



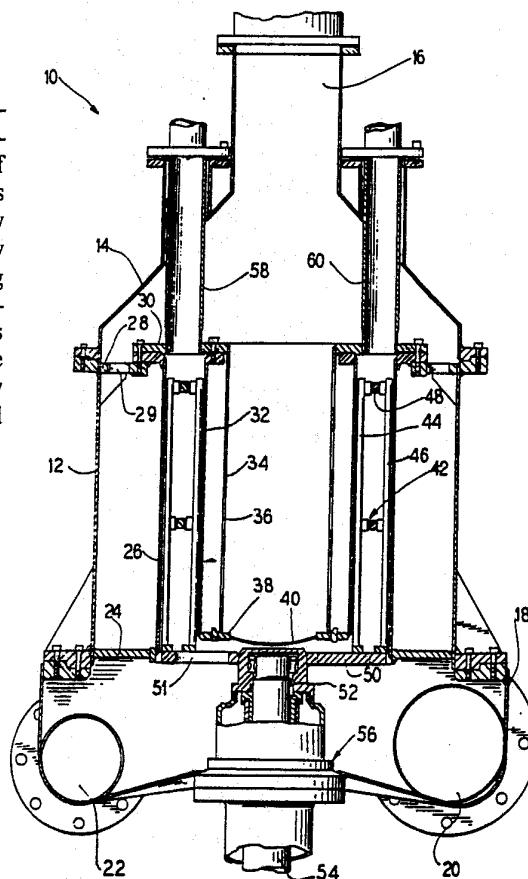
## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<p>(51) International Patent Classification 5 : D21D 5/02, B01D 29/54, 29/86</p>	A1	<p>(11) International Publication Number: <b>WO 91/06703</b></p> <p>(43) International Publication Date: 16 May 1991 (16.05.91)</p>
<p>(21) International Application Number: PCT/US90/05467</p> <p>(22) International Filing Date: 26 September 1990 (26.09.90)</p> <p>(30) Priority data: 429,874 30 October 1989 (30.10.89) US</p> <p>(71) Applicant: BELOIT CORPORATION [US/US]; One St. Lawrence Avenue, Beloit, WI 53511 (US).</p> <p>(72) Inventor: LEBLANC, Peter ; 9271 Pine Circle, Seminole, FL 34646 (US).</p> <p>(74) Agent: CAMPBELL, Raymond, W.; One St. Lawrence Avenue, Beloit, WI 53511 (US).</p>		<p>(81) Designated States: AT (European patent), AU, BE (European patent), CA, CH (European patent), DE (European patent)*, DK (European patent), ES (European patent), FI, FR (European patent), GB (European patent), IT (European patent), JP, LU (European patent), NL (European patent), SE (European patent).</p> <p><b>Published</b> <i>With international search report.</i></p>

(54) Title: PULSELESS SCREEN

(57) Abstract

A screening apparatus (10) comprises a pair of stationary concentric screens (26 and 32) with a plurality of foil structures (42) rotating therebetween and adjacent thereto, individual foils (44 and 46) of each foil structure being radially aligned. The screening apparatus comprises a tangentially disposed slurry inlet (20) and a diametrically and tangentially disposed heavy rejects outlet (22) at the end of a heavy rejects trap. The light reject/accepts slurry flows into the screening zone and, after separation, is discharged at an end of the screening apparatus by way of respective light rejects (58, 60, or 60'') and accepts (16) outlets. The accept outlet is located axially with respect to the screen cylinders and rotating foils so the pressure pulses are virtually eliminated in the screening process. The apparatus may be constructed for vertical or horizontal rotation of the foils.



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Title  
PULSELESS SCREEN

Background of the Invention

i. Technical Field

The present invention relates to screening apparatus for separating accepts and rejects of a slurry in preparing pulps for use in a paper making machine.

ii. Prior Art

Screening apparatus are well known in the art. For example, A. J. Haug in U.S. Patent 1,864,818, discloses a pulp screening machine which employs a rotary screening drum for producing a centrifugal effect on the stock in contact with the drum, and maintains the drum submerged in screened stock and applies a substantially uniform hydraulic pressure to the drum at points spaced uniformly thereabout to obtain substantially equal screening operations about the circumference of the screen drum.

In U.S. Patent 1,974, 651, A. J. Haug discloses a pulp screening machine which employs a horizontal screening machine which employs a horizontal screening drum in which the stock is moved adjacent to the surface of the drum in a circumferential direction. In this apparatus, the stock is subjected to a motion so as to create temporary localized reversals of the normal flow of stock through the screening surface in order to loosen the tailings which cling to the screening surface.

G. L. Nelson, in U.S. Patent 3,053,391 discloses a vertically disposed screening apparatus in which the incoming stock is fed into the top of the system and flows between a pair of screens having offset foils running therebetween.

A. C. Martin, in U.S. Patent 4,252,641 discloses a horizontal screening apparatus in which the axes of a cylindrical screen plate and a casing surrounding the screen plate are offset to one another to provide an enlargement in the chamber surrounding the screen plate. A partition is provided in the enlarged area and extends from the inlet opening to approximately the rejects outlet and a baffle is provided about the screen helically and substantially coextensively with the partition to provide a passage of decreasing cross-sectional area approaching the rejects outlet to provide an optimum velocity of material which prevents plugging of the passage by larger particles.

D. A. Goddard, in U.S. Patent 4,316,768 discloses a screening apparatus which includes a centrifugal pump which is mounted for rotation in a housing coaxial with a cylindrical screen which extends about a tubular hub portion of the pump. In this screening apparatus, a slurry is delivered to the top of the centrifugal pump and forced outwardly and upwardly by the pump to the cylindrical screen. The rejects are forced into and collected in a rejects zone for later flushing.

Modern paper machines are very sensitive to pressure pulses. Existing screens usually produce pulses which are sufficiently large such that often "barring" occurs on the paper machine. The troublesome pulses occur when a foil or other pulse creating device passes the accepts outlet on a conventional screen. It is therefore desirable to eliminate or at least minimize such pulses.

It is therefore an object of the present invention to eliminate, or at least minimize, pressure pulses in the accepts flow in a screening apparatus.

Summary of the Invention

According to the present invention, the above object is achieved by eliminating a radially disposed accepts outlet and replacing the same with an accepts outlet which is totally axial in its position relative to the screen. It is also advisable to so isolate the inlet connection for further reduction in transmitted pulses.

Although referred to below as being a vertical screen, the apparatus may be mounted with the screens and the axis of rotation horizontal, in that the screen is a pressure screen operable independent of its orientation.

More specifically, the screening apparatus of the present invention has a generally vertical or horizontal orientation and employs a pair of vertical or horizontal coaxial screen cylinders fixed within a housing which has an axial accepts outlet at one end and at least one light rejects outlet at that end beyond the screens. A heavy rejects outlet is provided at the other end of the apparatus, tangential to the apparatus, and substantially diametrically opposed to the slurry inlet.

A pair of foil structures are rotated between the screen cylinders at approximately 45'/sec velocities. The material to be screened enters through the tangential slurry inlet and flows to the space between the inner and outer screen cylinders. The accepts pass through the screen cylinders and flow by way of an accepts collecting chamber to the axial accepts outlet. The light rejects are removed through an outlet which may extend parallel to the accepts outlet or at 90° with respect thereto as will be evident from the description below.

As is radially apparent to those skilled in the art, the use of multiple screen cylinders is not new per se; however, the use of such cylinders in accordance with the unique features of the invention has proved to be highly

advantageous. For example, in previous screening apparatus using a pair of screen cylinders, the foils sweeping the inner and outer screen cylinders were not aligned. With aligned foils, the positive to negative pressure gradients become substantially uniform for the multiplicity of foils traversing the screening zone. This design also allows removal and replacement of both inner and outer screen cylinders without removing the rotating foil assembly.

As mentioned above, many screens are fed from the top so that the heavier rejects flow to the bottom, and no provision is made for light rejects. According to the present invention, the heavy rejects are forced outwardly and are trapped by the centrifugal force of the incoming slurry so as to be trapped in the bottom of the apparatus which therefore prevents the screen cylinders from being subjected to the heavier particles and the resulting potential damage. The light rejects encountered by the screen cylinders are directed upwardly and basically flow out of the top of the apparatus with only the accepts being passed through the screen cylinders.

According to a particular feature of the invention, and in contrast to previous designs in which the foils swept passed the general location of the accepts outlet, the accepts outlet has been moved from adjacent to the screening zone to a location displaced from the axial with respect to the screening zone so that pressure pulses are virtually eliminated.

#### Brief Description of the Drawings

Other objects, features, and advantages of the invention, its organization, construction and operation will be best understood from the following detailed description, taken in conjunction with the accompanying drawings, in which:

Figure 1 is an elevational view, shown in cross-section, of a screening apparatus constructed in accordance

with the present invention;

Figure 2 is a bottom view, partially broken away, of the apparatus illustrated in Figure 1;

Figure 3 is a fragmentary sectional view of the foils and screen cylinders of the screening apparatus of Figure 1;

Figure 4 is a fragmentary sectional view of a first modification of the screening apparatus of Figure 1 showing the light rejects discharged through the side of the apparatus; and

Figure 5 is a fragmentary sectional view, similar to that in Figure 4, showing a further modification of the side discharge of the light rejects.

#### Detailed Description of the Preferred Embodiment

Referring to Figure 1, a screening apparatus is generally illustrated at 10 as comprising a housing including an intermediate section 12 supporting a top section 14 which has an axially disposed accepts outlet 16. A bottom section 18 supports the middle section 12 and comprises a tangentially oriented slurry intake 20 and a tangentially oriented heavy rejects outlet 22 diametrically disposed with respect to the slurry inlet 20.

An annular ring 24 substantially separates the middle section 12 and the lower section 18. The annular ring 24 is connected to and supports the lower end of a screen cylinder 26 the upper end of which is connected to and supported by a ring 30 connected to an apertured ring 28 including a plurality of apertures 29.

An inner screen cylinder 32 is connected to and supported at its upper end by the ring 30 spaced from the screen cylinder 26 and further spaced from an apertured cylinder 34, having apertures 36 therein. The cylinders 32

and 34 are supported at their lower ends by an extension 38 of a closed bottom 40 of the apertured cylinder 34.

The screen cylinders may be profiled cylinders of the type commonly used in pressure screens of other types.

A foil structure 42 is rotatably supported on a plate 50. The plate 50 is connected at 52 to a shaft 54 rotatably supported by a bearing 56 at the bottom wall of the bottom section 18. The foil structure 42 comprises a plurality of circumferentially spaced foils 44 and a plurality of circumferentially spaced foils 46, with the respective foils 44 and 46 radially aligned and secured to one another by a plurality of rings 48.

While foils are believed to be a preferred pulse inducing means for use in the present invention, it should be recognized that most any other type of pulsing means such as cam-style rotors, bump rotors and the like, well-known to those in the industry, also can be used.

A plurality of light rejects outlets comprise a plurality of conduits 58, 60 in communication with the space between the screen cylinders 26, 32 and extending out of the top section 14 parallel to the accepts outlet 16.

In operation, the slurry is introduced into the slurry inlet 20 and the heavy rejects, through centrifical force, are forced outwardly and trapped for exit through the heavy rejects outlet 22. The light/accepts slurry remaining flows upwardly through the apertures 51 in the plate 50 (rotated by way of shaft 54) into the space between the two cylindrical screens 26, 32. The light rejects cannot pass through the screen cylinders and flow upwardly through the light rejects outlets 58, 60, while the accepts flow through the screens 26 and 32. Accepts flowing through screen 26 are received between the screen 26 and the sidewall of middle section 12 and flow upwardly through the apertures 29 into the conical top section 14. On the inner side, accepts



flow through the screen 32 and through the apertures 36 and upwardly into the conical top section 14. The accepts from the outer chamber and the inner chamber join in the top section 14 and exit through the accepts outlet 16.

As is evident, the rotating foils do not pass an adjacent accept outlet so that pressure pulses are virtually eliminated.

Referring to Figures 2 and 3, the alignment of the foils 44, 46 is illustrated in greater detail, the foils being connected to one another, in each instance, by a ring 48.

Referring to Figure 4, a first modification for the light rejects outlet is illustrated as comprising a 90° bend in the conduit so that the conduit exits the housing above the screening zone and through the housing in the radial direction. Otherwise, the screen apparatus is basically the same as illustrated in Figure 1.

Also as basically illustrated in Figure 1, Figure 5 shows a further modification of the light rejects discharge in which a chamber 64 is formed from the upper portion of the apertured cylinder 34, a supporting ring 62 and a flange for conduit 60". In all other respects, however, the apparatus is substantially the same as that illustrated in Figure 1.

Although we have described our invention by reference to a particular illustrated embodiment thereof, many changes and modifications of the invention may become apparent to those skilled in the art without departing from the spirit and scope of the invention. We therefore intend to include within the patent warranted hereon all such changes and modifications as may reasonably and properly be included within the scope of our contribution to the art.

Claims

1. A screening apparatus (10) for separating accepts and rejects of a slurry fed to the apparatus, said apparatus comprising:

a closed hollow housing (12,14,18) including at least one side wall (12), first and second ends (14,18), and a slurry inlet (20) at said first end;

cylindrical screen means (26,32) fixedly mounted in said housing, a first side of said screen means being in communication with said slurry inlet;

said screen means (26,32) extending generally from near said first end (18) to near said second end (14);

a drive shaft (54) extending into and journaled to said housing for rotation;

pulsing means (42) connected to said drive shaft (54) for rotation adjacent said screen means for inducing flow of slurry through said screen means;

a rejects outlet (58,60) in flow communication with said first side of said screen means and in communication with the path of rotation of said pulsing means;

and an accepts outlet (16) in flow communication with said second side of said screen means, said accepts outlet (16) being located at one end of said screen means axially, with said screen means;

whereby the accepts are discharged axially from said screening apparatus.

2. The screening apparatus of claim 1, wherein:

said screen means comprises a pair of concentric screen cylinders (26,32) mounted spaced apart to define a gap therebetween;

said pulsing means comprises a plurality of first foils (46) mounted circumferentially spaced for rotation adjacent the outer one of said screen cylinders and a plurality of second foils (44) each aligned with a respective first foil for rotation therewith adjacent the inner core of said screen cylinders;

and said slurry inlet (20) is in flow communication with said gap.

3. The screening apparatus of claim 2, wherein: said screen means further comprises an apertured cylinder (34) fixedly mounted spaced from the inner screen cylinder (32), said apertured cylinder comprising a side wall including openings (36) therethrough for passing accepts, a closed bottom (40) and an open top in communication with said accepts outlet (16).

4. The screening apparatus of claim 1, and further comprising:  
a plurality of said rejects outlets spaced apart about said housing.

5. The screening apparatus of claim 1, wherein said rejects outlet is a first rejects outlet for lighter rejects, and further comprising:  
a second rejects outlet (22) at the bottom of said housing spaced from said slurry inlet for the heavier rejects, and wherein said housing is a cylindrical housing and said slurry inlet and said second rejects outlet extend tangential to said housing.

6. The screening apparatus of claim 1, wherein: said rejects outlet extends through said end of said housing.

7. The screening apparatus of claim 1, wherein: said rejects outlet extends through said side wall of said housing.

8. The screening apparatus of claim 1, wherein: said rejects outlet comprises a conduit, including an elbow (60'), extending through said side wall.

9. The screening apparatus of claim 1, wherein:  
said rejects outlet comprises a chamber (64) in  
communication with the path of slurry flow at said  
pulsing means and a conduit (60") connected to  
said chamber and extending through said side wall.
10. Screening apparatus (10) for separating accepts  
and rejects of a slurry fed to the apparatus, comprising:  
a vertical cylindrical housing (12,14,18) including a  
slurry inlet (20) at the bottom of said housing, a  
heavy rejects outlet (22) spaced from said inlet  
(20) at the bottom of said housing, first means  
(18) defining a generally horizontal arcuate  
slurry path between said slurry inlet and said  
heavy rejects outlet;  
an axially disposed accepts outlet (16) at the top of  
said housing, at least one light rejects outlet  
(58 or 60) spaced from said accepts outlet, and  
second means in communication with and defining a  
dividing path for the slurry between said first  
means and said light rejects and accepts outlet;  
said second means including first and second spaced,  
vertical screen cylinders (26 and 32) for passing  
the accepts fixedly mounted in said housing, first  
and second foil structures (44 and 46) mounted for  
rotation between and adjacent said first and  
second screen cylinders;  
and third means connected to rotate said foil  
structures, said light rejects passing through the  
space between said screen cylinders to said light  
rejects outlet and said accepts passing through  
said screen cylinders to said accepts outlet.
11. The pulseless screening apparatus of claim 10,  
wherein:  
said at least one light rejects outlet extends parallel  
to said accepts outlet.

12. The pulseless screening apparatus of claim 10, wherein:

said at least one light rejects outlet extends perpendicular to said accepts outlet.

13. Pulseless screening apparatus for separating heavy rejects, light rejects and accepts from a slurry fed to the apparatus, comprising:

a vertical housing including a generally conical top section (14), a cylindrical middle section (12) supporting said top section, and a generally cylindrical bottom section (18) supporting said middle section;

a tangentially disposed slurry inlet (20) in said bottom section and a tangentially disposed heavy rejects outlet (22) in said bottom section circumferentially spaced from said inlet for the outflow of heavy rejects forced radially outward from the flow of incoming slurry;

bearing means (56) axially mounted in said bottom section, and a shaft (54) rotatably supported by said bearing means for connection to a rotating drive;

an apertured plate (50) connected to said shaft for rotation therewith and for passing the light rejects and accepts slurry therethrough;

first and second multiple foil structures (42) mounted spaced apart on said plate for rotation therewith in said middle section, each of said foil structures including a plurality of circumferentially spaced elongate foils (46 and 44) with the foils of said first foil structure radially aligned with the foils of said second foil structure, said foil structures receiving the slurry therebetween;

first and second vertically disposed screen cylinders (26 and 32) fixed spaced apart in said middle section with the outer surface of said first screen cylinder adjacent said first foil structure

and the inner surface of said second screen cylinder adjacent said second foil structure, the light rejects flowing upwardly through and out of the path of rotation of said foil structures and the accepts flowing through said screen cylinders;  
a light rejects outlet (58,60 or 64,60") above said screen cylinders in communication with the path of rotation of said foil structures;  
an axially located accepts outlet (16) in said top section;  
and accepts collection means communicating with said screen cylinders and said accepts outlet.

14. The pulseless screening apparatus of claim 13, wherein said accepts collection means comprises:

a hollow tube (34) fixedly mounted within said first screen cylinder and including an open top communicating with said accepts outlet, a perforate (36) side wall spaced from said first screen cylinder and a closed bottom (40) adjacent said plate.

15. The pulseless screening apparatus of claim 13, and further comprising:

an annular ring (24) generally coplanar with and receiving said plate therein, said ring fixed to said middle section and sealing said middle section from said bottom section so as to direct the slurry upwardly through said apertured plate.

16. The pulseless screening apparatus of claim 15, wherein:

said second screen cylinder is connected to and supported by said annular ring.

17. The pulseless screening apparatus of claim 13, wherein said accepts collection means comprises:

a hollow tube (34) fixedly mounted within said first screen cylinder and including an open top

communicating with said accepts outlet, a perforate (36) side wall spaced from said first screen cylinder and a closed bottom (40) adjacent said apertured plate, said closed bottom including a ring-like extension (38) supporting the bottom of said first screen cylinder.

18. The pulseless screening apparatus of claim 13, and further comprising:

- a first ring means (28) at the top of and connected to said middle section and including apertures (29), as a part of said accepts collection means, communicating said second screen cylinder with said top section;
- a second ring means (30) connected to and supported by said first ring means, said second ring means connected to the tops of and supporting each of said screen cylinders and including at least one opening aligned with the space between said screen cylinders for passing the light rejects;
- and a conduit (64) extending between said opening and said light rejects outlet.

19. The pulseless screening apparatus of claim 18, wherein said accepts collection means comprises:

- a hollow tube (34) fixedly mounted within said first screen cylinder and including an open top communicating with said accepts outlet, a perforate (36) side wall spaced from said first screen cylinder and a closed bottom (40) adjacent said plate;
- and said top of said hollow tube connected to and supported by said second ring means.

20. The pulseless screening apparatus of claim 13, wherein said light rejects outlet comprises:

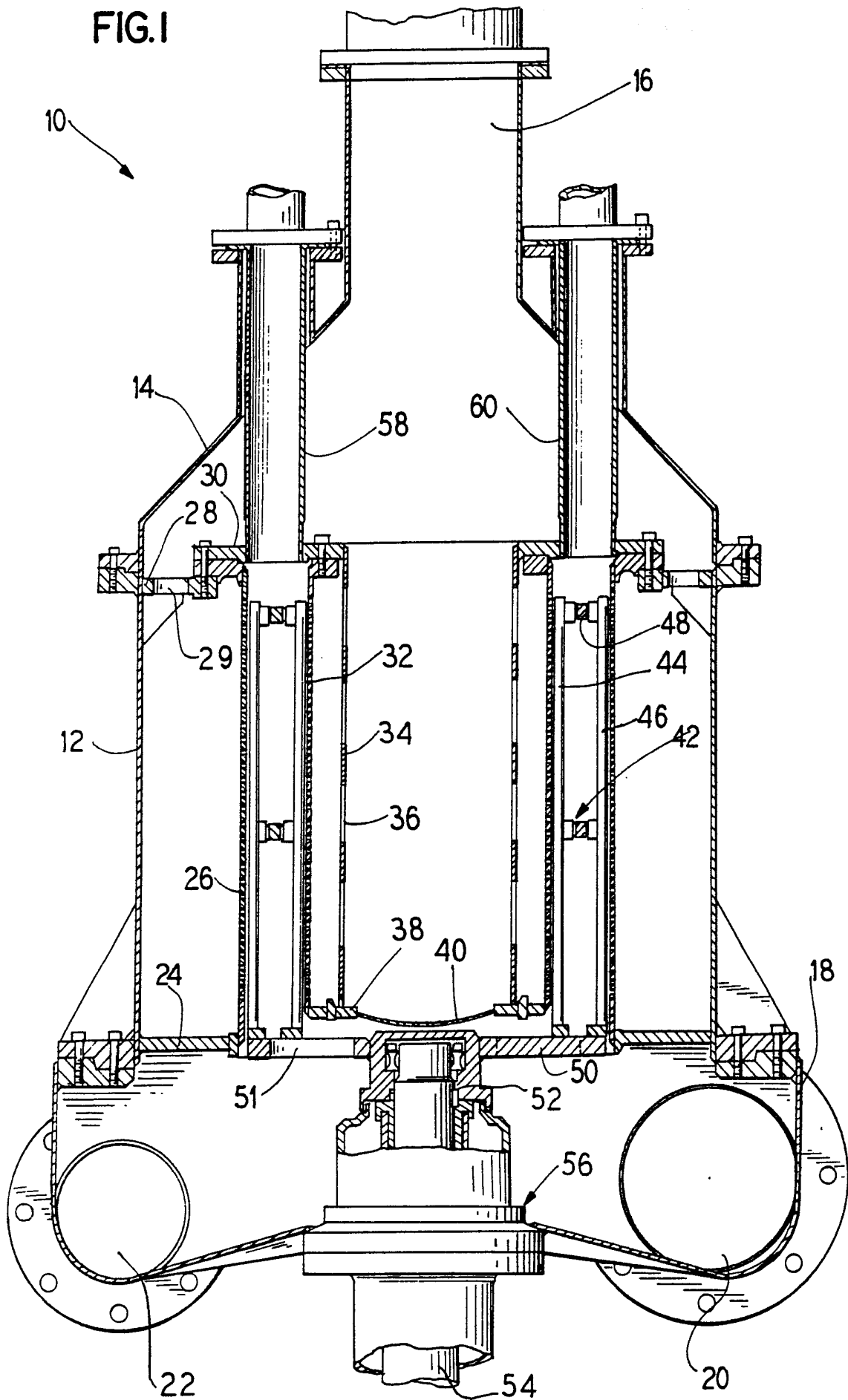
- a conduit (58,60 or 60") in communication with the space between said screen cylinder and extending out of said housing.

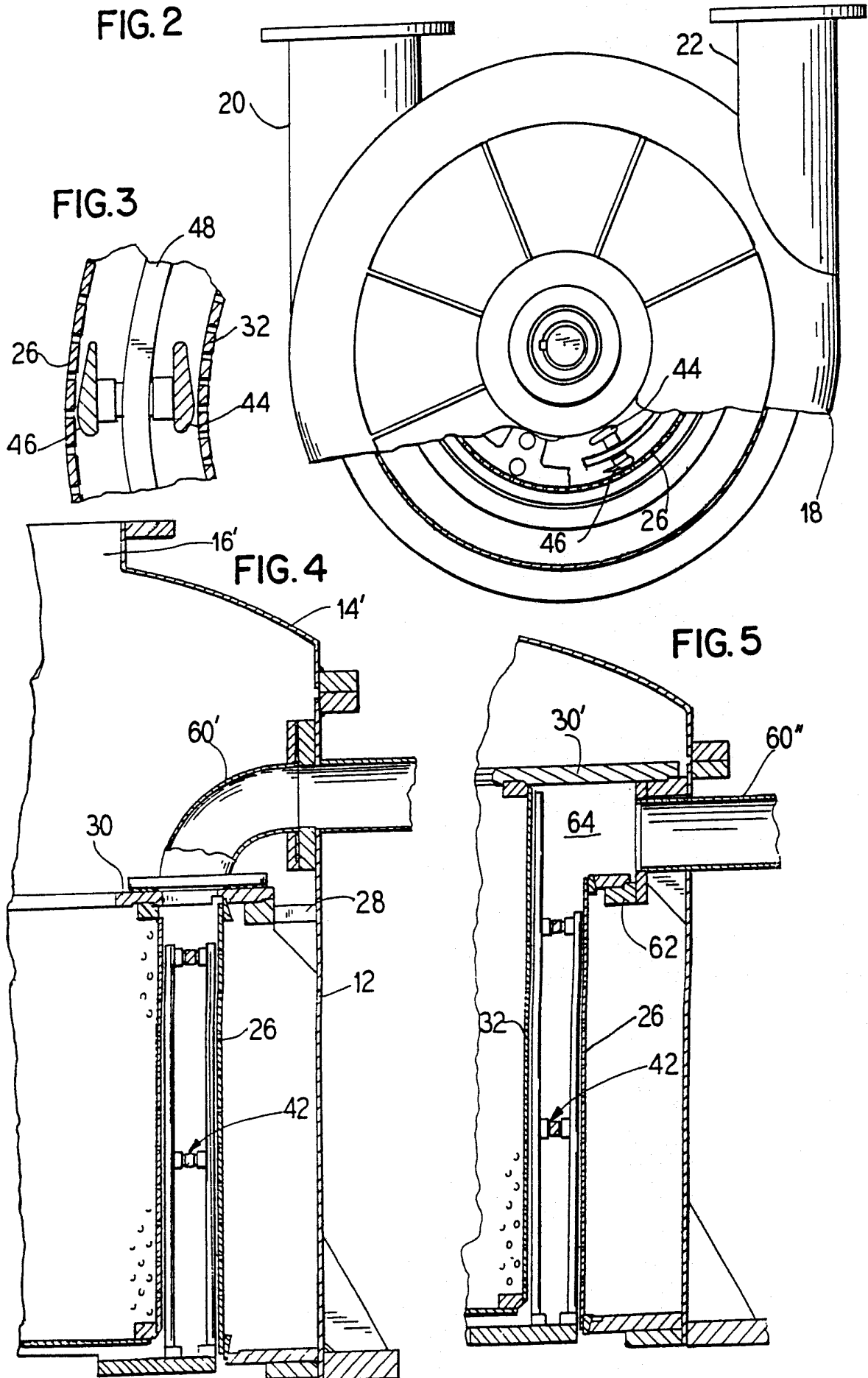
21. The pulseless screening apparatus of claim 13, wherein said light rejects outlet comprises:  
a conduit (58 or 60) in communication with the space between said screen cylinder and extending parallel to said accepts outlet and out of said housing.

22. The pulseless screening apparatus of claim 13, wherein said light rejects outlet comprises:  
a conduit (60") in communication with the space between said screen cylinder and extending perpendicular to said accepts outlet and out of said housing.



FIG. 1





# INTERNATIONAL SEARCH REPORT

International Application No PCT/US 90/05467

<b>I. CLASSIFICATION OF SUBJECT MATTER</b> (if several classification symbols apply, indicate all) *				
According to International Patent Classification (IPC) or to both National Classification and IPC				
IPC <sup>5</sup> : D 21 D 5/02, B 01 D 29/54, 29/86				
<b>II. FIELDS SEARCHED</b>				
Minimum Documentation Searched <sup>7</sup>				
Classification System	Classification Symbols			
IPC <sup>5</sup>	B 01 D, D 21 D			
Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched <sup>8</sup>				
<b>III. DOCUMENTS CONSIDERED TO BE RELEVANT <sup>9</sup></b>				
Category <sup>9</sup>	Citation of Document, <sup>11</sup> with indication, where appropriate, of the relevant passages <sup>12</sup>	Relevant to Claim No. <sup>13</sup>		
A	US, A, 2975899 (MADISON M. CANNON) 21 March 1961 see columns 1-6  --	1,10,13,15, 16		
A	FR, A, 1472743 (CANADIAN INGERSOLL-RAND) 10 March 1967 see figures 1,18  --	1,4,5-7,10, 11		
A	DE, C, 599616 (ERNST BUCHHAAS) 5 July 1934 see pages 1-4  --	1-22		
A	EP, A, 36329 (BLACK CLAWSON) 23 September 1981 see pages 1-13  -----	1-22		
<table style="width: 100%; border: none;"> <tr> <td style="width: 50%; border: none; vertical-align: top;"> <p><sup>*</sup> Special categories of cited documents: <sup>10</sup></p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> </td> <td style="width: 50%; border: none; vertical-align: top;"> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.</p> <p>"&amp;" document member of the same patent family</p> </td> </tr> </table>			<p><sup>*</sup> Special categories of cited documents: <sup>10</sup></p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p>	<p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.</p> <p>"&amp;" document member of the same patent family</p>
<p><sup>*</sup> Special categories of cited documents: <sup>10</sup></p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p>	<p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.</p> <p>"&amp;" document member of the same patent family</p>			
<b>IV. CERTIFICATION</b>				
Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report			
4th February 1991	18 FEB 1991			
International Searching Authority	Signature of Authorized Officer			
EUROPEAN PATENT OFFICE	Mme N. KUIPER			

**ANNEX TO THE INTERNATIONAL SEARCH REPORT  
ON INTERNATIONAL PATENT APPLICATION NO.**

US 9005467  
SA 41310

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report. The members are as contained in the European Patent Office EDP file on 11/02/91. The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US-A- 2975899		FR-A- 1198662	
FR-A- 1472743		GB-A- 1118646	
DE-C- 599616		None	
EP-A- 0036329	23-09-81	US-A- 4302327	24-11-81
		CA-A- 1156975	15-11-83
		JP-A- 56144288	10-11-81