



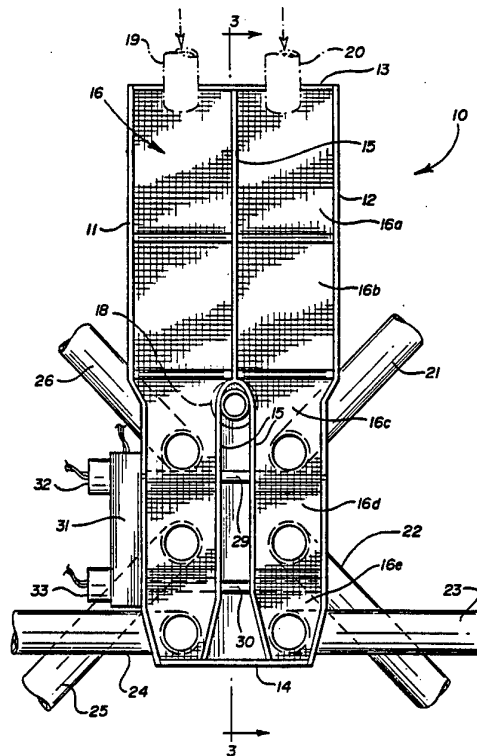
INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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(21) International Application Number: PCT/US93/09319 (22) International Filing Date: 30 September 1993 (30.09.93) (30) Priority data: 955,599 2 October 1992 (02.10.92) US (60) Parent Application or Grant (63) Related by Continuation US 955,599 (CON) Filed on 2 October 1992 (02.10.92) (71) Applicant (for all designated States except US): MERCK & CO., INC. [US/US]; 126 East Lincoln Avenue, Rahway, NJ 07065 (US).	(72) Inventors; and (75) Inventors/Applicants (for US only) : TARNOPOLSKI, Richard [US/US]; 1550 Koffel Road, Hatfield, PA 19440 (US). REAVES, Gregory, E. [US/US]; 1000 Dixon Road, Elkins Park, PA 19117 (US). (74) Agent: PFEIFFER, Hesna, J.; 126 East Lincoln Avenue, Rahway, NJ 07065 (US). (81) Designated States: AU, BB, BG, BR, BY, CA, CZ, FI, HU, JP, KR, KZ, LK, LV, MG, MN, MW, NO, NZ, PL, RO, RU, SD, SK, UA, US, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG). Published <i>With international search report.</i>	

(54) Title: CASCADE DEDUSTING APPARATUS

(57) Abstract

There is disclosed a cascade dedusting apparatus (10) which effectively removes dust from compressed tablets supplied from a tableting machine (19, 20) by causing the tablets to tumble along an inclined cascade member (16). The dust from the tablets is constantly removed from the dedusting apparatus by vacuum means (18) and the dedusted tablets are delivered to appropriate receptacles through a plurality of discharge tubes (21-26). The cascade dedusting apparatus of the invention also includes means to control the flow of dedusted tablets (32, 33) to a pre-selected discharge tube.



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- 1 -

10 TITLE OF THE INVENTION
CASCADE DEDUSTING APPARATUS

BACKGROUND OF THE INVENTION

15 In the pharmaceutical industry, many unit
doses of medications prescribed for oral
administration are provided in the form of coated
tablets of various sizes and shapes. These tablets
are typically formed by commercial tableting
machines which compress the medications supplied to
20 them in the form of particles, granules, powders, and
the like, into tablets.

These tablets are then coated with
conventional coatings such as coatings to facilitate
oral administration, prevent premature dissolution of
25 the medication, maintain tablet integrity, and the
like. However, before these coatings are applied,

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- 2 -

residual dust resulting from the tableting operation must be removed to enable them to be effectively coated.

5 Typical, commercially available tableting and dedusting apparatus employed for these purposes are the "Hata" supplied by Elizabeth-Hata International, Inc. and the "Fette P3100" supplied by Wilhelm Fette GMBH. These apparatus also include
10 computerized systems that count the number of dedusted tablets to prevent overfilling the receptacles in which the dedusted tablets are deposited.

15 These commercial dedusting apparatus dedust the tablets by means of a housing enclosing a horizontally disposed, hollow cylindrical screen drum equipped with an internal, co-axially aligned worm conveyor seated therein. Compressed tablets from a
20 tableting machine are fed into one end of the drum and the drum is activated rotate. As the drum rotates, the tablets are caused to vigorously tumble as they are transported by the worm conveyor to the discharge end of the drum where they are deposited into a suitable receptacle. Dust removed from the
25 tablets is withdrawn from the housing by suitable vacuum means.

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- 3 -

While effectively removing dust from the compressed tablets as required, these dedusting apparatus are not entirely satisfactory. Due to the vigorous tumbling action to which the tablets are subjected, many tablets are broken and cannot be coated. In addition, it has been found that in these dedusting apparatus much of the removed dust remains and accumulates at the supply end of the drum. After a prolonged period of operation, this accumulated dust has a tendency to cake up and cannot be removed by the vacuum means. As a result, the dedusting apparatus has to be constantly monitored and periodically both the tableting and the dedusting operators have to be shut down in order to remove caked dust. Further, since these dedusters discharge the dedusted tablets into one or, at most, two receptacles, the deduster and the tableting machine must be both shut down in order to remove the filled receptacle and provide an empty receptacle.

Thus, these conventional dedusting apparatus are not considered to be highly efficient or cost effective as they are expensive to manufacture, costly to operate, result in a significant number of broken tablets which cannot be coated, require constant supervision, and must be periodically shut down either to perform clean up maintenance or to replace a filled receptacle with an empty one.

SUMMARY OF THE INVENTION

It has now been found that these shortcomings of such conventional dedusting apparatus are overcome by the cascade dedusting apparatus of

- 4 -

the invention. In general, the cascade dedusting apparatus of the invention comprises a generally elongated rectangular housing having opposed side walls and opposed end walls, one of said end walls being at the supply end and the other end wall being at the discharge end of the apparatus; a cascade screen member seated within the opposed end walls and opposed side walls and inclined from the supply end toward the discharge end, the cascade screen member consisting of a plurality of screen sections, each section being disposed horizontally higher than a succeeding section from the supply end toward the discharge end; a floor beneath the screen member secured to the opposed side walls; a plurality of discharge tubes at the discharge end of the deduster apparatus, each of the tubes communicating with the interior of the deduster; and, vacuum means intermediate the opposed end walls communicating with the interior of the deduster apparatus.

In preferred embodiments, the cascade deduster apparatus of the invention is provided with a diverter wall disposed between the opposed end walls to substantially divide the cascade screen member longitudinally in half; gate means to close off pre-selected discharge ports; and, sensing means to prevent overflowing of the receptacles receiving dedusted tablets in the event of malfunctions.

Tablets fed to the cascade deduster apparatus of the invention are gently tumbled along the cascade screen member toward the discharge end of the apparatus removing dust from the tablets. The removed dust falls through the cascade screen member

- 5 -

5 onto the floor and is constantly withdrawn from the apparatus by the vacuum means. At the discharge end, the dedusted tablets are directed through the discharge tubes into a plurality of receptacles. By using the gate means, the dedusted tablets can be directed to pre-selected discharge tubes enabling their associated receptacles to be filled successively or sequentially. Employing the sensoring means safeguards against overfilling the receptacles should a malfunction occur.

10 Thus, the cascade deduster apparatus of the invention is simple to use and economic to manufacture. In addition, use of this apparatus minimizes and virtually eliminates tablet breakage and minimizes operator supervision and maintenance. Further, the apparatus permits increased productivity and greater flexibility since filling the plurality of receptacles can be controlled thereby enabling tablets to be dedusted continuously for prolonged periods of time.

DETAILED DESCRIPTION OF THE INVENTION

25 The cascade deduster apparatus of the invention will become more apparent from the ensuing description when considered together with the accompanying drawing wherein like reference numerals denote like parts and wherein:

30 Figure 1 is a perspective view of the cascade deduster apparatus of the invention;

- 6 -

Figure 2 is a top plan view of the apparatus shown in Figure 1;

5 Figure 3 is a view taken substantially on the line 3-3 of Figure 2; and,

10 Figure 4 is an elevation and partial diagrammatic view of a gate means that can be used with the deduster apparatus of the invention.

As shown in Figures 1-3 the cascade deduster apparatus of the invention, generally identified by reference numeral 10, having opposed side walls 11, 12, opposed end walls 13, 14 and a central diverter wall 15 which divides the deduster apparatus substantially in half lengthwise.

20 Seated within side walls 11, 12 and end walls 13, 14 is an inclined cascade screen member 16 consisting of a plurality of sections such as 16a-16e, each section being horizontally higher than a succeeding section as one progresses from end wall 13 to end wall 14 to form a cascade screen.

25 The mesh size of screen 16 is not critical but should not be so large as to enable compressed tablets to pass through it nor so small as to become clogged with removed dust during dedusting operations. For typical dedusting operations, a screen having a mesh size in the range of from about 0.050 to about 0.095 is suitable. Also useful is a
30 stainless steel type 304 wire cloth (0.023 wire; 12 x 12 mesh) having a wire opening of 0.060.

- 7 -

5 Beneath screen 16 is a floor 17 secured to
side walls 11, 12 which extends from end wall 13 to
terminate at a point intermediate the dust removal
conduct 18 and the first discharge tubes 21, 26 as
10 indicated at 17a (Figure 3) and which receives the
dust from the dedusted tablets. Intermediate end
walls 13, 14 and communicating with the interior of
the apparatus through an opening formed in floor 17
is a dust removal conduit 18 (Figures 2 and 3)
15 preferably in the form of a tube, through which the
dust from dedusted tablets is removed. Preferably,
floor 17 is pitched at an angle from end wall 13
toward dust removal conduit 18 to facilitate removal
of the dust. Removal conduit 18 is connected to a
suitable vacuum means (not shown) so that the dust is
constantly removed as the tablets are dedusted.

 In the embodiments shown in Figures 1-3, end
wall 13 is at the supply end of the deduster
20 apparatus and tablets to be dedusted are supplied to
the deduster apparatus from a conventional tableting
apparatus (not shown) such as by means of supply
tubes 19 and 20. Since most conventional tableting
machines are now provided as dual tableting
25 machines, two such supply tubes are indicated
although single tableting machines are still
currently being used.

 Opposed end wall 14 is at the discharge end
of the dedusting apparatus and intermediate end wall
14 and the end 17a of floor 17 there are provided a
30 plurality of discharge conduits or tubes 21, 22, 23,
24, 25 and 26 through which dedusted tablets are
removed from the deduster. The upper ends of each of
the discharge tubes 21-26 communicates with the

- 8 -

interior of the apparatus to receive the dedusted tablets and deliver them to suitable receptacles such as drums as indicated at 27 in Figure 3.

5 In Figure 3, there is also shown a suitable support 28 for the deduster apparatus which is preferably of the type that can be vertically raised and lowered so that the deduster apparatus can be properly positioned adjacent discharge tubes 19, 20 of tableting apparatus.

10 In a preferred embodiment and as best seen in Figures 2 and 3, a pair of gates 29 and 30 are provided transverse to the longitudinal axis of the deduster 10 and are positioned to control the flow of dedusted tablets through discharge tubes 21-26 so
15 that when drums 27 have received a predetermined number of dedusted tablets from discharge tubes 21-26, one of the gates 29 or 30 is closed to shut off the flow of dedusted tablets to pre-selected discharge tubes. This is readily accomplished by
20 utilizing a conventional tablet counter as indicated at 31 (Figure 2) connected to a conventional computerized sensing device (not shown) which, in turn, is connected to solenoid switches 32, 33
25 (Figure 2). When the computerized sensing device receives a signal from the tablet counter 31 that a pre-determined number of dedusted tablets has passed through a pair of discharge tubes 21-26, it activates one of the solenoid switches 32 or 33 which, in turn, actuate a gate 29 or 30 to its closed position and
30 shut off the flow of dedusted tablets to that pair of discharge tubes 21-26. The computerized sensing device also serves to stop the tableting machine if the solenoid switches 32 and/or 33 malfunction and

- 9 -

fail to open or close the gates in proper sequence.

In the embodiment shown in Figure 2, gate 29 would be actuated to shut off the flow of dedusted tablets to discharge tubes 21, 26 and gate 30 would be actuated to shut off the flow of dedusted tablets to discharge tubes 22, 25 and discharge tubes 23, 24. Thus, a typical discharge sequence would be through discharge tubes 24, 25, 26 for one side and through discharge tubes 21, 22, 23 for the other side.

While any conventional arrangement can be used for gates 29 and 30, details of one such gate arrangement is illustrated in Figure 4. As can be seen in Figure 4, gate 29 is rotatably secured beneath cascade screen section 16c by means of axle 29a pinned to side wall 11 shown by dot-dash lines. Spaced from gate 29 is spring arm 34 which is also rotatably secured beneath floor 17 by means of spring arm pin 34a. Disposed between gate 29 and spring arm 34 is a spring 35 which is biased against gate 29 to retain gate 29 in a normally open position as indicated by the solid lines. Spring arm 34 is also connected to solenoid switch 32 by conventional means as indicated by 32a. When solenoid switch 32 sends a signal to spring arm 34 through connecting means 32a, spring arm 34 is actuated to rotate to its dashed line position enabling gate 29 to also rotate to its dashed line position and seal off cascade screen section 16c thereby stopping the flow of dedusted tablets to discharge tubes 21 and 26.

In operation, the cascade deduster apparatus of the invention is positioned to receive tablets from a conventional tableting machine through supply tubes 19 and 20 (Figures 1 and 2). As the tablets

- 10 -

are delivered from supply tubes 19 and 20, they are kept separated by means of diverter wall 15. The force with which tablets are discharged through supply tubes 19 and 20 from the tableting machines coupled with the inclined pitch of screen member 16 and the cascade effect created by screen sections 16a-16e, causes the tablets to gently tumble along screen member 16 toward discharge tubes 21-26. This tumbling action created by the cascade effect of the screen sections effectively dedusts the tablets and, since the tumbling action is relatively gentle, breakage of or damage to the tablets is significantly reduced. Since the dust is constantly removed from the tablets by means of removal conduit 18 as the tablets progress along the cascade screen member 16, dust build up in screen member 16 is prevented thereby enabling removal of virtually all dust from the tablets. By selective use of gates 29 and 30, continuous dedusting can be achieved by staggering the flow of dedusted tablets through discharge conduits 21-26 enabling filled drums 27 to be removed and replaced with empty drums to be filled.

Although the cascade dedusting apparatus of the invention has been described with particularity and in some detail, it should be understood and will be appreciated by those skilled in this art that modifications can be made therein without departing from the scope of the invention recited in the claims.

- 11 -

WHAT IS CLAIMED IS

1. A dedusting apparatus comprising:

5 (a) a generally rectangular housing having opposed side walls and opposed end walls, one end wall being at the supply end and the other end wall being at the discharge end of said apparatus;

10 (b) a screen member seated within said housing, said screen member being inclined from the horizontal downwardly from said supply end toward said discharge end;

(c) means to deliver tablets to be dedusted to said supply end and onto said screen member;

15 (d) a plurality of discharge tubes at said discharge end each of which communicates at one end which the interior of said housing and the other ends of which are open to deliver dedusted tablets into receptacles; and,

20 (e) vacuum means intermediate said opposed end walls and communicating with the interior of said housing to remove dust from dedusted tablets.

25 2. The apparatus of Claim 1 wherein said screen member comprises a plurality of screen sections, each of said sections being disposed horizontally higher than a succeeding section from said supply end to said discharge end.

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- 12 -

5 3. The apparatus of Claim 1 wherein a diverter wall is provided in said housing, said diverter wall being disposed between said opposed end walls longitudinally dividing said housing in half.

10 4. The apparatus of Claim 1 which includes a plurality of gate means at said discharge end positioned to control the flow of dedusted tablets to pre-selected discharge tubes.

15 5. The apparatus of Claim 4 wherein sensing means are provided to automatically close one or more of said gate means.

20 6. A dedusting apparatus comprising:
(a) a generally rectangular housing having opposed side walls and opposed end walls, one end wall being at the supply end and the other end wall being at the discharge end of said apparatus;
(b) a screen member seated within said housing, said screen member being inclined from the horizontal downwardly from said supply end toward said discharge end and having a plurality of screen sections, each of said sections being disposed
25 horizontally higher than a succeeding section from said supply end to said discharge end;
(c) means to deliver tablets to be dedusted to said supply end and onto said screen member;

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- 13 -

(d) a diverter wall disposed in said housing between said opposed end walls longitudinally dividing said housing in half;

5 (e) a plurality of discharge tubes at said discharge end each of which communicates at one end with the interior of said housing and the other ends of which are open to deliver dedusted tablets into receptacles;

10 (f) a plurality of gate means at said discharge end positioned to control the flow of dedusted tablets to pre-selected discharge tubes; and,

(g) vacuum means intermediate said opposed end walls and communicating with the interior of said housing to remove dust from dedusted tablets.

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7. The apparatus of Claim 6 wherein sensing means are provided to automatically close one or more of said gate means.

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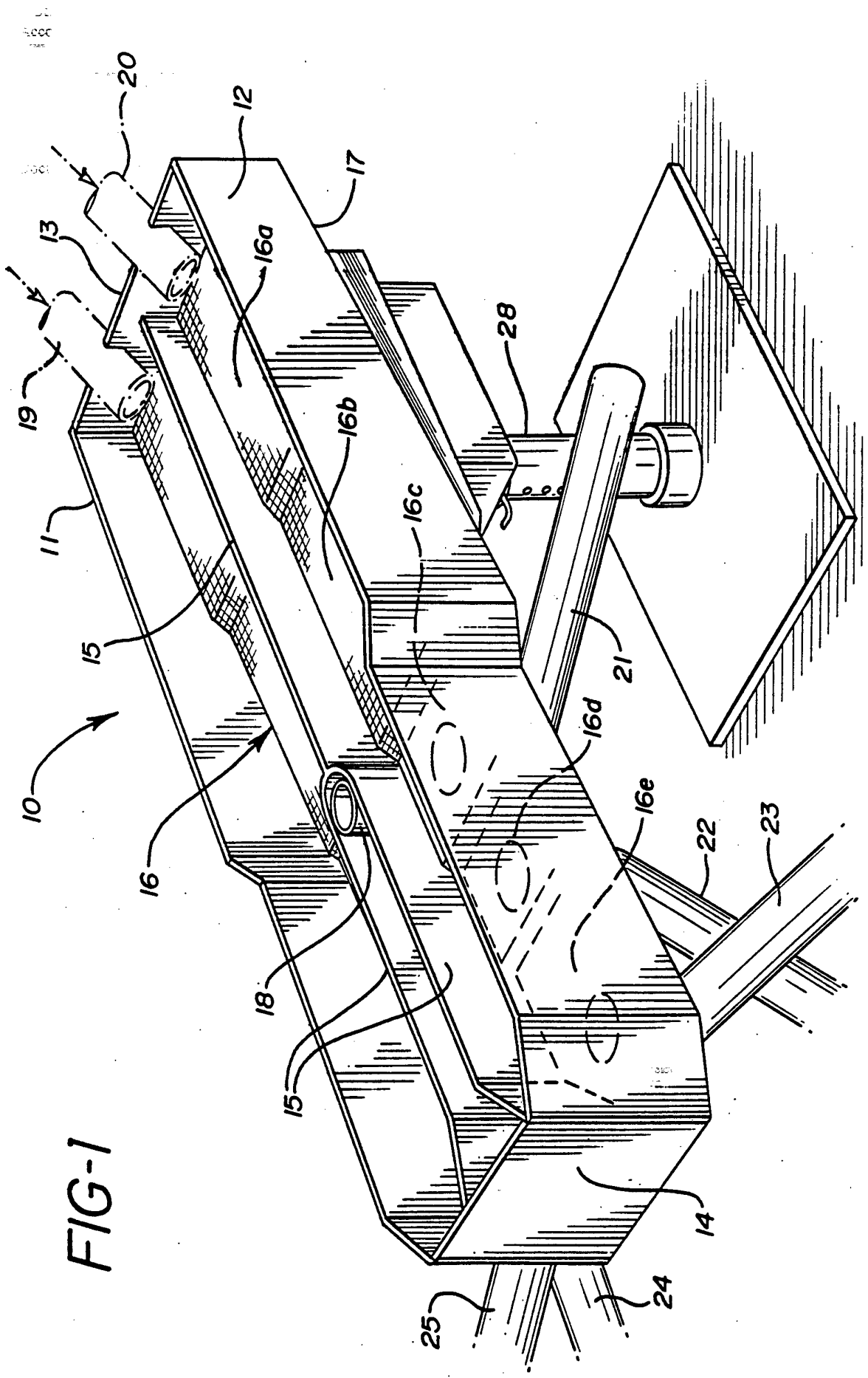


FIG-1

FIG-2

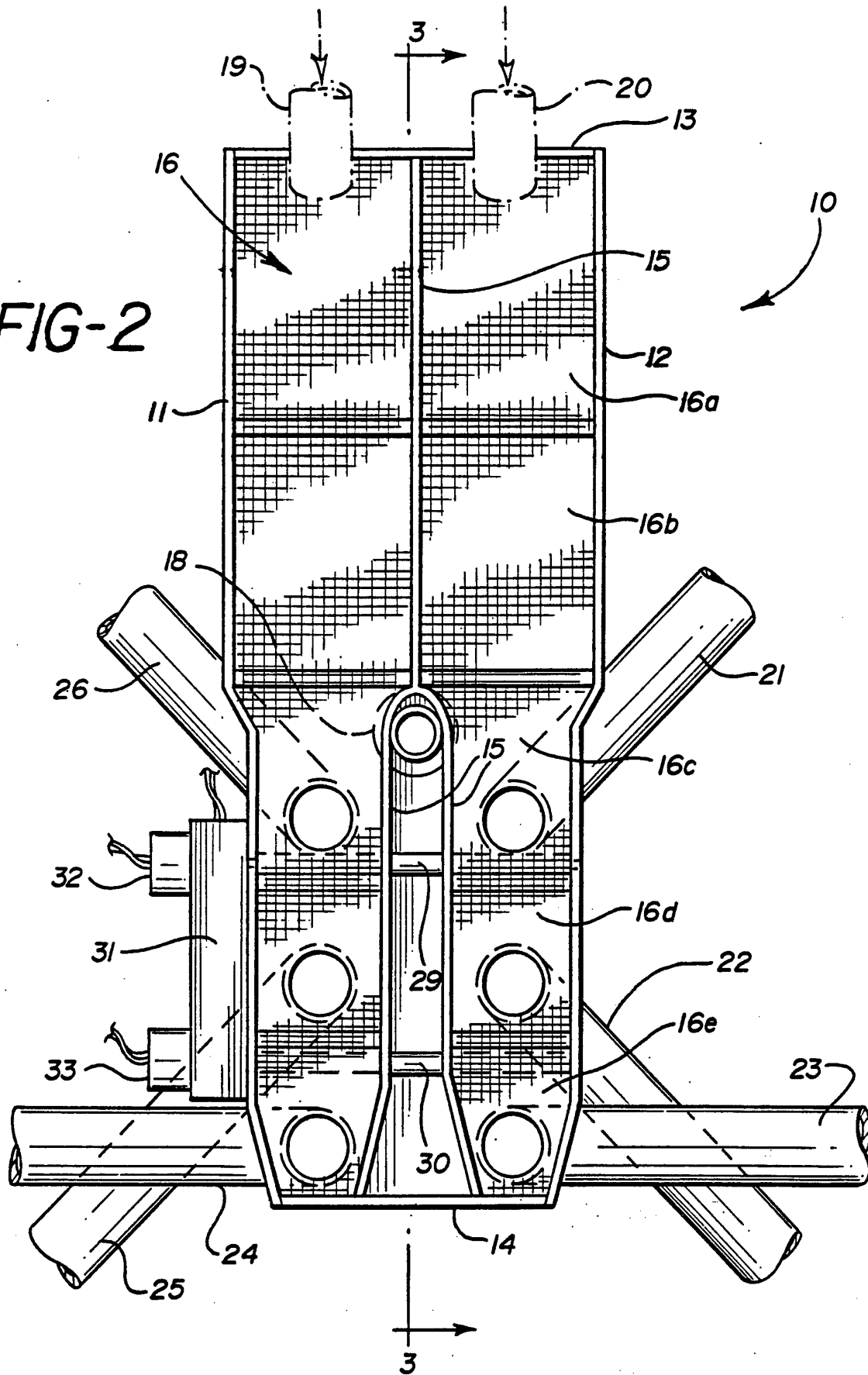


FIG-3

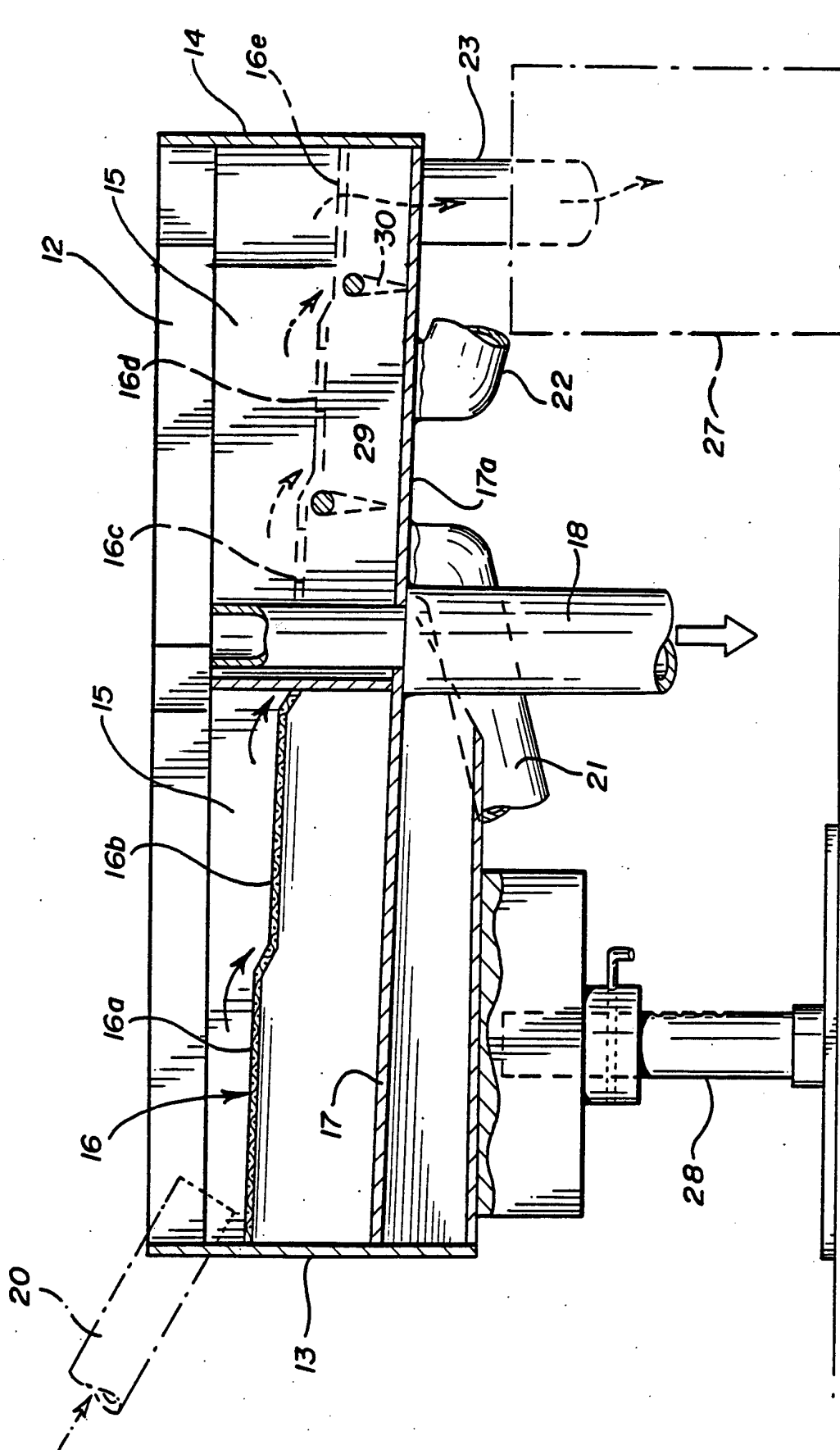
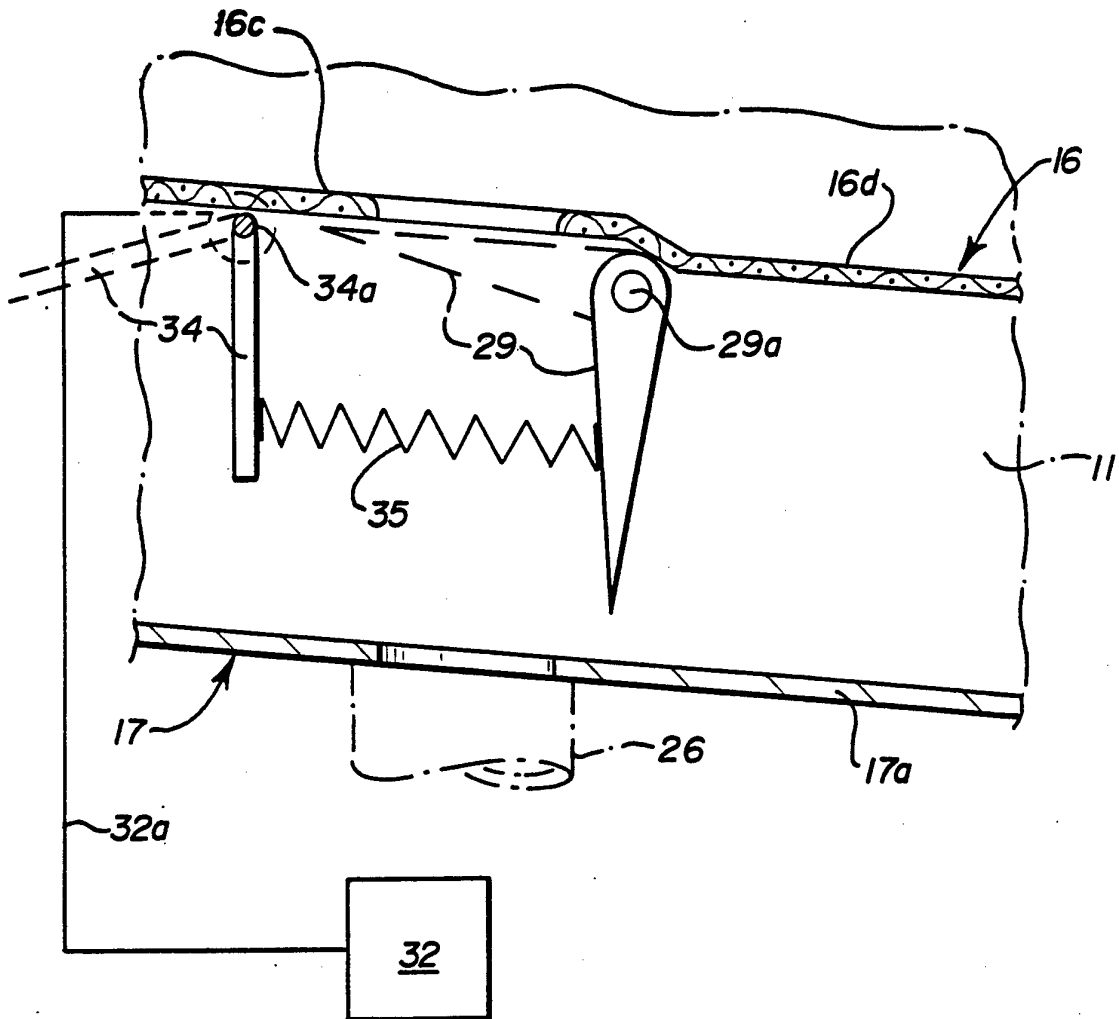


FIG-4



INTERNATIONAL SEARCH REPORT

International application No.
PCT/US93/09319

A. CLASSIFICATION OF SUBJECT MATTER

IPC(5) :A47L 5/38
US CL :015/309.2

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 015/309.2, 303, 306.1, 308; 209/466, 474, 476, 491, 496

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US, A, 4,411,038 (Muka \bar{u}) 25 October 1983, entire document.	1-7
Y	US, A, 3,412,858 (Stone) 26 November 1968, entire document.	1-7
Y	US, A, 2,012,633 (Meunier) 27 August 1935, entire document.	3,6,7
A	US, A, 775,946 (Stebbins) 29 November 1904, entire document.	1-7
A	US, A, 2,141,451 (Ridley) 27 December 1938, entire document.	1-7
A	US, A, 2,617,137 (Bodnar) 11 November 1952, entire document.	1-7

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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US, A, 3,096,532 (Frank) 09 July 1963, entire document.	1-7
A	US, A, 3,114,479 (Keeney) 17 December 1963, entire document.	1-7
A	US, A, 3,909,873 (Minasov et al.) 07 October 1975, entire document.	1-7
A	US, A, 4,304,611 (Ellis) 08 December 1981, entire document.	1-7
A	FR, A, 994,498 (Myard) 16 November 1951, entire document.	1-7