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

(11) Publication number: **0 598 943 A1**

(12) EUROPEAN PATENT APPLICATION

(21) Application number: **92120243.8**

(51) Int. Cl.5: **F23J 3/02**, B08B 9/02

(22) Date of filing: **26.11.92**

(43) Date of publication of application:
01.06.94 Bulletin 94/22

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

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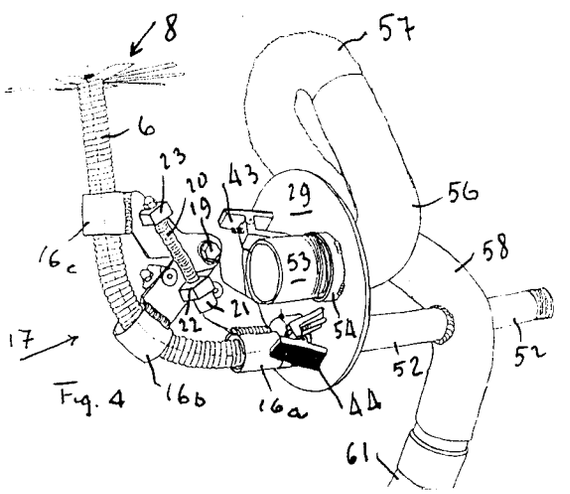
(54) Flue cleaning device and relevant cleaning process.

(57) The flue cleaning device (8) and the relevant process allow the cleaning from the lower end of the flue (1) by introducing the device along a horizontal path through an opening (2) in the wall of the flue and providing deflecting means (16,17) to guide the device (6,8) upwardly in a vertical direction (3). Means (29) are provided to close and seal the opening (2) and aspirating means (53,56,57,58) for collecting of debris scraped from the wall.



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The present invention relates to a flue cleaning device, for cleaning the interior cavity of a flue of the type used with a wood burning stove or the like, comprising scraping means and support-control means of said scraping means, said scraping means being adapted, thanks to a substantially reciprocating movement of said support-control means, and consequently of said scraping means, to cause a scraping action from the walls of combustion product debris, said reciprocating movement being adapted to be either axial along axis of said flue or rotary around said axis.

Flue cleaning operation was highly reduced by modern civilisation, but it was not solved, at contrary it was aggravated also due to a considerable diffusion of heating systems of any kind (wood, coal, gas oil, diesel oil, natural gas, etc.). Till some time ago, when heating problem was entrusted to wood burning kitchens or stoves, the so-called "chimney sweepers" took responsability upon maintenance of flues. The operation was generally made with big metal brushes, connected to more or less long handles. Flues were cleaned starting from the top, with the consequence that people had to climb on the roofs, also when weather was not fine. At least in Italy, chimneys sweepers were gradually disappearing, also if, as already said, the problem is gradually becoming critic, due to the considerable increase of heating systems, which are working non only with wood, but also with mineral oil, gas, etc. Theese "modern combustible materials" are not always less dangerous than old traditional materials, as far as flue cleaning operation is concerned, because, also with them, combustion products debris are still fouling on the walls of its interior cavity. Two are the most dangerous consequences of such a fouling action of debris: at first obstruction of the interior cavity of flue, and then fire risk af said debris, due to the fact that they are generally made of carbon material.

Some chemical substances have been proposed, which are burned together with embers and which should have to eliminate, or at least to degrade carbon material debris. But risk is that these substances can stir up the fire in debris, whereby the only way to clean a flue is and remains the mechanical action of brushes, starting from the top of flue and, therefore, obliging people to climb on the roofs, whatever weather, external temperature, and so on, are.

Generally speaking, it should be a good rule to proceed with cleaning a flue at least two times per year. In northern European Countries, this rule is practically followed, also beacuse Government laws oblige to do so.

The same rules are not compulsory in Italy, where it is quite normal to read on newspapers that a house was destroyed by flames due to carbon material on the interior cavity which fired.

A problem, which the device according to the invention intends to solve is to propose a new solution, substantially simple and reliable, relating to the cleaning operation of a flue, avoiding risk to operate on a roof with any conditions of weather, but allowing an operator not to have his dress souled and not to have the room souled, too, where a fire place or a wood stove are working.

Said problem is solved by device according to the invention, which is characterized by closing and sealing means (29) of a throat (5) of said flue (1), said closing and sealing means (29) being adapted to allow said support-control means (13) of said scraping means (8) to pass through, driving means (17) of said support-control means (13) being provided, so that said support-control means (13) can pass and slide through at least one deflection (4) of said flue (1).

According to said device, it is possible to start the cleaning operation of a flue from the bottom and not from the top of the same flue. This fact explain why a flue cleaning process, said flue being adapted to develop according at least a first substantially horizontal path (2) and a second substantially vertical path (3), is characterized by the fact that an insertion of scraping means (8) is provided along said first path (2) of the flue, as well as through a deflection (4) of scraping means (8) along a second path (3), whereas driving means (17) in correspondence of said deflection (4) allow an operator to control the deflection of support-control means (13) of said scraping means (8), starting from a throat (5) of said flue (1).

These and further characteristics will be apparent from the following description and from alleged drawings, where:

Fig.1 represents a cross section of a flue, into which device according to the invention is inserted;

Fig.2 represents a perspective view of closing and sealing means of device according to the invention;

Fig.3 represents a side view of Fig.2;

Fig.4 represents a perspective view of closing and sealing means;

Fig.5 represents a side view of driving means of device according to the invention;

Fig.6 represents a side view of Fig.5, with driving means in operation position;

Fig.7 represents a side view of a threaded block to be fastened to closing and sealing means of Fig.4;

Fig.8 represents a side view of a not threaded block, which is to be connected to driving means of Fig.5 and threaded block of Fig.7;

Figgs. 9a,9b represent two side views of support-control means and of relevant additional

pieces;

Figg.1Oa,1Ob,1Oc represent three different solutions of scraping means;

Figg.1Oa'1Ob',1Oc'represent corresponding side views of Figg.1Oa,1Ob,1Oc;

Fig.11a represents a side view of inflatable means, whereas Fig.11b represents a frontal view of the same inflatable means;

Fig.12 represents a perspective assembly view of the device according to the invention;

Fig.13 represents a perspective view of external support means of control and support means of the device according to the invention.

Fig.1 shows a traditional shape of a fire place or, better, of its flue 1, which presents a first substantially horizontal path 2 and a second substantially vertical path 3. Paths 2 and 3 are connected each to other by means of a deflection 4. The external bottom end of path 2 presents a throat 5, which can have a circular, square or rectangular shape. As far as sizes of throat 5 and path 3 are concerned, they are included in a substantially narrow range of standard sizes, as it will apparent forwards. Through throat 5 a hose 6 is adapted to be inserted in the paths 2,3 (Figg.9,1O), to an upper end 7 of which a brush 8 is adapted to be fixed. Hose 6 represents support-control means of device according to the invention, whereas brush 8 represents scraping means of said device. Hose 8 is made of a steel wire 6a, which is spiral-wounded as a pre-loaded spring, so that each spiral adhere to the next one, practically making up a hose. Brush 8 is fixed to the end 7 of the hose 6 by means of a screw 9, which is adapted to allow a plurality of scraping elements 1O a rest position, where said elements 1O are overlapped each to the other in order to simplify their transportation, or an operating position, where the elements 1O are offset, each with respect to others, in order to make up a shape adapted to operate as scraping means of fuel 1, as it will explained forwards. Elements 10 are made of harmonic steel stripes, so that they can be elasticly deformated during reciprocating either axial or rotating movement of hoses 6, depending on the shape of fuel 1. For instance in the case of a square section of a fuel, elements 10 are made of steel stripes, having the same lenght and a starwise shape, in operating position. In the case of a square section fuel, elements 10 are made of two steel stripes, which are vertical with respect to the walls of fuel and two steel stripes, which develop according to the diagonal direction. In the case of a rectangular section fuel, having a substantionally big dimension, additional stripes 11 can be provided, especially in correspondence of greater side of rectangle. Said stripes 11 are welded to the end of diagonal stripes. Also additional stripes 12 can be provided, which are operating according to a vertical direction with respect to stripes 10. Hose 6, to which brush 8 is connected, is adapted to be joined, in correspondence of side opposite to the end 7, to other hoses 13, each one of which is made of steel spiral wounded wire 13a, likewise wires 6a of hose 6, and is provided with a threaded fitting 14. Said fitting 14 is adapted to be screwed in a corresponding seat of both hose 6 and hoses 13 (Fig,9b), so that they can reach a suitable height of fuel 1 for a cleaning operation of it, starting from bottom of fuel. It is well knokn, indeed, that the strongest debris are stored on the walls in correspondence of the lower part of fuel, but it necessary to proceed with cleaning operation till a suitable height of the fuel, at least 2/3 of this height. Hose 6 and hoses 13 are adapted to pass, in correspondence of deflection 4, through at least tubolar elements 16a,16b,16c of a device 17 (Figg.5,6), which represents driving means of hoses 6,13. Said device 17 allows, as it will be apparent forwards, hoses 6,13 to follow deflection 4 between path 2 and path 3. Device 17 presents, for each hose 16, a support 18a,18b,18c, all said supports being able to rotate around a pivot 19. Element 16c is adapted to cooperate with element 16b by means of a screw 20, wich is provided with a head 21. Screw 20 is adapted to mesh with a threaded seat of a block 23, which is integral with support 18c. In such a way, by operating on head 21, angular opening of support 18c can be suitably adjusted with respect to support 18b. In the same way, support 18a is adapted to cooperate with support 18b by means of a screw 24, which si provided with a head 26. Screw 24 is adapted to mesh with a threaded seat of a block, not represented in the drawings, which is integral with support 18a. In such a way, angular opening of support 18a with respect to support 18b can be suitably adjusted. Practically, it is possible to change shape of Fig.5 into shape of Fig.6. In fact, also in this case, the other end of screw 24 is adapted to rotate in the seat, which is obtained on block 22, integral with support 18b. Therefore, it is apparent that hose 6 and hoses 13 are adapted to develop according the direction of vertical path 3, after passing through path 2. A block 28 is adapted to cooperate with element 16a (Fig.8) and is adapted to cooperate also with other blocks 28, having the same or a different axial lenght. Said blocks represent a connection between support 18a of device 17 and a flange 29, which represents closing and sealing means of device according to the invention (Fig.2). Blocks 28 are made of a main body 31 and of a fitting 32 (Fig.8), which is adapted to be inserted into the main body 31 of next block. A last block 33 is provided with a pin 34, which is adapted to engage a corresponding hole obtained in the flange 29. A threaded portion 35 of block 33 is

adapted to engage an interior thread of a coupling 36 (Fig.11), in correspondence of external part of flange 29. The first block 28 is fixed to element 16a of device 17 by means of a screw 37, which is adapted to be engaged by a hole 38 of next block 18, and so the other blocks 18 are connected each to other in the same way, as well as block 33, which is connected to last block 28. Said blocks 28 present a plurality of axial lenghts, which are different each from others, so that their total coupling is able to satisfy the entire lenght of path 2 as long as block 33 presents its threaded portion 35 outside throat 5. A ring seal 39 is applied on the internal part of flange 29, and is adapted to adhere to the external edge of throat 5. Flange 29 presents, on its part which is to be placed on throat 5, a couple of squares 41 (Fig.3), which represent locking means of flange 29 on throat 5. A slide 43 is pivotally connected around an axis situated on an upper end 42, connected to each square 41. On said slide 43 an elastic element 44 is applied which has to cooperate with internal wall of throat 5 of path 2. Each square 41 is provided with two pins 46, which are adapted to engage two corresponding seats of flange 29. A block 47 is adapted to be crossed by a screw 48 in correspondence of external part of said flange 29. Screw 48 is provided with a head 49, which is adapted to engage a thread obtained on the upper part of square 41. It will be explained forwards that, by turning screw 48, square 41 leans towars external part of flange 29 and stops against walls of path 2 and locks flange 29, which can, therefore, adhere, thanks to ring seal 39, to throat 5. Thread of a tube 52 (Fig.12) is adapted to cooperate with thread of block 33, by means of coupling 36. The plurality of hoses 13, connected each to the other, as it was explained earlier, is adapted to slide inside tube 52, which represents external support means oh hoses 6,13. Flange 29 presents, in correspondence of internal part of throat 5 a piece of tube 53, which is screwed on a threaded sleeve 54 (Fig.4,12) welded to flange 29. In correspondence of external part of flange 29, a bent tube 56 is screwed on sleeve 54. A flexible sleeve 57 is adapted to connect the end of tube 56 with an end of a curved tube 58, which crosses tube 52 (Fig.13). Said tube 52 presents, inside curved tube 58, an opening 59, in correspondence of the part opposite to the part where sleeve 57 connects tube 56 with tube 58. The other end of curved tube 58 is connected with a flexible tube 61 of an aspirator not represented in the drawings. Tube 53, together with tube 56, flexible sleeve and tube 58 represents aspirating means of device according to the invention.

Scraping means 1O of Fig.1O can be substituted with other scraping means, as shown in Fig.11 by a inflatable device 62, which is made of a substantially elastic ball, externally covered by rough material, for instance marble or glass powder integrally attached on the external surface of ball. Said ball is adapted to be connected, in a way known per sè, to the end of hose 6 (Fig.9a), whereas a flexible tube, for instance a rubber one, inserted inside hose 6, is adapted to be connected, on one side, with an end 63 of ball and, one the other end, with a compressor, in a way known per sè. Said compressor is not represented in the drawings.

Inflatable ball 62 is adapted to be inserted inside flue 1, in the same way as scraping means 8, and is, at a certain point, inflated by compressor, as long as it reach an intermediate shape represented in Fig.11b with a continuous line. If inflation goes on, ball 62 is obliged by air pressure to adhere also in correspondence of corners of fuel, as long as it reaches a shape represented in Fig. 11b with a dashed line.

Flue cleaning device according to the invention operates as follows. After operator visually and manually controls shape of throat 5 and in which way deflection 4 of path 2 develops (Fig.1), he manually inserts hose 6 into path 2, after fixing brush 8 on its end (Figg.9,1O). Selection of brush is made, as for dimensions and shape, according to what previously evaluated by operator, by using traditional or specific tools. Instead of brush 8, the ball 62 (Figg.11a,11b) can be fixed to hose 6, which is connected to rubber tube inserted inside hose 6. Depending on lenght of path 2, one or more hoses 13 are screwed to hose 6. Thanks to flexible hoses mounted as explained, operator can slide said assembly 6,13 within elements 16a,16b,16c, which are arranged according to Fig.5, acting at first on screw 2O and then on screw 24, so that development of hoses 6,13 can be adapted to the change of direction of path 2 with direction of path 3. Generally speaking, first path 2 is substantially horizontal and second path 3 is substantially vertical, but different shapes of paths 2,3 can be present. In any case, device 17 is able to adjust hoses 6,13 according the same development which the flue 1 has, in correspondence of first and second paths 2,3. Brush 8, as well as ball 62, which are suitably choosen, can start scraping the walls of flue 1 thanks to elements 10,11 or to rough covering of ball 62 by means of an alternative axial or rotating movement of hoses 6,13 and, therefore, of brush 8 or ball 62. In detail, stripes 1O present their ends slightly bent down, as long as brush 8 is pushed topwards, whereas they present their ends bent up, as long as brush 8 is pushed bottomwards. It is apparent that scraping action exerted by steel stripes 10, as well as by brush 62, will cause debris scraped from flue walls during cleaning operation, to fall down. Number of

hoses 13 connected each to others depend on the lenght of flue, which is to be cleaned. Scraping action of scraping means 8,62 should interest at least 2/3 of the entire flue lenght. After connecting hose 6 to a reduced number of hoses 13, the last ones of said hoses 13 are made slide through the hole of flange 29 (Figg.2,12), which is placed on throat 5 of flue 1. Then screws 48 of turned (Fig.2) as long as elastic elements 44 of slides 43 allow a their good grasp on internal walls of throat 5. In such a way, also ring seal 39 can adhere to the external wall of throat 5. Before fixing flange 29 to the wall, hoses 13 are made slide within all block 28 (Fig.8), which are necessary for obtaining, starting from element 16a of device 17, a run of path 2, where, by adding a block 33, the plane of external wall of throat 5 is reached. Now, sleeve 36 and, on the other end of said sleeve, tube 52 are screwed on threaded part 35 (Fig.7) of block 33, and holes 13 are made slide inside tube 52. Previously tube 56 is screwed on sleeve 54 and is, in such a way, connected to flexible tube 57 in correspondence of an end of tube 58. Opening 59 of tube 52 should be on the opposite side with respect to connection with flexible tube 57. The other end of curved tube 58 is now connected with aspirator, which starts up. Hoses 6,13 are manually or by means of a motor non represented in the drawings, set in alternative, axial and/or rotatory motion together with brush 8 or ball 62.

Flue is cleaned, starting, for instance, from bottom of path 3 and then the other upper parts of path 3 are cleaned. Debris removed from walls of flue 1 are falling down in the bottom of flue, where depression caused by aspirator make them suck through tube 53 of flange 29. Said debris pass through tube 56, sleeve 57 and involve, by passing through tube 58, also the external surface of hoses 6,13. Indeed, hoses 6,13 are interest by run of debris, which are just sucked by the action of aspirator, allowing, in such a way, internal ambience not to be involved by debris, avoiding it to be got dirty, together with the operator. All debris are collected into a container and then eliminated outside. After cleaning operation is over, hoses 6,13 are quite quite clean inside and, therefore, they can be again used for further flue cleaning operations. Just an external cleaning operation of hoses 6,13 could be suitable.

It is apparent that a simultaneous flue cleaning operation is obtained by means of device according to the invention: flue walls are cleaned from debris, which is collected in the same time, while falling down in the flue, through tubes 56,58 up to a container. Internal ambience and the same operator are not interested by debris, the bottom of flue is not interested by falling down of debris, because it is sucked into a container, outside from the flue. As far as flange 29 is concerned, it may be conceived in different shapes, according to specific shapes of throat 5 (circular, square, rectangular etc.)

Claims

1. Flue cleaning device for cleaning the interior cavity of a flue of the type used with wood burning stove or the like, comprising scraping means and support-control means of said scraping means, said scraping means being adapted, thanks to a substantially reciprocating movement of said support-control means, to cause a scraping action from the flue walls of combustion product debris, said reciprocating movement being adapted to be either axial along axis of said flue or rotary around said axis, characterized by closing and sealing means (29) of a throat (5) of said flue, said closing and sealing means (29) being adapted to allow said support-control means (13) of said scraping means (8) to pass through, driving means (17) of said support-control means being provided, so that said support-control means (13) can pass and slide through at least one deflection (4) of said flue (1).

2. Device according to Claim 1, characterized in that said closing and sealing means (29) are made of a flange, a ring seal (39) on said flange being provided in order to to make a closing and a seal against said throat (5).

3. Device according to Claim 1, characterized in that said scraping means (8) are made of a plurality of elements (10) and are adapted to take a rest position, in said rest position said elements being adapted to be overlapped each on the others in order to simplify their transportation and an operation position, in said operative position said elements being offset each with respect to the others, in order to make up a shape adapted to operate as scraping means of said flue (1).

4. Device according to Claim 1, characterized in that said scraping means are adapted to be made of a inflatable device (62), said device (62) being made of a substantially elastic ball, said ball being covered by rough material, for instance marble or glass powder, in order to exert on walls of said flue (1) an action directed to scrap carbon debris or the like encrusted on said walls.

5. Device according to Claim 3, characterized in that said elements (10) are made of a plurality of harmonic steel stripes, so that they can be

elasticly deformated during reciprocating either axial or rotating movements of said scraping means (8,62).

6. Device according to Claims 1,3,5, characterized in that said elements (10) are adapted to have a starwise shape, if flue has a square section, or a square, rectangular shape in the case of different section of said flue (1).

7. Device according to Claim 1, characterized in that said support-control means (6,13) are made of a flexible tube (6), to said tube a brush (8) being adapted to be connected, and are adapted to made of additional tubes (13), said tubes (6,13) being adapted to be made of spiral wounded steel wire (6a,13a) as a loaded-spring, so that each spiral adheres to the next one, substantially making up a flexible and sealing hose.

8. Device according to Claims 1,7, characterized in that said tube (6) is adapted to be screwed to additional tubes (13), in order to allow said scraping means (8,62) to reach a working height of said flue (1), said height being adapted to be substantially not lower than 2/3 of the entire lenght of said flue (1).

9. Device according to Claims 1,7,8, characterized in that said driving means (17) are adapted to allow said tubes (6,13) to suit with change of direction of a first substantially horizontal path (2) with a second substantially vertical path (3), said device (17) being adapted to present a plurality of tubolar elements (16), each one of said elements (16) being integral with a corresponding support (18a,18b,18c), first one of said elements (16a) being adapted to be connected with a plurality of blocks (28), said blocks being adapted to present a substantially different axial lenght, in order that entire lenght is adapted to satisfy an entire run of said path (2), a last block (33) being provided for being fixed to said closing and sealing means (29).

10. Device according to Claim 1, characterized in locking means (41) on said throat (5) of said closing and sealing means (29), said means (41) being formed by at least two squares, said squares being made of slides (41), on each one of said slides being fixed an elastic element (44).

11. Device according to Claims 1,7, characterized in that said closing and sealing means (29) are adapted to cooperate with external support means (52) of said tubes (6,13), said tubes (6,13) being adapted to be controlled manually or by a motor, in order to operate scraping action of said flue (1).

12. Device according to Claims 1,2,10, characterized in that said closing and sealing means (29) are adapted to cooperate with aspirating means (53,56,57,58), so that a collection is made, outside said flue (1), of debris scraped from walls of said flue (1).

13. Flue cleaning process, said flue being adapted to develop according at least a first substantially horizontal path (2) and a second substantially vertical path (3), characterized in that an insertion of scraping means (8,62) is provided alon said first path (2), as well as through a deflection (4) of scraping means (8,62) along a second path (3), whereas driving means (17) in correspondence of said deflection (4) allow an operator to control the deflection of support-control means (13) of said scraping means (8,62), starting from a throat (5) of said flue (1).

14. Process according to Claim 13, characterized in that a tube (6) is adapted to be connected with additional tubes (13), in order to suit axial development of said flue cleaning device with axial development of at least 2/3 of lenght of said flue (1).

15. Process according to Claims 13,14, characterized in that said throat (5) is protected by closing and sealing means (29) against danger that internal ambience and operator can be got dirty by debris scraped from walls of flue, after flue cleaning operation is made.

16. Process according to Claims 13-15, characterized in that scraping action of debris is made substantially in a simultaneous time with its collection, said collection being made outside said flue (1), in such a way that substantially no danger to be got dirty exists both for ambience and for operator.

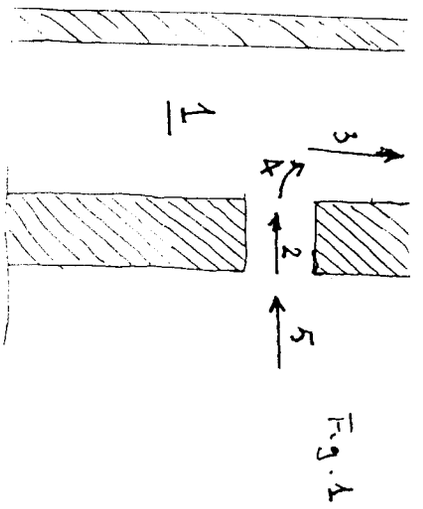

Fig. 1

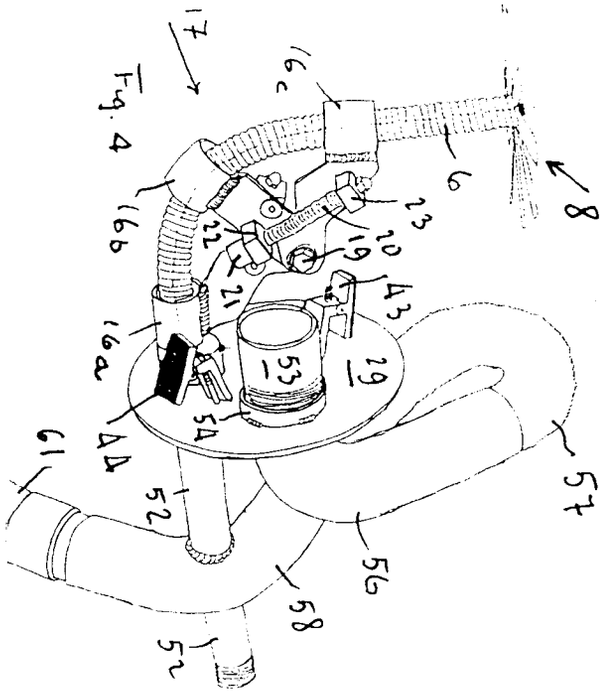

Fig. 4

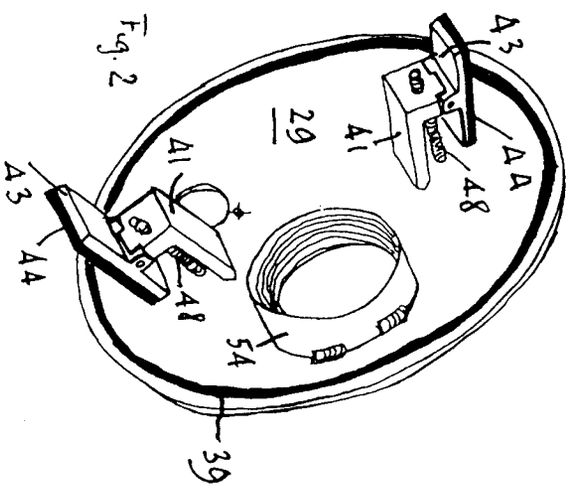

Fig. 2

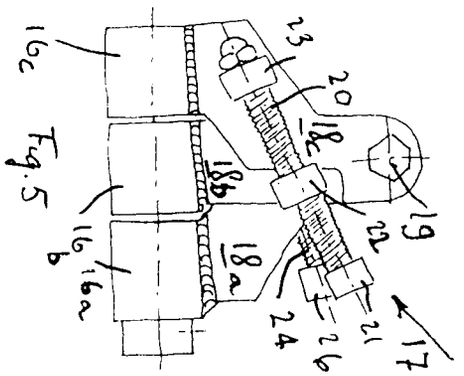

Fig. 5

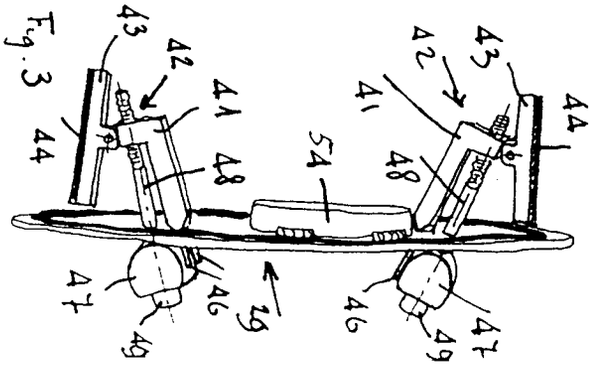

Fig. 3

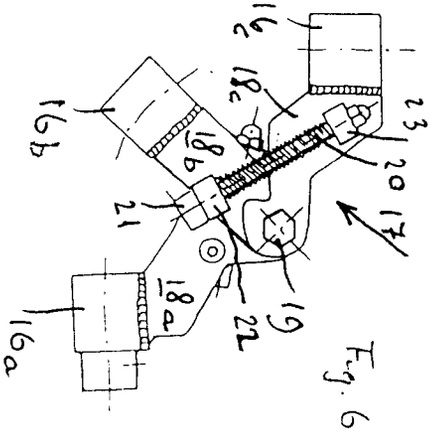

Fig. 6

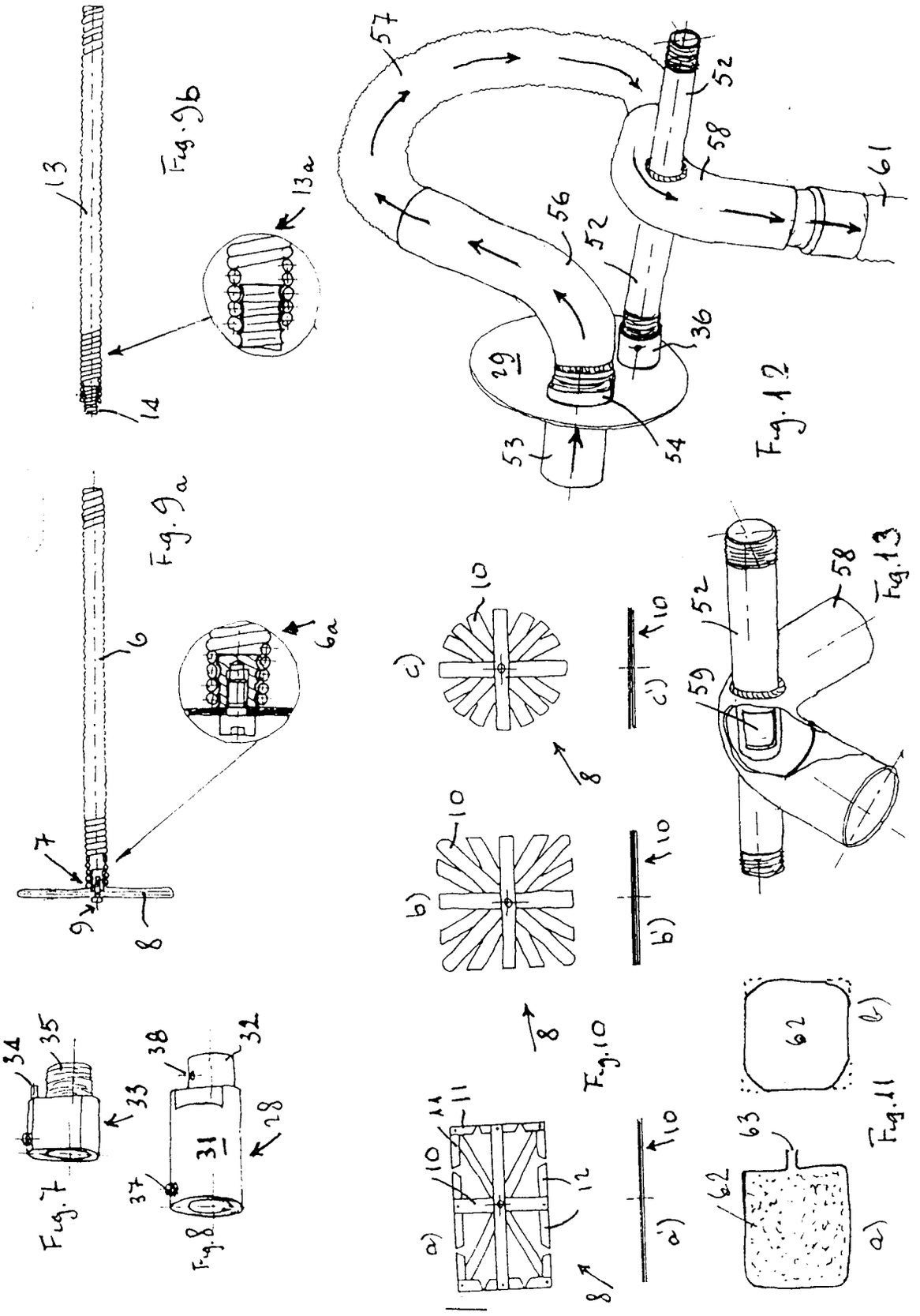
Fig.9b
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Fig.9a
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Fig.12
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European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 92 12 0243

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X	FR-A-1 524 324 (DISANT) * page 1, left column, line 1 - right column, line 31 * * page 1, right column, line 42 - page 2, left column, line 33 * * figures 1,2 *	1,13	F23J3/02 B08B9/02
Y		4,7	
A		2,11,12, 15,16	
Y	DE-C-1 845 (ANDREOLI) * page 1, left column, paragraph 3 * * figure B *	4	
Y	DE-A-2 452 630 (KLÜNDER) * page 1, line 7 - page 1, line 27 * * page 4; claim 1; figure 1 *	7	
A		14	
A	FR-A-1 072 066 (RIAND) * the whole document *	3,5,6	
A	FR-A-1 388 887 (SCHWEND) * the whole document *	3,5,6	
A	DE-C-565 182 (GRAHLKE) * page 1, line 48 - page 2, line 25 * * figures 1,2 *	1,7	
A	US-A-4 661 007 (SCHNEIDER) * column 3, line 21 - column 3, line 37 * * figures 1-3 *	9	
A	GB-A-657 160 (CHALLIS)		
A	US-A-1 338 917 (HALL)		
A	FR-A-383 193 (KUMMLER)		

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

F23J
F16C
B08B
F28G

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	20 APRIL 1993	PHOA Y.E.

CATEGORY OF CITED DOCUMENTS

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Application Number

EP 92 12 0243

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
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