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

(11) Publication number: **0 185 744**
B1

(12) EUROPEAN PATENT SPECIFICATION

(45) Date of publication of patent specification: **28.12.88**

(51) Int. Cl.^{4}: **F 23 J 3/02**

(21) Application number: **85903230.2**

(22) Date of filing: **14.06.85**

(86) International application number:
PCT/DK85/00060

(87) International publication number:
WO 86/00391 16.01.86 Gazette 86/02

(54) A METHOD AND A TOOL FOR INCREASING THE WIDTH IN THE CLEAR OF A CHIMNEY.

(30) Priority: **18.06.84 DK 2965/84**

(43) Date of publication of application:
02.07.86 Bulletin 86/27

(45) Publication of the grant of the patent:
28.12.88 Bulletin 88/52

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

(56) References cited:
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DE-C- 227 335
FR-A- 540 910
FR-A- 707 546
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EP 0 185 744 B1

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Courier Press, Leamington Spa, England.

Description

The invention relates to a method for increasing the width in the clear of a chimney by means of a rotary tool having radially yieldable means, and an apparatus for carrying out the method for increasing the width in the clear of a chimney by means of a rotary tool comprising a holder mounted at the free end of a rotatable shaft and having chains, consisting e.g. of simple, elongated, ring-shaped chain links, which are fixedly mounted on several levels at right angles to the rotatable shaft.

It may be desirable to increase the width in the clear of an existing chimney if, for stoking-technical reasons, internal insulation with lining tubes of a diameter larger than the existing width in the clear is required, for instance when switching to another type of fuel or to a new stoking system.

Thus, it is known that older chimneys have such a width in the clear that it has been possible without any problems to insert a lining tube in the chimney when switching to e.g. oil firing. In a possible subsequent change-over to gas firing where the width in the clear of the chimney should be still smaller, the width in the clear of the lining previously inserted is however too small to permit inserting the new lining and, hence, it is necessary to mill out the existing lining tube.

After a chimney fire, the chimney must be rebuilt, which normally makes it necessary to pull down the chimney and rebuild it, with consequential drawbacks and substantial costs owing to roof covering, work to be done by carpenters and painters as well as waste of resources, even if the external construction of the chimney is all right. This would be overcome if means were available for increasing the width in the clear of the chimney in such a manner that a lining tube could be inserted to restore the damaged interior face of the chimney or replace a lining tube previously mounted.

FR—A—707,546 discloses a method for increasing the width in the clear of a chimney by means of rotary bodies, in which method the inside of the chimney is processed by strokes of high intensity from several bodies disposed on different levels. Said bodies are rigid plates each of which is pivotally mounted on a shaft which is provided on a holder in such a manner that the bodies can execute but a limited pivotal movement. This tool is capable of increasing the width in the clear of an existing chimney, provided it consists of suitable soft material, but because of the restricted pivotment of the bodies, this tool can only be used in chimneys where the width in the clear is merely reduced to an insignificant extent, for instance by deposits of shining soot. Therefore, this tool cannot be used for increasing the width in the clear of an existing chimney to such an extent that it will be possible to insert a lining in the widened chimney.

From SE—A—177,343 and 177,783, it is known to process the internal surfaces of a chimney with strokes from single chains to loosen soot from the chimney wall. In the tools disclosed therein, chain parts are slidably mounted in the axial direction on straps, which means that if a chain hits a coating or a firm object it will be struck off the course, whereby the intensity of the impact becomes rather low. Further, the chains are disposed on separate levels and, hence, cannot support each other if they hit an obstacle of the type mentioned above.

It is therefore an object of the invention to provide a method that can be used for increasing the width in the clear of a chimney in relation to the existing width. The method of the invention should allow not only to remove existing soot deposits in the chimney but also to remove materials from the interior wall surface of the chimney to such an extent that a lining tube can be inserted in the chimney.

According to the invention, this object is achieved by a method of the above-mentioned type, which is characterized in that use is made of a rotary tool having chains disposed on several immediately adjoining levels, that the rotary tool is lowered from the top of the chimney to the bottom thereof, that the tool guided by guide means is moved upwards through the chimney while increasing the width in the clear thereof to a greater value than that of the original width in the clear, that the material pulverized during the reaming operation is withdrawn at the bottom of the chimney, for instance by a vacuum cleaner, that a lining of an internal diameter corresponding to the original width in the clear is inserted in the widened width in the clear, the external diameter of the lining being slightly less than said greater value of the width in the clear of the chimney, and that a remaining void between the lining and the inner wall of the chimney is filled with a material, preferably a mass capable of producing an intimate bond between the inner wall of the chimney and the outer wall of the lining.

For starting the reaming of the chimney or the object concerned from the bottom, the tool is pulled up through the chimney. If, on the other hand, the tool should be inserted from the top of the chimney, it had been necessary to subject the flexible shaft to a pressure in the longitudinal direction thereof, whereby the shaft would easily be deflected with detrimetal consequences. Also, the reaming operation according to the invention is conveniently started in that the tool can be guided in the original width in the clear of the chimney. It is also achieved that the material removed by the reaming operation can drop freely through the widened width in the clear of the chimney to the bottom thereof, whereas when engaging the tool from above, the material removed would have remained on the rim between the original width in the clear and the widened one and would embarrass the rotation of the tool. Moreover, the rotary tool can easily be lowered in the chimney since owing to its radially yieldable means, it occupies such a radial dimension that it can be descended through the chim-

ney. By the provision of several chains on each level at right angles to the rotatable shaft and on several levels immediately adjoining each other, none of the chains can be struck out of the level on which it is moving when hitting a coating or the inside of the chimney since it will be decelerated by the chains located on the level above or below. Thus, the chain will continue along its path of movement and also mill off the following part of the chimney surface. In this manner, the inner surface of the chimney becomes completely smooth even if there are hard portions in the material of the chimney wall. Further, it has been found that reinforcing iron in the concrete slab covering a chimney at the top thereof is also completely removed. In the method of the invention, the material milled off from the interior of the chimney becomes completely pulverized if this material is brick or a conventional chimney lining material while, when being concrete from the chimney top slab, it will be broken into relatively small fragments. It is then possible to withdraw the pulverized material at the bottom of the chimney by means of a vacuum cleaner or like apparatus.

When, after the reaming operation, the tool has been withdrawn from the chimney and the pulverized material removed at the bottom thereof, the necessary lining can conveniently be inserted in the smoothly milled chimney, whereupon the remaining void between the outer side of the lining and the inner wall of the chimney is filled with a suitable material, preferably a mass capable of providing an intimate bond between the inner wall of the chimney and the lining.

Reaming of a chimney with the subsequent insertion of a lining tube in the chimney can be carried out by the method and the apparatus according to the invention at a relatively low cost and without any additional expenses for roof covering, work required by carpenters or painters. This cost should be compared with the costs for rebuilding the chimney.

The invention also relates to an apparatus for carrying out the method for increasing the width in the clear of a chimney by means of a rotary tool comprising a holder mounted at the free end of a rotatable shaft and having chains, consisting e.g. of simple, elongated, ring-shaped chain links, which are fixedly mounted on several levels at right angles to the rotatable shaft, said apparatus being characterized in that the chains are disposed on levels immediately adjoining each other, that the rotatable shaft is rotatably mounted immediately above said holder in a guiding unit having outer dimensions at right angles to the rotatable shaft which are but slightly less than the original width in the clear of the chimney, and that the tool comprises means for lowering and lifting the guiding unit, the shaft, the holder and the chains in the chimney.

This tool is very simple and makes it possible in an appropriate manner to carry out the method of the invention, in that the apparatus according to the invention permits processing the inner side of a chimney or a chimney lining at a high intensity and by means of several chains as stated above.

According to the features of claim 4, there is achieved an apparatus which is simple and cheap to manufacture and which can be descended through the opening of a chimney to be milled before the insertion of a lining.

By using chains with an odd number of links, an extremely simple method of manufacturing the tool is achieved, and it becomes easy to ensure the balance of the holder which becomes self-centering to a great extent.

According to the features of claim 5, the use of chains on several levels, preferably eight, at right angles to the rotatable shaft ensures adequate processing of a suitably large zone in a chimney as the chains simultaneously support each other in a suitable manner. Also, there is achieved an apparatus which is not too heavy and which is easy to handle, and there is provided a better possibility of reaming or cleaning chimneys with openings that do not extend linearly, which is often the case especially in older houses, where the chimney pot is located on the roof ridge and the vertical part of the chimney is offset in relation thereto.

Further, according to the features of claim 6, it is appropriate to use chains consisting of a hard and heavy material, for instance hardened steel, the uttermost chain links optionally containing diamond dust, and to form the chain links preferably with a thickness of 5—6 mm, so as to obtain elements that are suitably hard and have a sufficiently large mass to process the inner side of the chimney with the force of impact required.

Moreover, according to the features of claim 7, it is appropriate to have the means for lowering and lifting the guiding unit, the shaft, the holder and the chains comprise a rack which can be mounted on the top of the chimney and which has a pulley for guiding the flexible shaft, so as to achieve a simple way of operating the rotary tool.

The invention will be described in more details below with reference to the drawings, wherein

Fig. 1 schematically shows a tool according to the invention during the lowering into a chimney,

Fig. 2 schematically the same tool during the cleaning of the chimney of soot coatings,

Fig. 3 a sectional view of a rotor head with chains according to the invention,

Fig. 4 schematically the tool used by the method according to the invention for increasing the width in the clear of a chimney in comparison with the original one,

Fig. 5 a sectional view along the line a—a in Fig. 4 in a chimney with traditional brick-built construction,

Fig. 6 a sectional view along the line b—b in Fig. 4 in the chimney in Fig. 5 after the increasing of the width in the clear and insertion of a lining and casting,

Fig. 7 a sectional view corresponding to same in Fig. 5 in a chimney of tile concrete elements,

Fig. 8 a sectional view corresponding to same in Fig. 6 in the chimney shown in Fig. 7,

Fig. 9 a sectional view corresponding to same in Fig. 5 in a chimney of light concrete elements, and

Fig. 10 a sectional view corresponding to same in Fig. 6 in the chimney shown in Fig. 9.

From Figs. 1 and 2 it appears how the tool is used for the cleaning of a chimney 1. Reference number 2 indicates a coating of tarry deposits on the internal surfaces of the chimney 1. Moreover, a guiding unit 3 is shown, which is advantageously an electric hand drill. The guiding unit 3 is connected with a flexible shaft 6 by means of an elastic coupling 7 which can be disconnected. The guiding unit can advantageously be located on the roof, as the flexible coupling 7 as well as the distance between the guiding unit 3 and the chimney 1 has the effect that during operation the guiding unit 3 will not be moving on the roof. The flexible shaft 6 is in the opposite end connected to a rotor head 4, on which are mounted a number of chains 5. In Fig. 1 it is illustrated, how the rotor head 4 with chains 5 can be lowered into a chimney 1. An opening of substantially the same size as the rotor head 4 is sufficient in order that the chimney may be cleaned. After having lowered the rotor head 4 right down into the chimney 1, the guiding unit 3 is started. The chains 5 will be slung against the internal surfaces of the chimney 1 and will process these with series of strokes. Hereby the coating 2 will be milled out and broken. By taking the rotor head 4 through the chimney 1, said chimney will be effectively cleaned of internal coatings 2.

All connections between the guiding unit 3, the flexible shaft 6, the rotor head 4 as well as the rigid extension shafts 8 are made by means of couplings known per se that can be disconnected.

In Fig. 3 a more detailed rotor head 4 is shown, on which are mounted four chains 5, same having an odd number of links, and same being firmly fixed through the central links. It is of course possible to use a different number of chains 5, just as these may be connected to the rotor head in various manners known per se, as long as they are firmly fixed. The chains 5 are advantageously made from iron or a similar strong and heavy material, for instance hardened steel, and preferably they have a gauge of metal of 5—6 mm. The uttermost links may, if desired, contain diamond dust, which is of particular importance if part of a concrete material is to be removed. When eight chains being located crossed above each other are used, a height of the "chain pile" of approximately 10 cm is typically obtained.

In practical experiments the method according to the invention has turned out to be superior to all known methods for the cleaning of chimneys, as the cleaning of a chimney becomes substantially more rapid by the method according to the invention than it was previously possible.

In Fig. 4 is shown the tool according to the invention for use by the method according to the invention for milling a chimney, in order that the width in the clear is increased. In order to centre the tool in a chimney, same tool is provided with a guiding unit 15, through which the flexible shaft 6 has been conducted. The guiding unit is located immediately above the rotor head 4 and may have the form of a tube section, same at its ends being provided with two truncated cones, and with a hole through it.

The diameter of the guiding unit is preferably somewhat smaller than the width in the clear in the chimney, the width of which is to be increased, said guiding unit for a chimney flue with a width in the clear of 15 cm having for instance a diameter of 14.5 cm. Adjusting the length of the chains 5 determines how much is to be milled off.

In this manner e.g. an "Iso-kaern"-lining may be milled, removing both the inner tube and the Leca-casting while leaving the chimney itself, and using as driving unit 3 a more powerful engine than for the removal of soot. Then, in the usual manner a new lining can be inserted. The tool may also be used for the removal of the interior of an "Anki"-chimney or a "Kaminent"-chimney. By the removal the lining is pulverized and drops to the bottom in the chimney. So far it has not been possible selectively to remove a lining in a chimney, either after a fire or if an increase of the width in the clear of the chimney is required out of consideration for another application than the original.

When the tool is used for increasing the width in the clear of a chimney, it is of course obvious that more energy than by soot removal must be used, and in this case a guiding unit in the form of an electric motor or a combustion engine, e.g. an engine ranging up to 3.7 Kw (5 HP) would be suitable. A 1.5 kw (2 HP) electric motor may for instance be used.

When using the method and the tool for the removal of coatings such as soot, the rotor head is lowered into the chimney, whereupon the rotation is started.

It can easily be heard when the chains have removed the soot and then hit the inner wall of the chimney, whereupon the tool may for instance be pulled upwards until it processes a coating surface again. For the removal of for instance soot coatings it is possible to hold the tool with the hand, as the cleaning is rapidly done and the tool is light.

When it is required, as shown in Fig. 4, to increase the width in the clear of a chimney, it is advantageous to mount a rack 27 with a wheel 16, over which the flexible shaft 6 is conducted, and the engine 7 may be placed on the roof. An advantageous method in this case is to lower the tool right down to the bottom of the chimney, the width of which is to be increased, and then start up there, the chain length being adjusted to the required new width in the clear. The tool is started, and when it can be heard that it "runs at idle speed" it is pulled upwardly until again the chains "catch" an inner surface which is to be removed, and at the same time the tool is guided by the guiding unit 15. It is advantageous at the same time to remove the milled off or pulverized material with a vacuum cleaner at the bottom of

the chimney, thereby to a large extent avoiding the inconveniences of dust for the person doing the work.

Figs. 5, 7 and 9 show a sectional view along the line a—a in Fig. 4 in three chimneys of a traditional brick-built construction, of tile concrete elements and of light concrete elements, respectively, and Fig. 6, 8 and 10 show a sectional view along the line b—b in Fig. 4 after "milling" of the chimneys shown in Figs. 5, 7 and 9, respectively, and insertion of a chimney lining, e.g. an "Iso-kaern"-chimney lining, and after casting around the lining with a mass, e.g. Leca-concrete. As lining may also, if desired, be inserted a steel lining, and for the casting around the lining may also be used granulated rock wool, e.g. "Rockwool"-granulate mixed with water or a product called "Fibo", corresponding to "Leca".

The chimney shown in Fig. 5, built of bricks 17 with mortar joints 18 may according to the method be given a smaller width in the clear by inserting a chimney lining. The lining 19 shown in Fig. 6 can not be inserted in the chimney until the width in the clear has been increased to such an extent that it corresponds to a hole with limiting surfaces 20, whereupon the void around the lining 19 is filled with e.g. Leca-concrete 21.

Figs. 7 and 8 show the insertion of a chimney lining 19 in a chimney made of tile concrete elements 22 after removal of the inner parts 24 of the element 22 to such an extent that there is room for a lining 19. After inserting the lining the void around the lining is filled with a mass 21.

Figs. 9 and 10 show in an analogous manner as Figs. 7 and 8 an embodiment of the invention, where a lining 19 is inserted in a chimney of light concrete elements 25 after removal of an inner part 26 thereof and casting of the void around the lining 19 with e.g. Leca-concrete 21.

According to the invention it is thus possible to increase as well as reduce the width in the clear of an existing chimney or to insert a lining in a chimney while keeping the existing width in the clear without having to resort to chimney breaking and rebuilding. The insertion of a lining and the casting around the lining are carried out in a manner known per se, when space for this has been created in the chimney.

The "Leca"-concrete used is preferably made as follows: Pre-watered Leca-peas with the diameter of 3—10 mm are mixed with cement in the ratio of 1:20. After thorough mixing more water is added until the mixture obtains a ground-moist consistence, and this mixture is carefully poured into the void around the lining without tampering.

The embodiments of the invention shown in the drawing are illustrative of the invention, and the invention is not restricted to said embodiments but by the claims mentioned below.

ISO-KAERN is a registered trade mark for chimney insulation, supplied by Iso-Kaern, Bregnerϕdvej 127, DK-3460 Birkerϕd, Denmark.

KAMINENT is a registered trade mark for an element chimney, supplied by Kählers Teglvaerk, Teglvaerksvej, Svenstrup, DK-4220 Korsϕr, Denmark.

ANKI is a registered trade mark for chimney elements and chimney linings, supplied by Petri & Haugsted A/S, Islevdalvej 181, DK-2640 Rϕdovre, Denmark.

ROCKWOOL is a registered trade mark for rock wool, supplied by Rockwool A/S, DK-2640 Hedehusene, Denmark.

LECA is a registered trade mark for products manufactured from expanded clay, supplied by Lemvis-Müller & Co., Vestergade 16, DK-1456 Kϕbenhavn K.

FIBO is a registered trade mark for products manufactured from expanded clay, corresponding to LECA.

Claims

1. A method for increasing the width in the clear of a chimney by means of a rotary tool having radially yieldable means, characterized in that use is made of a rotary tool having chains disposed on several immediately adjoining levels, that the rotary tool is lowered from the top of the chimney to the bottom thereof, that the tool guided by guide means is moved upwards through the chimney, while increasing the width in the clear of the chimney to a greater value than that of the original width in the clear, that the material pulverized during the reaming operation is withdrawn at the bottom of the chimney, for instance by a vacuum cleaner, that a lining of an internal diameter corresponding to the original width in the clear is inserted in the widened width in the clear, the external diameter of the lining being slightly less than said greater value of the width in the clear of the chimney, and that a remaining void between the lining and the inner wall of the chimney is filled with a material, for instance a mass capable of producing an intimate bond between the inner wall of the chimney and the outer wall of the lining.

2. Method as claimed in claim 1, characterized in that the mass used is a casting mass, such as Leca concrete.

3. Apparatus for carrying out the method of claim 1 for increasing the width in the clear of a chimney (1) by means of a rotary tool comprising a holder (4) mounted at the free end of a rotatable shaft (6) and having chains (5) fixedly mounted on several levels at right angles to the rotatable shaft (6) and consisting e.g. of simple, elongated, ring-shaped chain links, characterized in that the chains (5) are disposed on levels immediately adjoining each other, that the rotatable shaft (6), immediately above the holder (4), is rotatably mounted in guiding unit (15) having external dimensions at right angles to the rotatable shaft (6) that are but slightly less than the original width in the clear of the chimney (1), and that the tool comprises means for lowering and lifting the guiding unit (15), the shaft (6), the holder (4) and the chains (5) in the chimney (1).

4. Apparatus as claimed in claim 3, characterized in that the holder (4) is in the form of a bolt, that the chains (5) are fixedly mounted on the bolt by means of a nut, that the chains (5) have an odd number of chain links, that the bolt is passed through the central chain links of the chains (5), and that the chains (5) are alternately mounted at right angles to each other.

5. Apparatus as claimed in claims 3—4, characterized in that the chains (5) are preferably disposed on eight levels at right angles to the rotatable shaft (6) which is flexible and extensible.

6. Apparatus as claimed in claims 3—5, characterized in that the chains (5) consist of a hard and heavy material, for instance hardened steel, the uttermost chain links optionally containing diamond dust, the chain links preferably having a material thickness of 5—6 mm.

7. Apparatus as claimed in claim 3, characterized in that the means for lowering and lifting the guiding unit (15), the shaft (6), the holder (4) and the chains (5) comprise a rack disposed on the top of the chimney (1) and having a pulley (16) for guiding the flexible shaft (6).

Patentansprüche

1. Verfahren zum Erweitern des Kanals eines Schornsteins mittels eines Drehwerkzeugs mit radial nachgebenden Mitteln, dadurch gekennzeichnet, daß ein Drehwerkzeug mit auf mehreren unmittelbar benachbarten Ebenen angeordneten Ketten verwendet wird, daß das Drehwerkzeug vom oberen Ende des Schornsteins bis auf dessen Sohle heruntergelassen wird, daß das von Führungsmitteln geführte Drehwerkzeug aufwärts durch den Schornstein bewegt und dabei die lichte Weite von dessen Kanal auf einen Wert gebracht wird, der größer als dessen ursprüngliche lichte Weite ist, daß das während des Erweiterungsvorgangs anfallende staubförmige Gut bsp. mittels eines Staubsaugers an der Schornsteinsohle abgezogen wird, daß eine Auskleidung, deren Innendurchmesser der ursprünglichen lichten Weite des Kanals des Schornsteins entspricht, in dessen erweiterten Innenraum eingesetzt wird, wobei der Außendurchmesser der Auskleidung etwas kleiner als der größere Wert der lichten Weite des Schornsteinkanals ist, und daß ein zwischen Auskleidung und Schornsteininnenwand verbleibender Leerraum mit einem Material, bsp. einer Masse, die eine innige Verbindung zwischen der Innenwand des Schornsteins und der Außenwand der Auskleidung zu erzeugen vermag, ausgefüllt wird.

2. Verfahren nach Anspruch 1, dadurch gekennzeichnet, daß die verwendete Masse eine Gießmasse wie Leca-Beton ist.

3. Vorrichtung zur Durchführung des Verfahrens nach Anspruch 1 zum Erweitern des Kanals eines Schornsteins mittels eines Drehwerkzeugs, das einen Halter aufweist, der am freien Ende einer drehbaren Welle montiert und mit Ketten bestückt ist, die auf mehreren rechtwinklig zu der drehbaren Welle verlaufenden Ebenen befestigt sind und z.B. aus einfachen langgestreckten ringförmigen Kettengliedern bestehen, dadurch gekennzeichnet, daß die Ketten (5) auf unmittelbar benachbarten Ebenen angeordnet sind, daß die drehbare Welle (6) unmittelbar über dem Halter (4) in einem Führungsblock (15) drehbar montiert ist, dessen Außenabmessungen rechtwinklig zur Welle (6) nur geringfügig kleiner als die ursprüngliche lichte Weite des Kanals des Schornsteins sind, und daß das Drehwerkzeug Mittel zum Herunterlassen und Hochziehen des Führungsblocks (15), der Welle (6), des Halters (4) und der Ketten (5) im Schornstein (1) aufweist.

4. Vorrichtung nach Anspruch 3, dadurch gekennzeichnet, daß der Halter (4) die Form eines Bolzens besitzt, daß die Ketten (5) an dem Bolzen mittels einer Mutter fest montiert sind, daß die Ketten (5) eine ungerade Zahl von Kettengliedern aufweisen, daß der Bolzen durch das zentrale Glied der Ketten (5) hindurchgeführt ist und daß die Ketten (5) abwechselnd rechtwinklig zueinander angebracht sind.

5. Vorrichtung nach den Ansprüchen 3 und 4, dadurch gekennzeichnet, daß die Ketten (5) vorzugsweise auf acht Ebenen angeordnet sind, die rechtwinklig zur drehbaren Welle (6) verlaufen, welche biegsam und dehnbar ist.

6. Vorrichtung nach den Ansprüchen 3—5, dadurch gekennzeichnet, daß die Ketten (5) aus einem harten und schweren Werkstoff, z.B. gehärtetem Stahl, bestehen, wobei die äußersten Kettenglieder wahlweise Diamantstaub enthalten und die Kettenglieder vorzugsweise eine Materialdicke von 5—6 mm besitzen.

7. Vorrichtung nach Anspruch 3, dadurch gekennzeichnet, daß die Mittel zum Herunterlassen und Hochziehen des Führungsblocks (15), der Welle (6), des Halters (4) und der Ketten (5) aus einem Hebezeug bestehen, das am oberen Ende des Schornsteins (1) angeordnet ist und eine Rolle (16) zur Führung der flexiblen Welle (6) aufweist.

Revendications

1. Procédé d'élargissement du conduit d'une cheminée au moyen d'un outil rotatif ayant des moyens radialement souples, caractérisé en ce que l'on emploie un outil rotatif ayant des chaînes disposées à plusieurs niveaux immédiatement contigus, en ce que l'outil rotatif est descendu du sommet de la cheminée vers le fond de celle—ci, que l'outil guidé par des moyens de guidage est remonté à travers la cheminée tout en élargissant le conduit de la cheminée à une valeur supérieure à celle de la largeur initiale dans le conduit, que le matériau pulvérisé durant l'opération d'alésage est enlevé du fond de la cheminée, par un aspirateur par exemple, qu'un garnissage ayant un diamètre interne correspondant à la largeur initiale du conduit est inséré dans la partie élargie du conduit, le diamètre externe du garnissage étant légèrement inférieur à ladite valeur supérieure de largeur dans le conduit, et en ce que le vide restant entre le garnissage et la paroi interne de la

cheminée est rempli d'un matériau, par exemple une masse capable de produire une liaison intime entre la paroi interne de la cheminée et la paroi externe du garnissage.

2. Procédé selon la revendication 1, caractérisé en ce que la masse utilisée est une masse de coulage telle que le béton Leca.

3. Appareil pour éffectuer le procédé de la revendication 1 pour élargir le conduit d'une cheminée (1) au moyen d'un outil rotatif comprenant un support (4) attaché à l'extrémité libre d'un arbre rotatif (6) et ayant des chaînes (5) fixées de façon inamovible à plusieurs niveaux perpendiculairement à l'arbre rotatif (6) et composées par exemple de chaînons en forme d'anneau simple allongé, caractérisé en ce que les chaînes (5) sont disposées à des niveaux immédiatement contigüs, que l'arbre rotatif (6), immédiatement audessus du support (4), est fixé de façon à pouvoir tourner dans un dispositif de guidage (15) ayant des dimensions externes perpendiculairement à l'arbre rotatif (6) légèrement inférieures à la largeur initiale du conduit de la cheminée (1), et que l'outil comprend des moyens pour descendre et soulever le dispositif de guidage (15), l'arbre (6), le support (4) et les chaînes (5) dans la cheminée (1).

4. Appareil selon la revendication 3, caractérisé en ce que le support (4) a la forme d'un boulon, que les chaînes (5) sont fixées de façon inamovible au boulon au moyen d'un écrou, que les chaînes (5) possèdent un nombre impair de chaînons, que le boulon passe dans les chaînons centraux des chaînes (5), et que les chaînes sont fixées alternativement et perpendiculairement les unes aux autres.

5. Appareil selon les revendications 3—4, caractérisé en ce que les chaînes (5) sont disposées de préférence sur huit niveaux perpendiculairement à l'arbre rotatif (6) qui est flexible et extensible.

6. Appareil selon les revendications 3—5, caractérisé en ce que les chaînes (5) sont composées d'un matériau lourd et dur, de l'acier trempé par exemple, les chainons des extrémités pouvant contenir de la poussière de diamant, les chaînons ayant une épaisseur de 5—6 mm.

7. Appareil selon la revendication 3, caractérisé en ce que les moyens pour descendre et lever le dispositif de guidage (15), l'arbre (6), le support (4) et les chaînes (5) comprennent un support placé sur le sommet de la cheminée (1) ayant une poulie (16) pour guider l'arbre flexible (6).

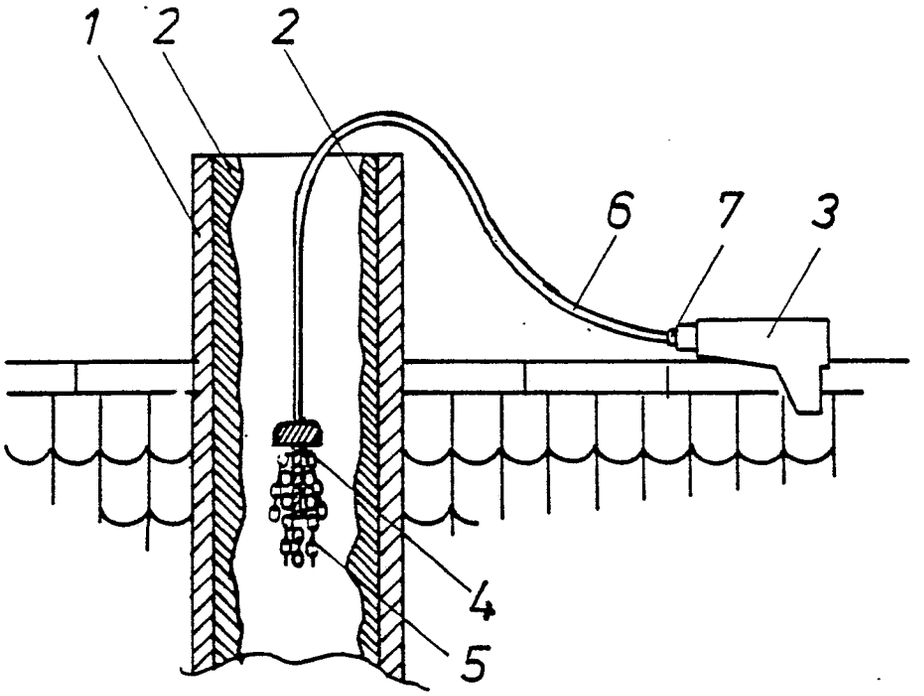


Fig.1

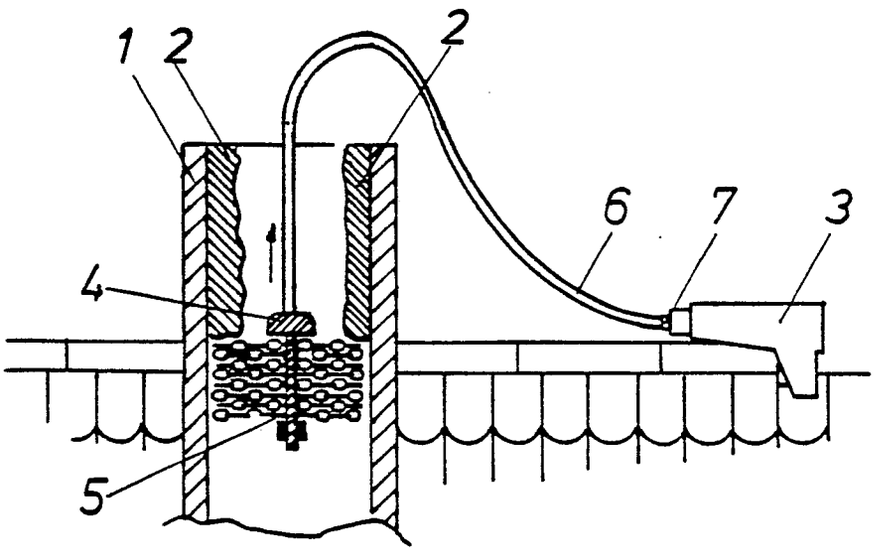


Fig. 2

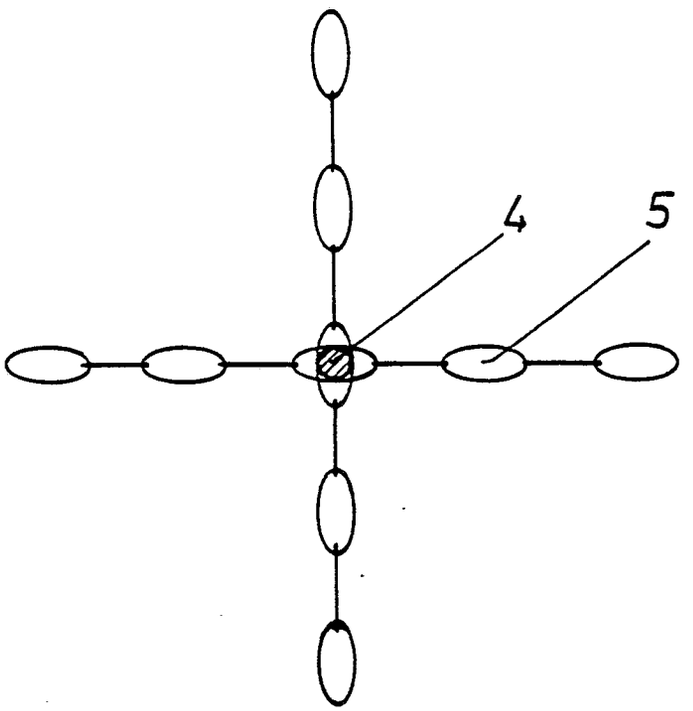


Fig.3

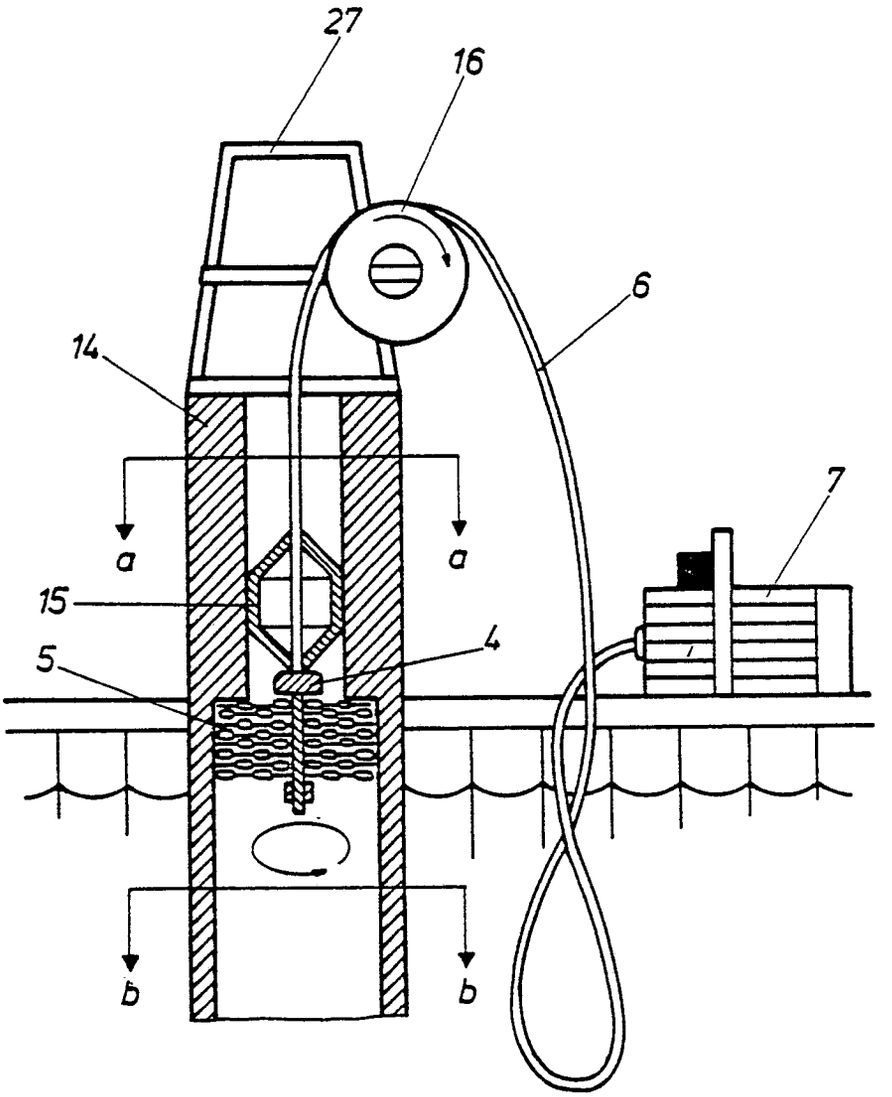


Fig. 4

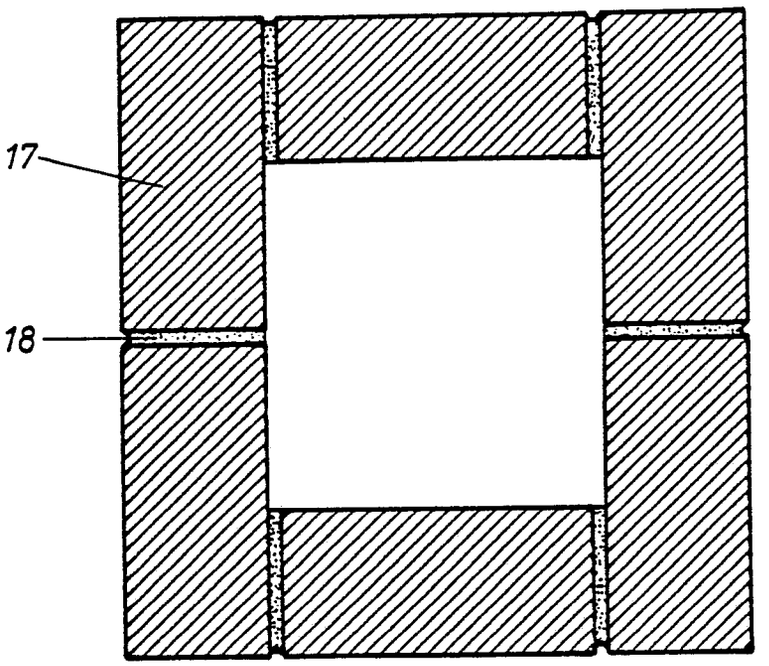


Fig. 5

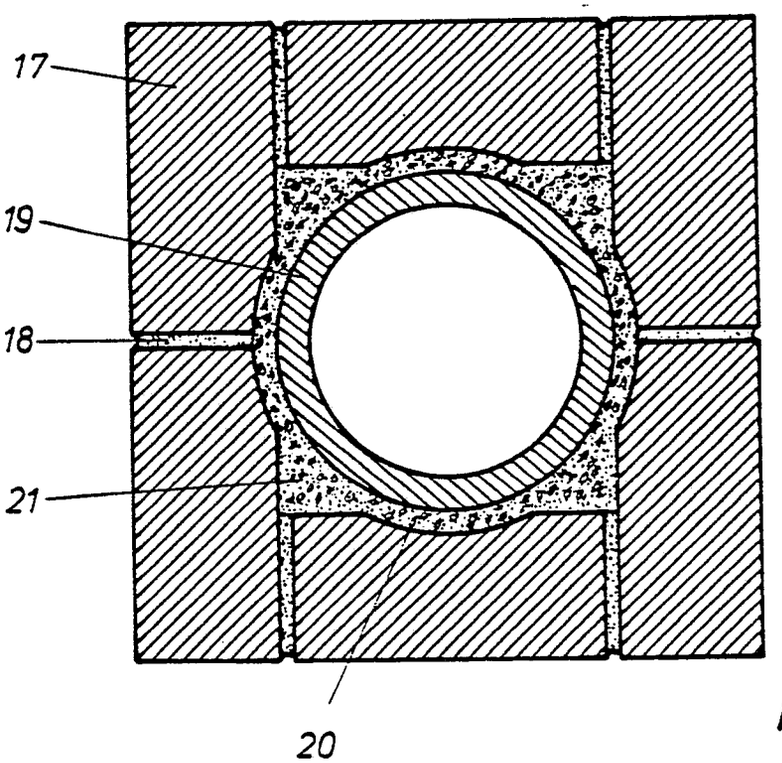


Fig. 6

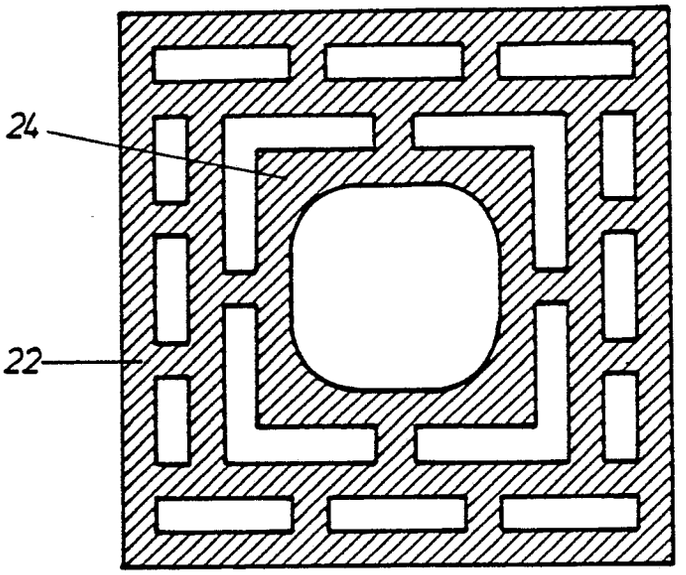


Fig. 7

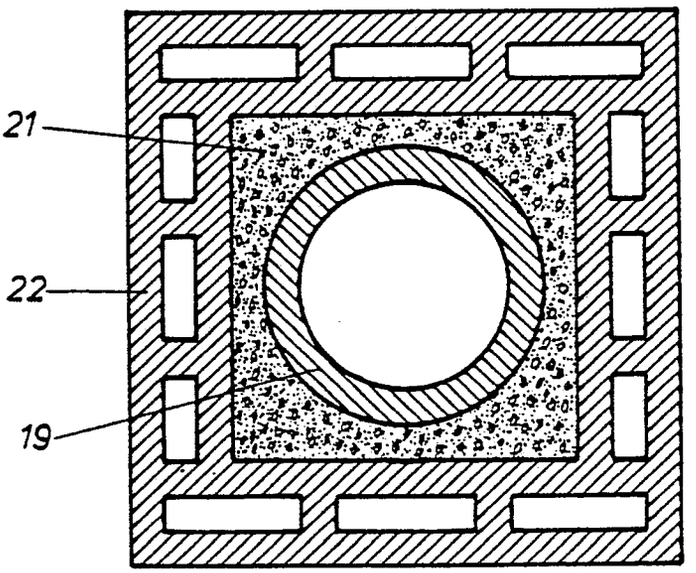


Fig. 8

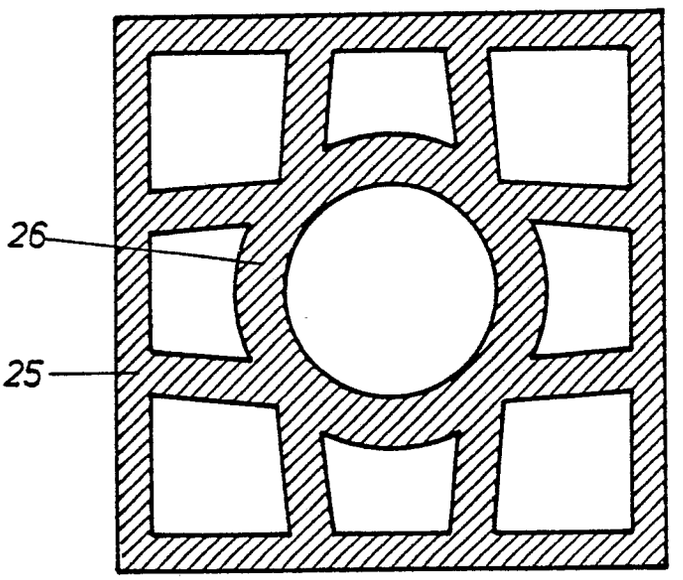


Fig. 9

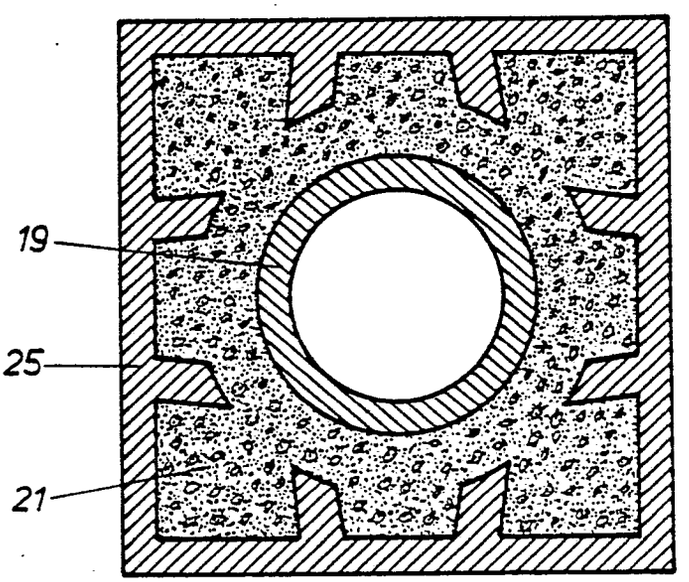


Fig. 10