(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 0 653 517 B1

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
15.10.1997 Bulletin 1997/42

(51) Int Cl.[6]: **E01C 19/10**

(21) Application number: **93830458.1**

(22) Date of filing: **17.11.1993**

(54) **Plant for producing bituminous conglomerate in continuous work cycle**

Anlage zur Bereitung eines Bitumenkonglomerats im Kontinuverfahren

Installation pour la production continue d'agglomérés de bitume

(84) Designated Contracting States:
AT BE CH DE DK ES FR GB GR IE IT LI NL PT SE

(43) Date of publication of application:
17.05.1995 Bulletin 1995/20

(73) Proprietor: **Ghirardelli, Giorgio**
I-44014 Longastrino (Ferrara) (IT)

(72) Inventor: **Ghirardelli, Giorgio**
I-44014 Longastrino (Ferrara) (IT)

(74) Representative: **Sassatelli, Franco T., Dr.**
c/o INIP
5, via Ruggi
40137 Bologna (IT)

(56) References cited:
EP-A- 0 347 271
EP-A- 0 391 768
US-A- 4 211 490
US-A- 5 054 931

Note: Within nine months from the publication of the mention of the grant of the European patent, any person may give notice to the European Patent Office of opposition to the European patent granted. Notice of opposition shall be filed in a written reasoned statement. It shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).

EP 0 653 517 B1

Printed by Jouve, 75001 PARIS (FR)

Description

The invention refers to a plant consists of a cylindrical rotary furnace and of a filter for the smokes to be used for producing bituminous conglomerate in continuous cycle. Said cylindrical furnace consists of an initial part of smaller diameter, forming the drying chamber, and of an other part of larger diameter and it provides in its inner a cylindrical structure with fixed duct, brought on head, which lets in the heat flow from the burner to the combustion chamber countercurrent compared to the way of advancement of the inert product. Inside the cylindrical furnace a mixing chamber is then provided. It consists of a closed unit lying behind the wall where is placed the inlet of the heat flow. Moreover the unloading of the product ready to be used from the mixing chamber of the furnace to a programmed time is provided. The filter realizes the blasting of the smokes with continuous unloading towards outside of the purified air. Said filter makes the total recovery and dosing of the fine dust of the cement suspended in the air flow for its prompt use into the mixing chamber. Moreover the filter permits the complete use of the heat flow acting into a closed cycle.

According to the prior art is know the plant described and shown in the Italian Patent Application BO91A 000487.

In comparison with said plant the invented plant providing the heat flow countercurrent compared to the direction of advancement of the inert product into the drying and and combustion chmbers permits, for contact, to increase the heat exchan ge effect so assuring a better yield of the furnace. Being the combustion chamber provides in a closed unit, thanks to the different placing of the unit generating the heat flow, it is avoided the product volatization in particular of the fine dust of the cement and it is permitted to keep the product mixing to a right dosing. The invented cylindrical furnace with its inital part of smaller diameter, contrary to the furnace described in the italian document BO91A 000487 with an unchanged diameter, permits to actuate the widths of the drying and combustion chambers related to the use necessities; this considering that into the drying chamber is prevalent necessary to move the product onto the wall to increase the licking up effect while into the combustion chamber is prevalent the necessity to bring the product onto the heat source.

In the plant described in the Italian document BO91A 000487 the unloading of the product ready to be used from the mixing chamber is actuated in continuous way according to the casuality so determining heterogeneous product.

The invented plant is provided with programmed times for the unloading to avoiding heterogeneous product. Moreover the invented plant permits the complete recovery and dosing of the fine dust of cement for its prompt re-use. Providing the invented plant an isolated filter consists of a closed unit and acts following to the cylindrical rotary furnace, it is possibile to realize the blasting of the smokes present into the circulation air and also to realize the complete use of the plant heat. Moreover being actuated the feeding of the bitumen in the mixing chamber, where there is not a circulation flow, is avoided the dispersion of the same bitumen and consequently it is avoided the air pollution.

Other apparatuses are known, as for instance the apparatuses described and shown in the documents US-A-4 211 490 and US-A-54 054 931.

The invented plant consists of a cylindrical rotary furnace in continuous cyle with upper filter. Said plant brought on a frame with three bridges 1 completed with a bearing structure 2. Said structure 2 provides beams 3, slanting towards the unloading, which bring on couple of rotaring bearings 4 with rollers 5 a cylindrical furnace with initial part of smaller diameter 6 and other part of larger diameter 7. Said furnace having emerging on its outside rims 8 for the contact of the rollers 5 with motion given by a motor 9 which trasmits on the gear 10 of the rotary support 11 to the rack 12. The inert product, after to have being dosed, from the elevator 13, through the inlet 14 present on the transversal fixed wall 15, coming into the drying chamber 16 formed by the inital part of smaller diameter 6 of the furnace. In said drying chamber the product, in continuous movement by means of the vanes, goes on gradually by gravity effect and it arrives into the combustion chamber 17 formed by the other part of larger diameter 7 of the cylindrical furnace. At the end of said combustion chamber the product climbs on a rotary elevator equipped with vanes 18 radially placed on the circular crown 19 emerging from the cylindrical furnace 6-7. Said crown 19 rotates together with the furnace and it forms, with the inner circular fixed part 20 centrally brought by a cylindrical structure 21 housing into the fixed frame 22 sets out on the bearing structure 2, an orifice plate which devides the combustion chamber from the mixing chamber 23. The inert product, after to have being dryed into the drying chamber 16 and to have being baked into the combustion chamber 17, climbs by means of the vanes 18 and it is unloaded in continuous cycle by means of the chute 24 into the mixing chamber 23. In said mixing chamber, through a duct 25, is let in nonasphaltic road oil at 140° coming from a feeder. Contemporary through a screw conveyor 26, coaxially placed around the duct 25, is unloaded into the mixing chamber 23 other material made by fine dust of cement coming from an other feeder and acting as binder. The mixing is facilitated by vanes 27 placed in parallel on the wall mixing chamber 23. To better mix the product it is provided its intermittent unloading. The intermitted unloading actuated by three hydraulic cylinders 28 equipped with timers to regulate the operating times. The hydraulic cylinders 28 open equidistant portholes 29 for the unloading of the product ready to be used which goes on in continuous and is unloaded through the opening 30 of the hopper 31. The product going out from the hopper 31 is then loaded on transport means

or used for the different necessities. The cylindrical rotary fornace 6-7 uses a burner 32 which, through a duct provided into the cylindrical structure 21, lets in the flame into the cylindrical furnace through the mouth 33 creating a heat flow countercurrent compared to the material advancing into the drying chamber 16 and into the combustion chamber 17. Upper to the cylindrical furnace, always supported by the bearing structure 2, a parallelepipedal filter 34 is provided with separators 35 which divide the inside space in sectors 36 equipped with fiber filters 37. An intake manifold 38 with air propeller 39 is used for the getting out of the air purified by smokes through the stack 40. With the inert product into the combustion chamber 17 run into the heat jet coming out from the mouth 33, through the collector 41 housing into the head 42, the smokes sucked up by the air propeller 39 pass into an upper duct 43 and coming into a pre-separator 44. Said smokes then arrive into the chamber 45 where, going through the fiber filters 37, are purified. The purified air goes out from the duct 46 and through the intake manifold 38 by the air propeller 39 goes out from the stack 40. The dusts which have being kept into the fiber filters 37 fall into the cone-shaped duct 47 with at its end the Archimedes'screw 48. Said Archimedes' screw 48 unloads the dusts into a duct 49 with a Archimedes' screw 50 where the load cells 51 of fine recovery product are weighed. The Archimedes' screw 50 then unload the fine recovery product into the mixing chamber 23 through the screw conveyor 26. In this way is realized the prompt re-use of the fine dust of cement dispelled into the plant. The invented plant is illustrated in schematic view in the drawings of sheets 1, 2, 3 and 4. Fig. 1 is longitudinal section view of the plant in its initial part with view of the cylindrical furnace 6-7 and of the upper filter 34. Fig. 2 is longitudinal section view of the plant in its end part with view of the mixing chamber 23. Fig. 3 is back view of the plant. Fig. 4 is side view of the plant with view of the frame with three bridges 1.

Claims

1. Plant for producing bituminous conglomerate in continuous work cycle, comprising a closed operative plant supported on a frame with three aligned bridges (1) completed with a bearing network structure (2) with beams (3), slanting towards the unloading side, which structure supports, on couple with rotary bearings (4) with rollers (5), a cylindrical rotary furnace (6-7), into which inert product coming from an elevator (13) is fed, and above the cylindrical furnace, always supported by the network structure (2), a parallelepipedal filtering unit (34);

   - the cylindrical furnace (6-7) consisting of an initial part of smaller diameter (6) forming a drying chamber (16) and of a subsequent part of larger diameter (7) forming a combustion chamber (17); in said drying chamber (16) the product, moved by sets of vanes, proceeds due to gravity effect to come into the combustion chamber (17), at the end of which the product climbs on a rotary elevator equipped with a set of vanes (18) and is unloaded in continuous work cycle by means of a chute (24) into a mixing chamber (23), where nonasphaltic road oil at 140° is let in through a duct (25) and where other material made of fine dust of cement is let in through a screw conveyor (26), and from which the product ready to be used is unloaded by means of a hopper (31);
   - the cylindrical furnace (6-7) using a burner (32), which, through a duct provided in a cylindrical structure (21), lets in a flame through a mouth (33), thereby creating a heat flow countercurrent compared to the material advancing into the drying chamber (16) and into the combustion chamber (17);
   - to better mixthe product its intermittent unloading being actuated by three hydraulic cylinders (28) equipped with timers for regulating the operative times, said cylinders (28) open a set of equidistant portholes (29) for the unloading of the product ready to be used which proceeds in continuous way;
   - the filtering unit (34) providing separators (35) which divide inside sectors (36) equipped with sets of fabric filters (37), and providing an intake manifold (38) with an air propeller (39) for getting out the purified air through a stack (40);
   - a prompt re-employment of the fine dust of cement kept by the fabric filters (37) being realized in that the dust falls into a cone-shaped duct (47) having at its end an Archimedean screw (48), which screw (48) loads said dust into a duct with an Archimedean screw (50), which re-puts the dust into the mixing chamber (23) through a screw conveyor (26).

2. Plant according to claim 1, characterized in that the cylindrical furnace (6-7) is provided on its outside with rims (8) for contact with the rollers (5), the motion being given by a motor (9) and being transmitted via a gear (10) on a support (11) to a rack (12).

3. Plant according to claim 1, characterized in that the set of vanes (18) is radially placed on a circular crown (19) emerging from the cylindrical furnace (6-7), and in that said crown (19) rotates together with the furnace to form, with the inner circular fixed part (20) brought centrally by a cylindrical structure (21), an orifice plate which divides the combustion chamber (17) from the subsequent mixing chamber (23).

4. Plant according to claim 1, characterized in that the mixing in the mixing chamber (23) is facilitated by sets of vanes (27) placed in parallel on the wall of the mixing chamber (23).

5. Plant according to claim 1, characterized in that the product going out from the hopper (31) is then loaded on transport means or used for different necessities.

6. Plant according to claim 1, characterized in that the smokes of the inert product in the combustion chamber (17) run into the heat jet coming out from the mouth (33), then through a collector housing (41) into the header (42), the smokes then being sucked up by the air propeller (39) and pass an upper duct (43), then come into a pre-separator (44) and then arrive in a chamber (45), where they, while going through the fabric filters (37), are purified.

7. Plant according to claim 1, characterized in that the last Archimedean screw (48) unloads the dusts into a duct (49) with an Archimedean screw (50), where the load cells (51) of fine recovery product are weighed.

Patentansprüche

1. Anlage zum Erzeugen eines Bitumenkonglomerates im Kontinueverfahren, umfassend eine geschlossene betriebsfertige Anlage, die auf einem Rahmen mit drei fluchtenden Stegen (1) gehalten ist, vervollstandigt durch einen tragenden Netzwerkaufbau (2) mit Trägern (3), die in Richtung zur Austragseite geneigt sind, wobei der Aufbau, gekoppelt mit Drehlagerungen (4) mit Walzen (5), einen zylindrischen Drehofen (6, 7) trägt, in den ein von einem Förderer (13) kommendes, inertes Produkt eingespeist wird, und mit einer quaderförmigen Filterinheit (34) oberhalb des zylindrischen Ofens, die ebenfalls von dem Netzwerkaufbau (2) gehalten ist;

   - wobei der zylindrische Ofen (6, 7) aus einem Anfangsteil mit kleinerem Durchmesser (6) besteht, der eine Trocknungskammer (16) bildet, und aus einem daran anschließenden Teil mit größerem Durchmesser (7), der eine Brennkammer (17) bildet, wobei das Produkt in der Trocknungskammer (16), bewegt durch Leitschaufelanordnungen, aufgrund der Schwerkraftwirkung voranschreitet und in die Brennekammer (17) gelangt, an deren Ende das Produkt an einem mit einem Satz von Leitblechen (18) versehen Rotationsförderer aufsteigt und im Kontinueverfahren mittels einer Rutsche (24) in einem Mischkammer (23) ausgetragen wird, in die nicht-asphaltisches Straßenöl bri 140° durch eine Leitung (25) eingeleitet wird, und in die weiteres Material, das aus feinem Zementstaub besteht, durch einen Schraubenförderer (26) eingeleitet wird, und aus der das gebrauchsfertige Produkt mittels eines Trichters (31) ausgetragen wird;
   - wobei der zylindrische Ofen (6, 7) einen Brenner (32) verwendet, der durch einen in einem zylindrischen Aufbau (21) vorhandenen Kanal eine Flamme durch eine Mündung (33) einläßt, wodurch ein Wärmestrom erzeugt wird, der im Gegenstrom zu dem Material ist, das in der Trocknungskammer (16) und inder Brennkammer (17) voranschreitet;
   - wobei ein intermittentes Austragen des Produkts durch drei Hydraulikzylinder (28) ausgeführt wird, um das Produkt besser zu mischen, die mit Zeitgebern zur Steuerung der Betriebszeiten ausgestattet sind, wobei die Zylinder (28) einen Satz von äquidistanten Durchlaßöffnungen (29) zum Austragen des gebrachsfertigen Produkts öffnen, welches in kontinuierlicher Weise voranschreitet ;
   - wobei die Filtereinheit (34) Trennwände (35) aufweist, die im Inneren Sektoren (36) abtrennen, welche mit Sätzen von Stoffiltern (37) ausgestattet sind, und wobei ein Einlaß-Verteillerrohr (38) mit einem Luftpropeller (39) vorhanden ist, umdie gereinigte Luft durch einen Kamin (40) hinauszubefördern;
   - wobei eine sofortige Wiederverwendung des feinen Zementstaubs, der durch die Stoffilter (37) zurückgehalten wird, dadurch erreicht wird, daß der Staub in einen konusförmigen Kanal (47) fällt, der an seinem Ende eine Schraubenwendel (archimedische Schraube) (48) aufweist, wobei die Schraube (48) den Staub in einen Kanal mit einer Schraubenwendel (archimedische Schraube) (50) lädt, welche den Staub über einen Schraubenförderer (26) erneut in die Mischkammer (23) befördert.

2. Anlage nach Anspruch 1, dadurch gekennzeichnet, daß der zylindrische Ofen (6, 7) auf seiner Außenseite mit Reifen (8) für den Kontakt mit den Walzen (5) versehen ist, wobei die Bewegung durch einen Motor (9) erfolgt und über ein Zahnrad (10) auf einem Lager (11) an eine Verzahnung (12) übertragen wird.

3. Anlage nach Ansrpuch 1, dadurch gekennzeichnet, daß der Satz von Leitschaufeln (18) radial auf einem kreisförmigen Kopfring (19) angeordnet ist, der aus dem zylindrischen Ofen (6, 7) vorsteht, wobei der Kopfring (19) zusammen mit dem Ofen rotiert, um zusammen mit dem inneren, kreisförmigen, feststehenden Teil (20) das durch einen zylindri-

schen Aufbau (21) zentral gehalten wird, eine Lochplatte zu bilden, die die Brennkammer (17) von der darauffolgenden Mischkammer (23) abtrennt.

4. Anlage nach Anspruch 1, dadurch gekennzeichnet, daß der Mischvorgang in der Mischkammer (23) durch Sätze von Leitblechen (27) erleichtert wird, die parallel auf der Wand der Mischkammer (23) angeordnet sind.

5. Anlage nach Anspruch 1, dadurch gekennzeichnet, daß das aus dem Trichter (31) kommende Produkt auf eine Transporteinrichtung geladen wird oder für unterschiedliche Zwecke verwendet wird.

6. Anlage nach Anspruch 1, dadurch gekennzeichnet, daß die Rauchgase des inerten Produkts in der Brennkammer (17) in den aus der Mündung (33) kommenden Wärmestrahl laufen, dann durch ein Kollektorgehäuse (41) in den Sammelstutzen (42), wobei die Rauchgase dann von dem Luftpropeller (39) angesaugt werden und durch einen oberen Kanal (43) hindurchgehen, anschließend in einen Vorabscheider (44) gehen und dann in eine Kammer (45) gelangen, in der sie gereinigt werden, während sie durch die Stoffilter (37) hindurchgehen.

7. Anlage nach Anspruch 1, dadurch gekennzeichnet, daß die letzte Schneckenwendel (48) die Stäube in einen Kanal (49) mit einer Schneckenwendel (50) austrägt, wo die Tragzellen (51) mit feinem Wiedergewinnungsprodukt gewogen werden.

Revendications

1. Installation pour la production continue d'agglomérés de bitume comprenant une installation opérative close maintenue sur une structure à trois ponts alignés (1) et complétée par un bâti-support (2) avec des poutres (3) inclinées vers le côté de déchargement où le dit bâti-support maintient, sur un couple de supports tournants (4) au moyen de rouleaux (5), un four cylindrique tournant (6-7) où le produit inerte provenant de l'alimentateur (13) est alimenté, et sur le four cylindrique il existe, toujours maintenue par le susdit bâti-support(2), une unité filtrante (34);

   - le four cylindrique (6-7) est constitué d'une partie initiale avec un diamètre mineur (6) formant la chambre de dessiccation (16), et d'une ultérieure partie avec un diamètre majeur (7) formant la chambre de combustion (17; dans la susdite chambre de dessiccation (16) le produit - remu par des systèmes à palettes - avance par suite de l'effet gravitationnel et arrive dans la chambre de combustion (17), au bout de la chambre de combustion le produit est élévé sur un élévateur rotant pourvu d'un système à palettes (18) et il est déchargé en production continue à travers un poulain (24) à l'intérieur de la chambre de mélange (23) où du bitume à l'état liquid à 140° est colé à travers la canalisation (25), tandis que du matériel fin de cément est introduit à travers un déchargement à vis d'Archimède (26); le produit prêt pour l'usage est ensuite déchargé de cette chambre de mélange au moyen d'une trémie (31);
   - un four cylindrique (6-7) employant un brûleur qui, au moyen d'une conduité construite dans sa structure cylindrique (21) fait pénétrer une flamme à traver la bouche (33) intéressée, par la suite de cette opération un flux de chaleur se produit en countre-courant par rapport au matériel qui avance dans la chambre de dessiccation (16) et dans la chambre de combustion ((17);
   - à fin de la mieux mélanger, le produit est dechargé par intermittence au moyen de trois cylindres hydrauliques (28) équipés de temporisateurs à fin de régler les temps d'intervention, les dits cylindres (28) ouvrent un système de portillons équidistants (29) pour le déchargement continu du produit prêt pour être utilisé;
   - l'unité filtrante (34) envisage des séparateurs (35) qui divisent l'espace intérieur en secteurs (36) équipés d'un sistème de filtres en tissu (37); elle envisage aussi un collecteur d'aspiration (38) avec un rotor de ventilation(39) pour la sortie de l'air dépuré à l'extérieur à travers une cheminée (40);
   - le prompt réemploi de la poudre fine de ciment retenue par les filtres en tissu (37) est obtenu des que la poudre tombe dans une canalisation conique (47) ayant une partie terminale à vis d'Archimède (48), cette vis d'Archimède (48) soulève la dite poudre à l'intérieur d'une conducture à vis d'Archimède (50), qui redecharge la poudre à l'intérieur de la chambre de mélange (23) à travers un déchargement à vis d'Archimède (26).

2. Installation selon la revendication 1, caractérisé par l'innovation que le four cylindrique (6-7) est équipé à son extérieur de cerclages (8) pour le contact avec les rouleaux (5), le mouvement de la dite installation étant actionné par un moteur (9) qui le transmet au moyen d'un engranage (10) sur un support (11) à une crémaillère (12).

3. Installation selon la revendication 1, caractérisé par l'innovation que le système à palettes (18) est placé en étoile sur une couronne circulaire (19) émergeant de four circulaire (6-7) et que la dite roue (19) tourneavec le four afin de former, avec la partie in-

térieure circulaire fixe (20) de l'installation maintenue centralement par une structure cylindrique (21), une cloison que sépare la chambre de combustion (17) de la chambre de mélange (33) qui suit.

4. Installation selon la revendication 1, caractérisée par l'innovation que le mélange dans la chambre de mélange (23) est facilité par un système à palettes (27), les dites palettes sont placées en parallèl sur la paroi de la chambre de mélange (23).

5. Installation selon la revendication 1, caractérisée par l'innovation que le produit dechargé de la trémie (31) est ensuite chargé sur les moyens de transport ou employé pour des nécessités diverses.

6. Installation selon la revendication 1, carctérisée par l'innovation que les fumées du produit inerte dans la chambre de combustion (17). sont atteintes par le jet de chaleur qui sort de la bouche du four (33) et ensuite, à traversun collecteur (41) placé dans une culasse (42), les dites fumées sont aspirées par un rotor de ventilation (39), ensuite elles passens dans une conduite supérieure (43) pour arriver dans un préséparateur (41) jusqu'à une chambre (45) où, a travers des filtres en tissu (37), elles sont dépurés.

7. Installation selon la revendication 1, caractérisée par l'innovation que la vis d'Archimède terminale (48) décharge les poudres dans une canalisation (49) hélicoïdale (50) où les cellules de chargement du produit fin récupéré sont pesées.

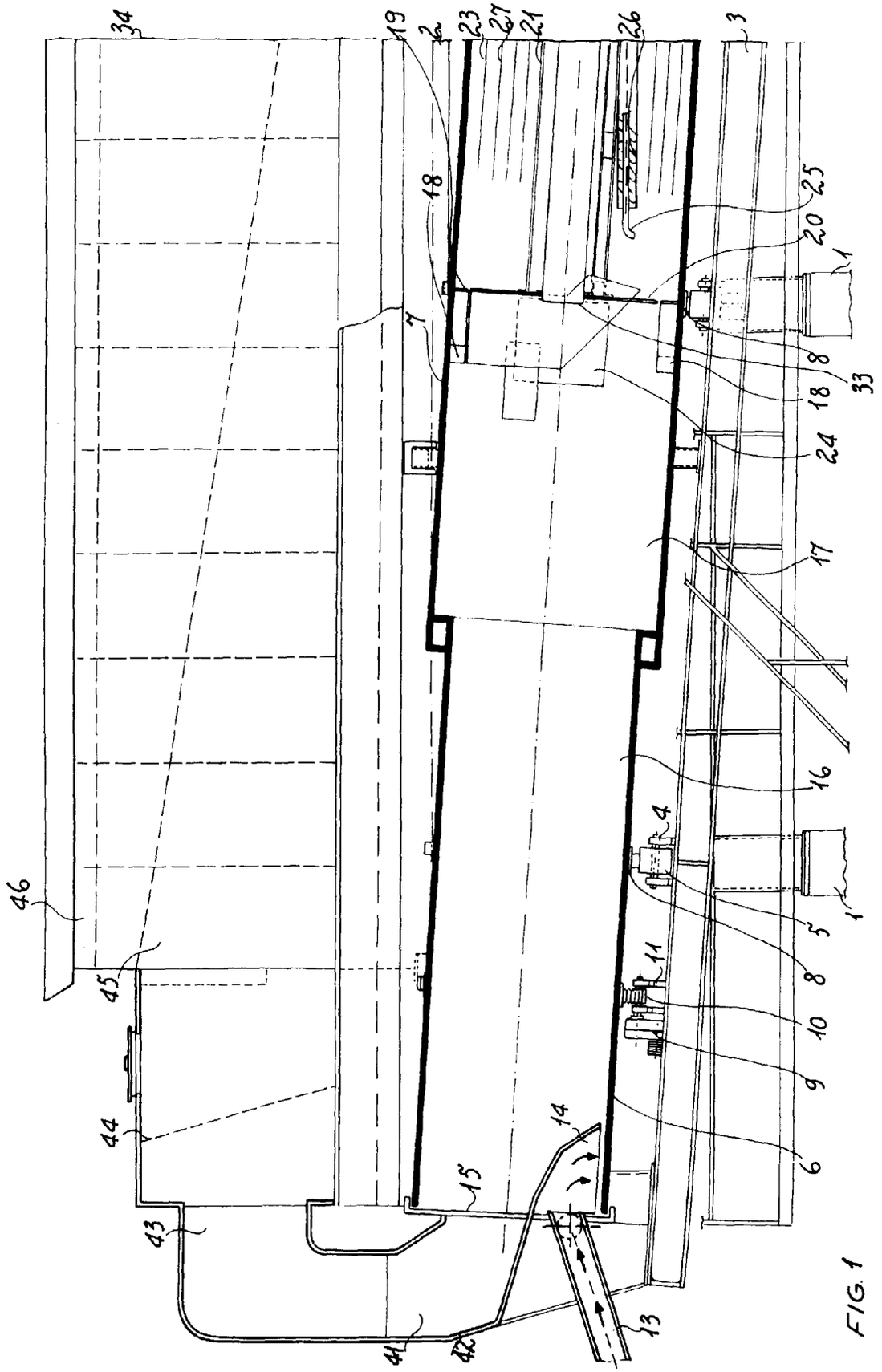

34
19
2
23
27
21
26
3
18
25
20
1
7
8
33
18
24
17
16
4
1
46
5
45
8
11
10
9
44
14
6
15
43
13
41
42

FIG. 1

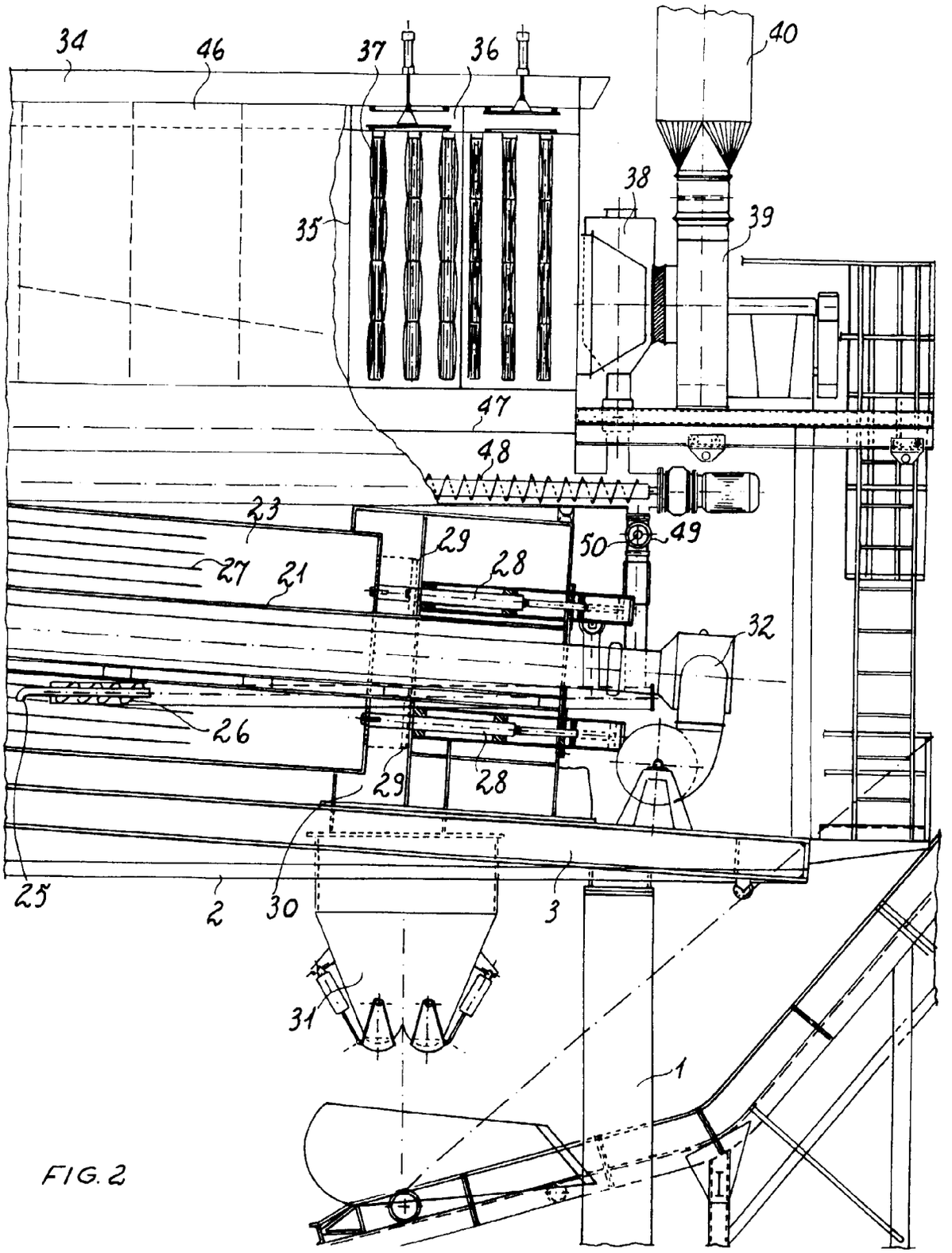

34
46
37
36
40
38
39
35
47
48
23
27
21
29
28
50
49
32
26
29
28
25
2
30
3
31
1

FIG. 2

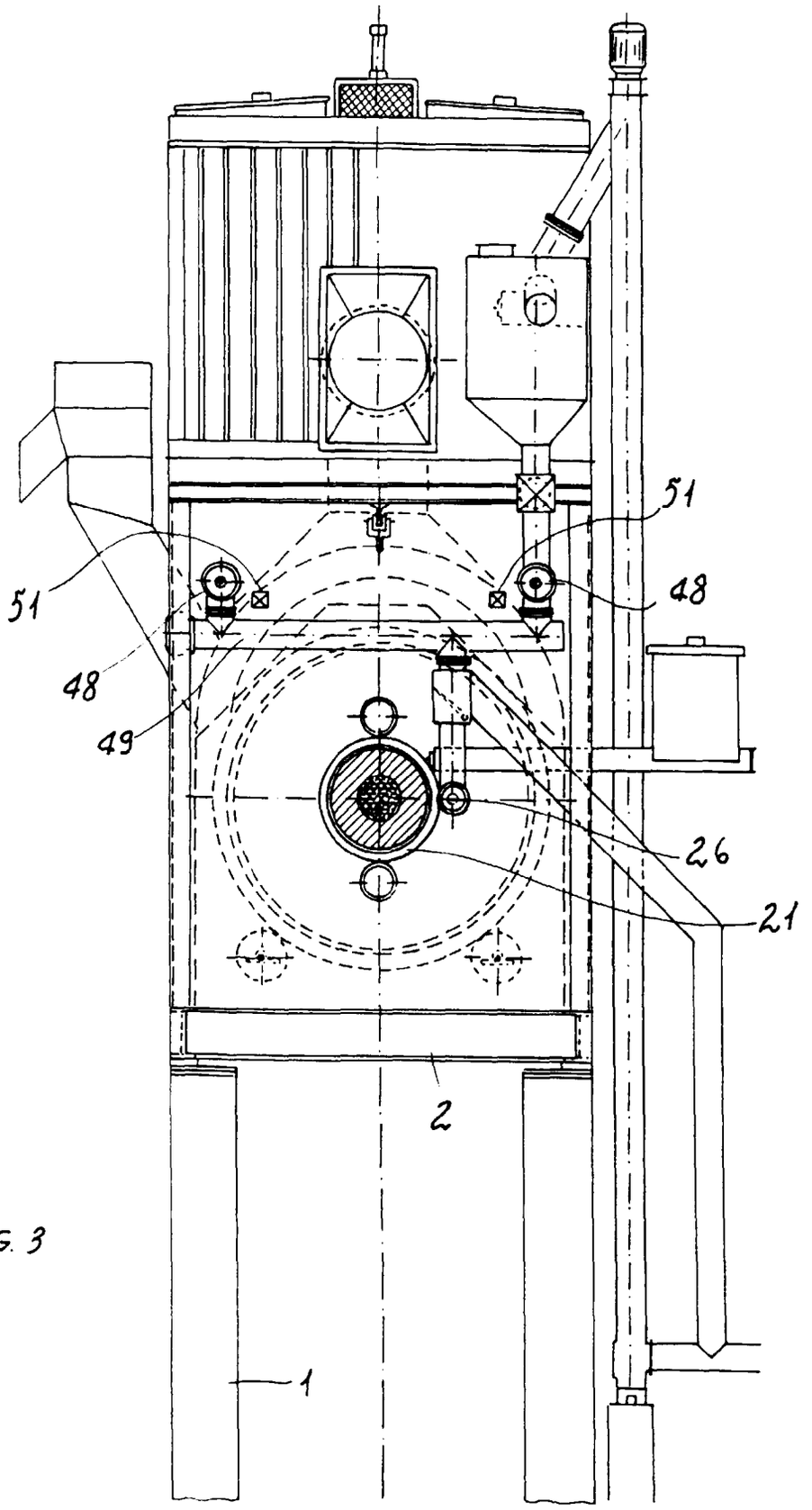


FIG. 3

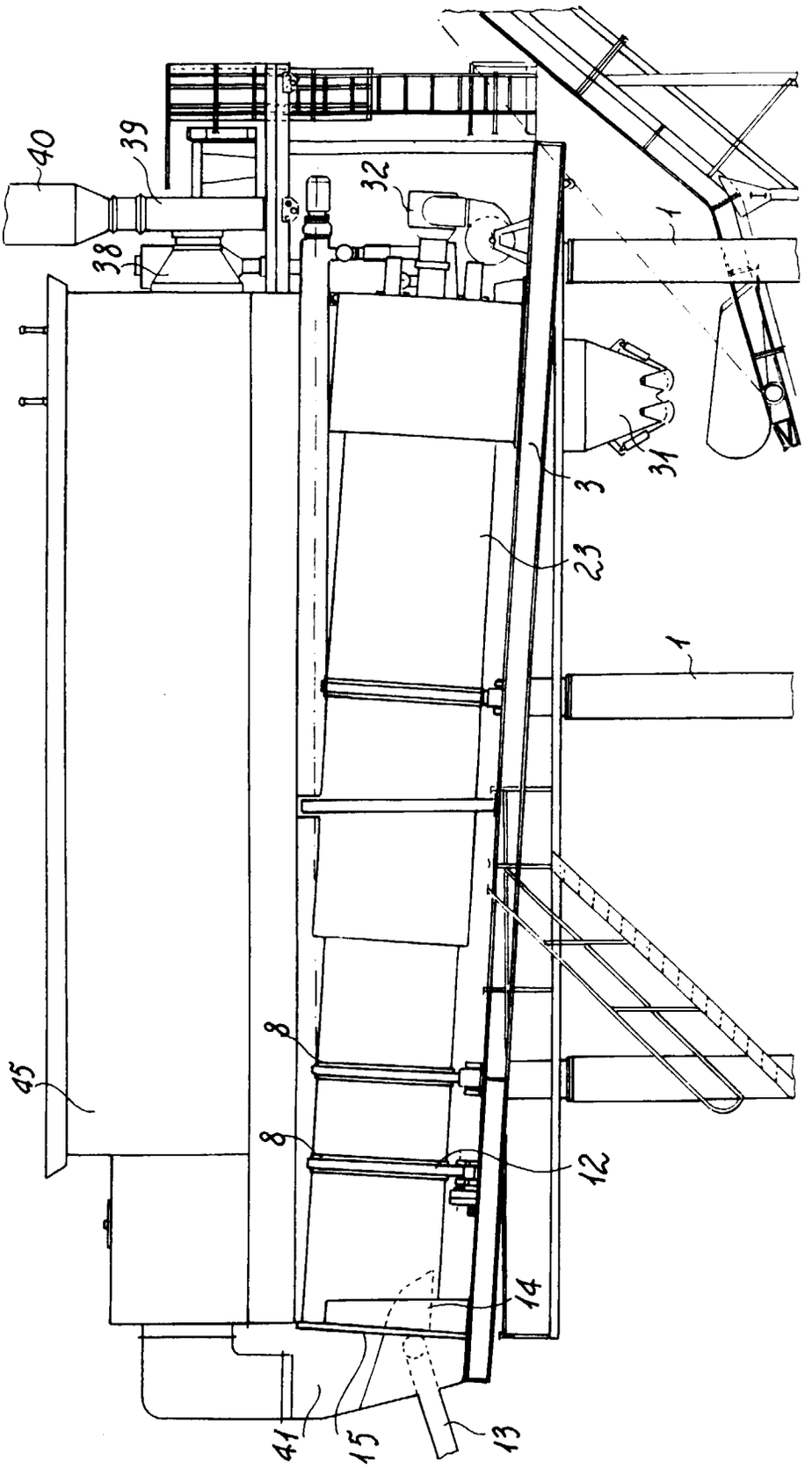


FIG.4