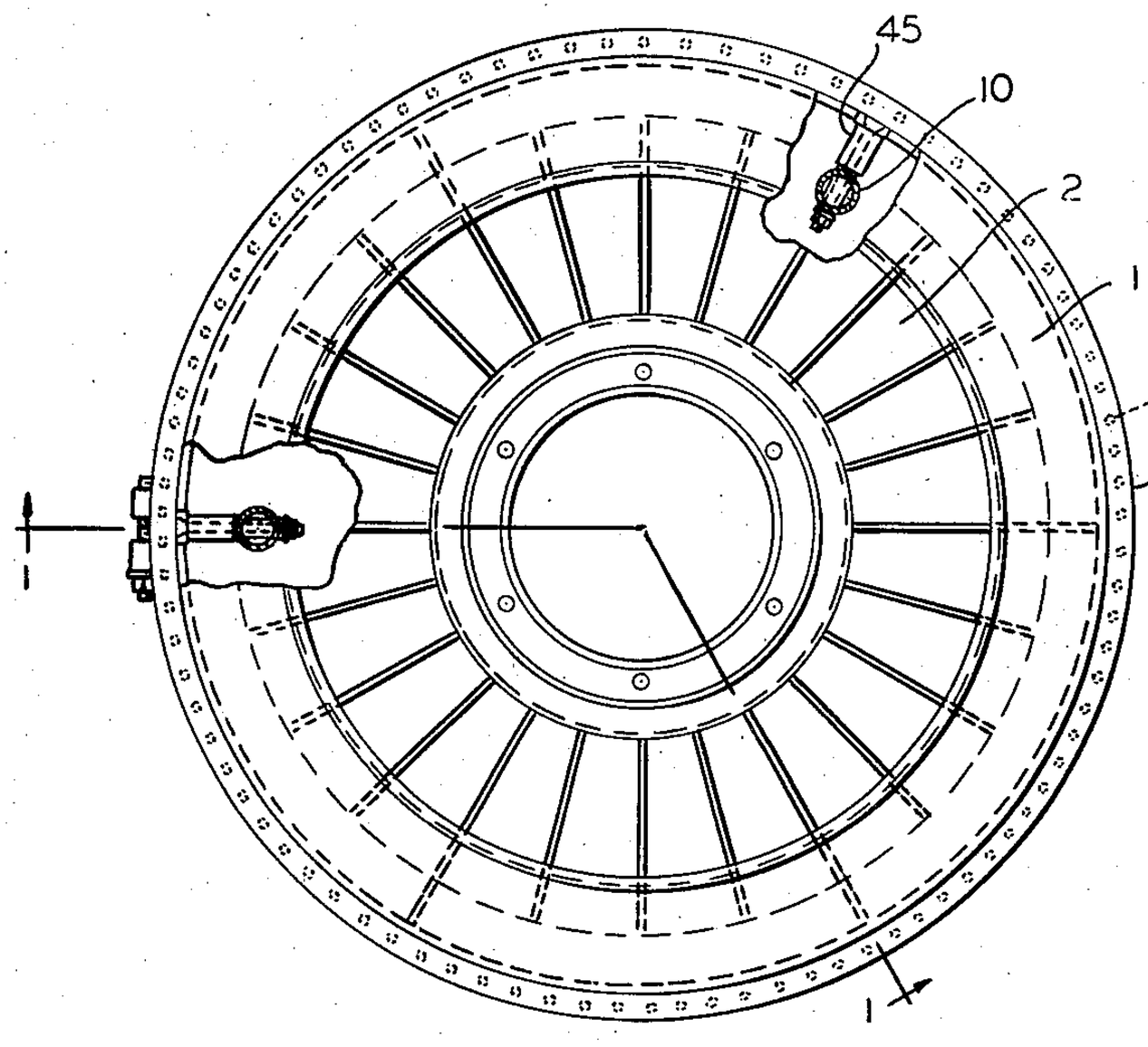

Fig. 3

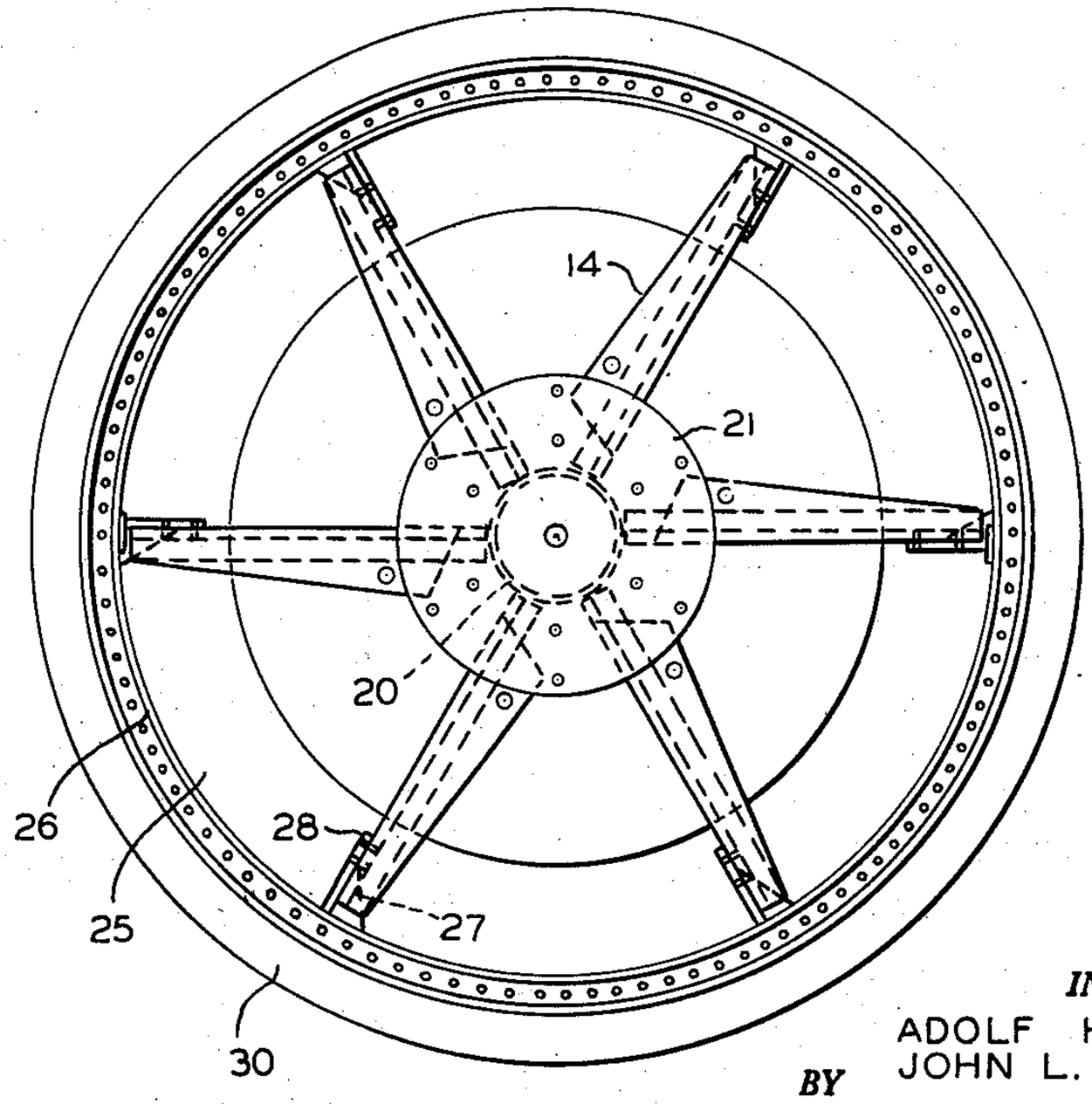

Fig. 4

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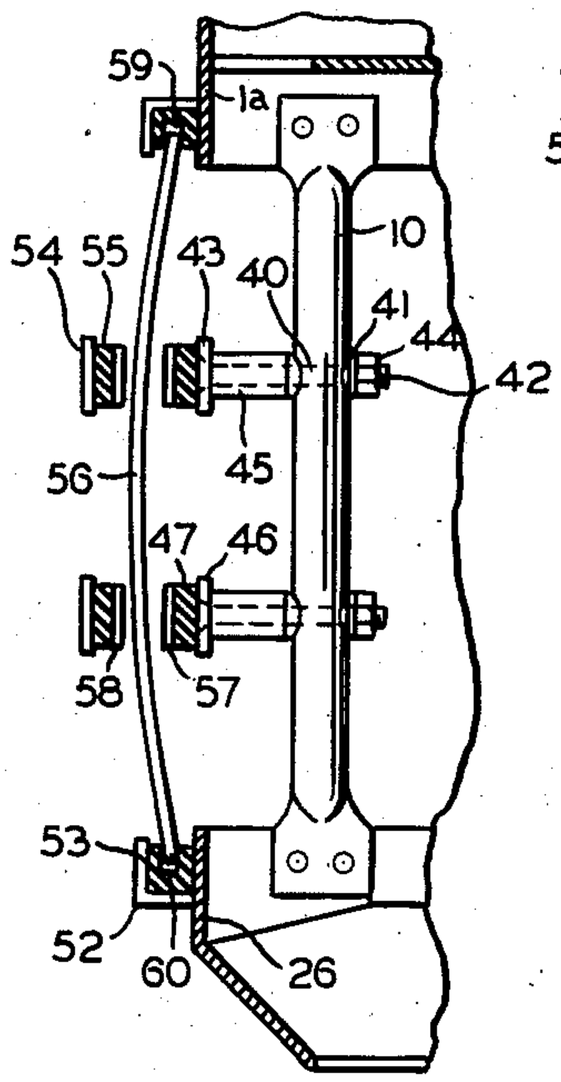

Fig.5

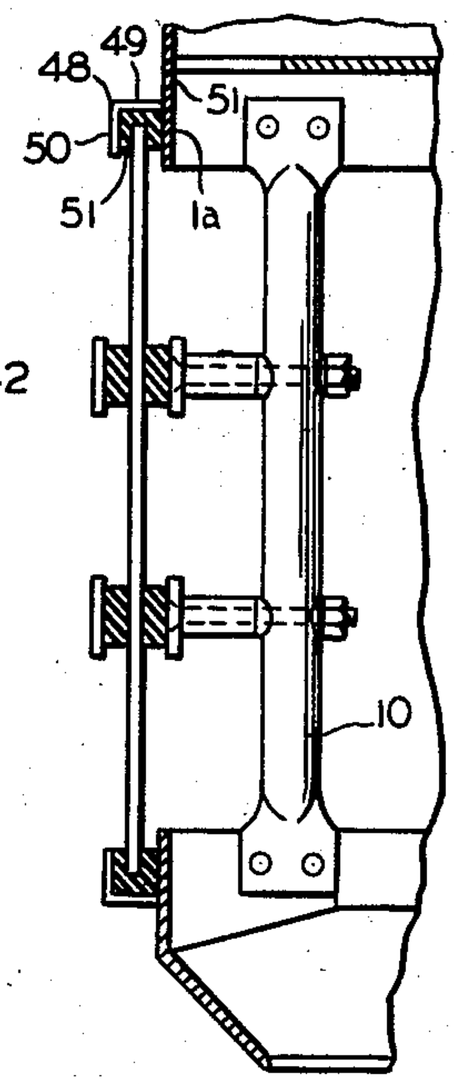

Fig.6

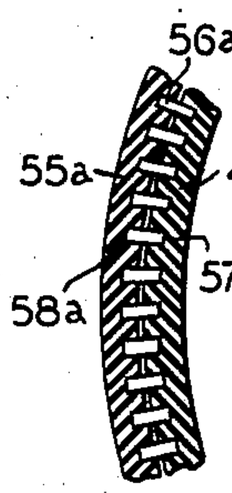

Fig.7

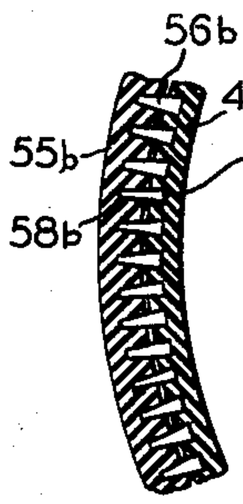

Fig.8

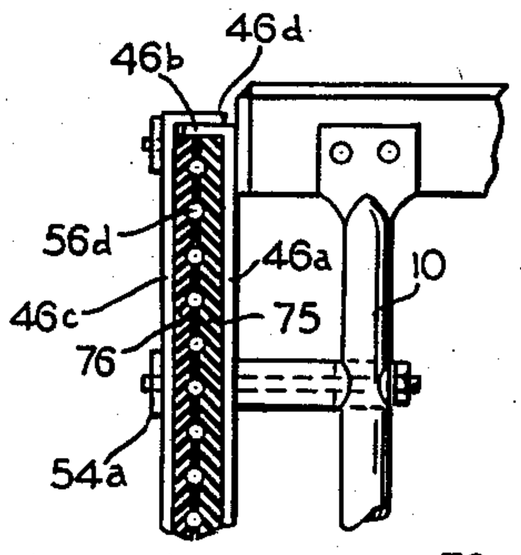

Fig.10

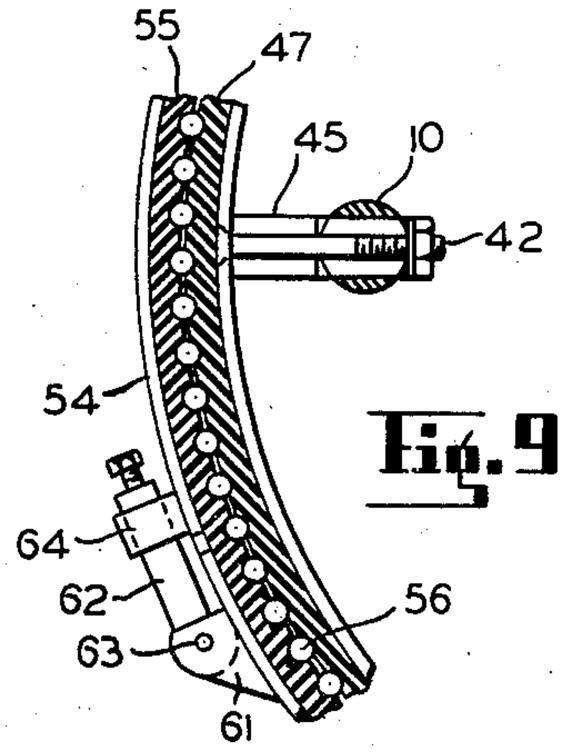

Fig.9

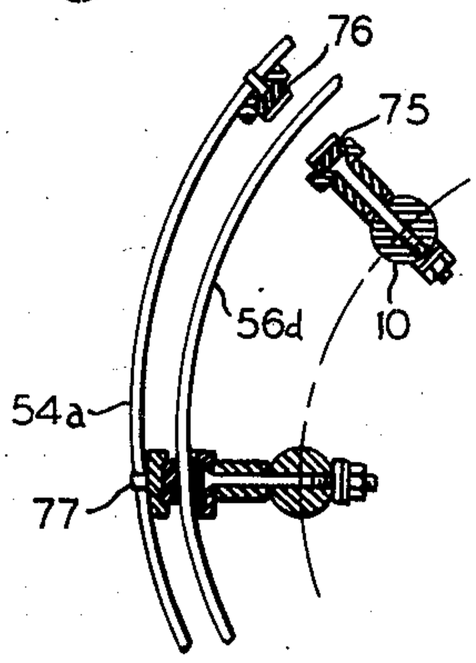

Fig.11

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CYLINDRICAL SCREEN CAGE

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Application June 22, 1954, Serial No. 438,443

7 Claims. (Cl. 209—303)

This invention relates to mechanisms for screening materials and separating particles which are oversize and those which are undersize and has particular relation to that type of mechanism known as cylindrical or rotary screens.

One object of the invention is to provide a new and improved internal structure for such mechanisms.

Another object is to provide an internal structure or framework for such screening mechanisms which shall be rigid, torsion resistant, and twist-proof.

Another object is to provide an improved framework or structure for such screening mechanisms which shall be more resistant to the abrasive action of the material to be screened.

Another object is to provide a construction or framework for such screening mechanisms which shall be lighter in weight, while retaining the strength of prior structures, and yet light enough to reduce the strain on the drive means employed with such screens.

Another object of the invention is to provide a screening mechanism which shall be comprised of a minimum number of parts and which may be produced at a substantially reduced cost in time and money.

Another object is to provide a screen member for such screening mechanisms which shall be composed of a plurality of easily removable and replaceable elements.

Another object is to provide a screening mechanism which may be easily assembled and disassembled.

Another object is to provide a screen surface, for rotary screening mechanisms, which will permit of easy and quick repair without removal of the entire screen surface.

Circular or rotary screens have been provided in the past. The internal or structural features of these screens which may, for convenience, be described as the framework thereof, have been, apparently in order to achieve strength, of an extremely heavy material. In addition, the presence of angular configurations contributed to a shortness of life due to abrasive action of material being screened. Moreover, prior structures have universally employed a screening surface formed in one piece, often running of a size measuring in the order of 3 feet wide by 12 feet long. This sheet was then curved about and clamped on to the framing structure to form the screening mechanism. When the screen was thus curved, the spacing, which had been so carefully set in the manufacture of the one-piece screen, was often offset or distorted. Moreover, it has been necessary, when a place on such screening surfaces was substantially worn or worn through, to replace the entire screen. A one-piece screen having a hole therein is, of course, useless since the material screened therethrough is likely to contain oversize particles. It is accordingly one purpose of

my invention to provide a screening surface for rotary screens which can be easily and simply repaired without the replacement of the entire surface.

Other objects will appear from time to time in the course of the specification and claims.

I illustrate my invention more or less diagrammatically in the following drawings, in which

Figure 1 is a side elevation in partial cross section,

Figure 2 is a side elevation illustrating the completed screening mechanism and on a reduced scale,

Figure 3 is a top view in partial cross section and with parts broken away and on the scale of Figure 1,

Figure 4 is a view taken on the line 4—4 of Figure 1,

Figure 5 is a detail view illustrating a step in the assembly or disassembly of the structure illustrated in Figure 1,

Figure 6 is a view similar to that of Figure 5 and illustrating the structure of Figure 5 in the assembled condition,

Figure 7 is a detail view illustrating one form of the replaceable screen members of my invention,

Figure 8 is a detail view similar to that of Figure 7 and illustrating a variant form of the replaceable screen members of my invention,

Figure 9 is a detail top view illustrating the form of the replaceable screen members of my invention shown in Figure 6 along with means for retaining them,

Figure 10 is a detail view, in partial cross section, illustrating a variant form of my invention in which my replaceable screen members are employed in a different position and illustrating a means for retaining them in such position, and

Figure 11 is a top view, in partial cross section, illustrating a step in the assembly of the device illustrated in Figure 10.

Like parts are indicated by like symbols throughout the specification and drawings.

Referring now to the drawings and particularly to Figure 1, the numeral 1 illustrates generally a top or cover plate or drum for my screening mechanism. The plate 1 has centrally located enlarged aperture 2. A drive mechanism for rotating and gyrating the screening device illustrated in Figure 1 may be located in said aperture and may have portions extending above and below the aperture 2. Since such drive mechanism does not form a part of the present invention, it is not shown and will not be further described herein.

A material-receiving or feed plate is illustrated generally at 3. The feed plate 3 has a plurality of generally radially extending upper ribs 4 and a central aperture 5 through which the drive mechanism above described may pass. The feed plate 3 has a peripheral edge 6 spaced inwardly from a generally cylindrical or circumferential vertical wall 1*a* of the top plate or drumhead 1.

A plurality of vertically extending, circumferentially spaced frame members 10, cylindrical in form, may be secured to the underside of the face 3 as shown generally at 11. The pipe-like or cylindrical posts 10 may have their upper ends flattened as indicated generally at 12 for ease in securing them to the feed plate 3 as indicated at 11. The opposite ends of the posts 10 may similarly be flattened as indicated at 13 and are connected each to a radially extending rib 14, which are circumferentially spaced, as indicated generally at 15. The ribs 14, as may be best seen from a view of Figure 4, together with a hub 20 form a bottom spider, there being a rib

14 for each of the posts 10. As best seen in Figure 1, the upper ends of the posts 10 may be secured to similarly disposed circumferentially spaced ribs 3*a* on the bottom face of the feed plate 3. While I illustrate the above-described vertical framing members 10 and horizontally disposed ribs 3*a*, 14 as being six in number, it will be realized that the number of these elements may be varied without departing from the nature and scope of my invention.

The drive mechanism above mentioned may be secured to the hub 20 wihch may carry a generally horizontally disposed top plate 21, A receiving, generally inwardly conical, downwardly disposed plate 25 may have an upper generally vertical cylindrical wall or drum section 26 which may in turn carry a plurality of inwardly directed brackets 27. The brackets 27 may be secured to the ribs 14 as indicated generally at 28. The brackets 27 may be strengthened by angular ribs 29 secured to the brackets 27 and the wall 26. An annular, outwardly extending flange 30 may be secured to the cylindrical wall portion 26 intermediate the upper and lower ends thereof.

The vertical framing posts 10 may be transversely apertured as indicated at 40 in Figure 5. Extending through each of the apertures 40 is a securing means 41 which may comprise a bolt 42 having at its outer end a head 43. The bolt 42 may have threaded upon its opposite end the nut 44. As best seen in Figure 5, the bolt 42 extends generally radially in relation to the vertical axis of the screening mechanism illustrated in Figure 1 through the posts 10 to a point generally in vertical alignment with the cylindrical wall portion 1*a* of the tops 1 and 26. Spacer members 45 may surround the bolt 42 beyond the posts 10 and may serve to position a horizontally disposed, generally rectangular in cross-section, ring member 46 in vertical alignment with the walls 1*a*, 26. The rings 46 are thus clamped by the securing means 41 to the posts 10 in the desired position.

The rings 46 may have positioned on their outer faces ring portions 47 of equal linear extension which may be formed of a material having the properties of rubber. The wall 1*a* may have a bracket 48 which may comprise the generally annular horizontally disposed portion 49 and the depending flange portion 50 spaced from the wall 1*a* by the portion 49. Encased within the U-shaped ring formed by the bracket 48 and wall 1*a* is a rubber-like ring member 51 of equal circumferential extension with the wall 1*a*. An upwardly-open bracket and rubber-like ring member similar to the structure 48—51 is secured to the outer face of the wall 26 as shown generally at 52, 53.

54 illustrates a clamping ring which may be generally rectangular in cross section. The clamp ring 54 may carry on its inner face a generally rubber-like ring member 55 corresponding in extension and general configuration with the member 47. Illustrated at 56 is a replaceable individual screen member or rod of sufficient extension to permit its opposite ends to seat within the upper rubber-like ring member 51 and lower rubber-like ring member 53. Illustrated at 57 are grooves in the outer face of the pliable rings 47 which are adapted to receive a portion of the rods 56. 58 illustrates similar corresponding grooves in the inner face of the pliable rings 55. 59 illustrates a socket or recess in the rings 51 adapted to receive the upper end of the rod 56 and 60 illustrates a similar socket in the ring 53 adapted to receive the opposite end of the rod 56.

Referring now to Figure 7, the numerals 47*a*, 55*a* generally indicate ring members similar to the members 47, 55. The grooves 57*a*, 58*a* are formed to receive portions of rods 56*a* which are generally rectangular in shape, the longitudinal axis of the lateral cross-section of the rod 56*a* extending generally in a radial direction in relation to the vertical axis of the screening mechanism illustrated in Figure 1.

Figure 8 illustrates a variant form of the rods 56, the

numeral 56*b* serving to illustrate rods which are substantially triangular in lateral cross section, the base of the triangle being inwardly disposed to provide a minimum separation between the inner faces of the rods 56*b* and a maximum separation between the opposed edges of the outer faces of the rods 56*b*. The inner ring member illustrated at 47*b* carries a groove 57*b* formed to receive the base portion of the wider inner edge of the rods 56*b* and the outer ring member 55*b* carries the grooves 58*b* formed to receive the smaller outer end of the rods 56*b*.

In Figure 9 I illustrate means for clamping or securing in place the rings 54, the clamping means being indicated generally at 61—64. One end of each of the rings 54 may have an outwardly disposed bracket 61 to which a screw member 62 may be pivoted as at 63. The opposite end of each of the rings 54 may carry a bracket 64 adapted to receive an end portion of the pivoted screw means 62.

In Figure 10 I illustrate a variant form of my invention in which the rods 56 may be disposed in a horizontal plane. For simplicity I illustrate the replaceable screening members or rods by the numeral 56*d*. Each of the posts 10 may have secured thereto a vertically disposed bracket member 46*a*. The member 46*a* may be secured to the post 10 substantially in the manner in which the rings 46 were secured to the posts 10 as illustrated in Figure 10. The brackets 46*a* have upper and lower outwardly disposed generally horizontal end portions 46*b*. For convenience I illustrate only the upper horizontal portion. A bracket 46*c* may be generally vertically positioned in alignment with the bracket 46*a* and may have inwardly extending generally horizontal upper and lower end portions 46*d* adapted to slidably engage the outer faces of the portions 46*b*. Clamping rings 54*a* are provided for retaining the brackets 46*c* in position in relation to the brackets 46*a* and for encasing or clamping between the brackets 46*a*, 46*c* a pair of opposed generally vertically disposed rubber-like spacers or strip members illustrated at 75, 76. The inner member 75 and the outer member 76 have their opposed faces transversely grooved to receive the rods 56*d*. 77 illustrates securing means for securing the rings 54*a*, brackets 46*c* and spacers 76 together. It will be realized that a securing means similar to that illustrated at 60—64 may be employed with the rings 54*a* in a manner similar to that illustrated in Figure 9.

Figure 11 illustrates one step in the assembly of the device of Figure 10. The rods 56*d* are curved about the posts 10 and are inserted in the grooves in the members 75. The clamping rings 54*a*, which carry the brackets 46*c* and outer rubber-like clamping or spacer member 76 are then placed over the rods 56*d* and are drawn tight by a means similar to that illustrated at 60—64 to position the rods 56*d* in the position illustrated in Figure 10.

It will be noted that the inner ring members 46 and brackets 46*a* are of sufficient extension to mask and protect the rubber rod retaining rings against abrasion by material impinging thereon as it passes from the inside of the screen mechanism shown in Figure 1 through the cylindrical screen formed of the rods 56.

It will be realized that whereas I have described and claimed a practical and operative device, nevertheless many changes may be made in size, shape, number and disposition of parts without departing from the spirit and scope of my invention. I therefore wish my description and drawings to be taken as in a broad sense illustrative or diagrammatic rather than as limiting me to my showing herein other than as is set forth in the appended claims.

The use and operation of my invention are as follows:

The material to be screened is fed onto the feed plate 3 and is thrown out by centrifugal force against the inner surface of the drum or cover plate 1. It will be understood that the screen structure illustrated in Figure 1, in operation, is rotated by a suitable drive mechanism and may also be simultaneously gyrated by such mechanism.

It will be further understood that the driving means substantially fills the aperture **5** in the plate **3**, thus preventing the passage of material fed upon the plate **3** through the aperture **5**. The material thrown against the inner face of the wall **1***a* passes downwardly through the space between the periphery **6** of the plate **3** and the wall **1***a* into the cylindrical screen formed by the posts **10** and rods **56** with the securing elements described above. Since the screen is rotating and gyrating the material is thrown against the inner surface of the screen formed by the rods **56** and the undersized particles of the material are thrown through the screening surface by the centrifugal force generated by rotation. There may, for example, be employed a system producing 14 gyrations of the screening structure to each rotation thereof. Since each gyration produces an inward deflection of the material being screened, the open spaces in the screening surface between the rods are freed for the passage of undersize particles at the next contact and the material is permitted to drop a short distance. The mechanism may be timed so that the material contacts the screening surface and is deflected inwardly once each gyration, a given mass of material thus being forced to contact or being thrown against the screening surface a number of times in the course of its passage downwardly through the screening mechanism. The material passed through the screen may be received in an appropriate structure (not shown) and directed to the desired location. The oversized particles drop by gravity between the ribs **14** and chute or plate **25** into an appropriate receiving structure (not shown).

As illustrated in Figures 7–9, the replaceable screening members or rods are arranged to insure that the spacing therebetween outwardly beyond the point of closest approach between adjacent rods grows larger. While this is particularly obvious in the case of the triangular rods illustrated in Figure 8, it is also true of the rectangular rods, Figure 7, since they are arranged radially in relation to the axis of the screen structure. This is also true of the circular or cylindrical rods of Figures 1–6 and 9–11. This is important to insure that material of a size sufficient to pass through the screen is not trapped after having passed through the predetermined spacing of the screening members.

As shown in Figure 5, the rods **56** may be easily and quickly removed or installed, it being necessary for the operator merely to bend or flex the rod to "snap" it into or out of position in the rubber-like retaining members.

The posts **10** are of a form such as to produce a maximum of strength with a minimum of weight and with a minimum subjection to abrasive action of the material being screened. In addition, the particular form of the posts **10** lends itself easily to the employment therewith of abrasive resistant coatings such, for example, as a rubber-like material.

We claim:

1. A cylindrical screen cage comprising a generally annular feed plate, an annular spider spaced from said feed plate and in axial alignment therewith, said spider having a diameter substantially equal to that of said feed plate, a plurality of generally elongated, rounded members spaced circumferentially about the axis of said feed plate and said spider and individually connected at one end to said feed plate and at the opposite end to said spider, said connecting members being spaced inwardly from the peripheral edges of said feed plate and said spider and paralleling said axis, each of said connecting members having one or more lateral apertures spaced intermediate said ends, screen-supporting members secured to said connecting members and having elements extending through said lateral apertures, said screen-supporting members comprising bolts extending radially in relation to said axis outwardly beyond said connecting members and rings surrounding said connecting members and connected to the outer ends of said bolts, said rings

having a diameter exceeding that of said feed plate, a circumferential screen surface bridging the space between said feed plate and said spider beyond said rings, said screen comprising a plurality of elongated rods and means for maintaining said rods in position against said rings including socket means adjacent top and bottom of the screen cage positioned to receive the opposite ends of said rods and clamping rings surrounding said screen in alignment with said first named rings, said clamping rings having means at their opposite ends for tightening said clamping rings about said screen.

2. The structure of claim 1 characterized by and including an inwardly directed, generally frusto-conical material-discharge member connected to said spider and directed outwardly therefrom beyond said connecting members.

3. The structure of claim 1 wherein said screen rods are rectangular in lateral cross-section and are positioned about said connecting members to have the longitudinal axis of said cross-section radially disposed in relation to said axis, whereby the space between the inner edges of said rectangular rods is less than the space between the outer edges thereof.

4. The structure of claim 1 wherein the said rods are triangular in lateral cross-section and are positioned about said connecting members to have the longitudinal axis of said cross-section disposed radially in relation to said axis, the base of said triangular cross-section being positioned inwardly from the apex thereof in relation to said axis, whereby the space between said rods at the inner edges thereof is less than the space between said rods at the outer edges thereof.

5. A generally cylindrical screen frame including a generally annular feed plate, a spider member spaced from said feed plate, said feed plate and spider member having a common axis, a plurality of circumferentially spaced, axially directed, post-like members connected at their opposite ends to said feed plate and spider, said post-like members being generally rounded in lateral cross-section and positioned intermediate said axis and the outer peripheral edges of said feed plate and spider, and a screening surface surrounding said feed plate, spider and post-like members being inwardly spaced from said screening surface and having radially directed screen-supporting elements spaced longitudinally thereon and extending outwardly therefrom into a position generally in alignment with said peripheral edges to support said screen surface.

6. In a cylindrical screen cage, a pair of spaced annular members having a common axis, a plurality of axially directed connecting members extending between and connecting said annular members, a circumferential screen surface bridging the space between said annular members, said screen surface comprising a plurality of individual rods circumferentially spaced about the peripheral edges of said annular members, said rods being generally rectangular in lateral cross-section, the longitudinal axis of said lateral cross-section being radially disposed in relation to the common axis of said annular members whereby the space between the inner edges of said rods is less than the space between the outer edges thereof, and means for securing said rods in relation to the spaced annular members including inner circumferential pads of yielding material generally concentric with the spaced annular members and located along axis therebetween, and outer circumferential pads of yielding material and means for tensionally securing said outer yielding pads about said inner pads and against said rods.

7. In a cylindrical screen cage, a pair of spaced annular members and means for connecting them together, a circumferential screen surface bridging the space between said annular members, said screen surface comprising a plurality of individual rods spaced circumferentially about the peripheral edges of said annular mem-

bers, said rods being generally triangular in lateral cross-section, said rods being positioned to cause the apex of said triangular cross-section to be directed outwardly from the axis of said annular members whereby a space between the inner edges of said rods is less than the space between the outer edges thereof, and means for securing said rods in relation to the spaced annular members including inner circumferential pads of yielding material generally concentric with the spaced annular members and located along axis therebetween, and outer circumferential pads of yielding material and means for

tensionally securing said outer yielding pads about said inner pads and against said rods.

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