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

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56 References cited:

AT-A- 203 707	AT-A- 207 545
DE-A- 1 659 540	DE-A- 2 002 503
DE-A- 2 016 520	DE-A- 2 155 733
DE-A- 2 216 086	DE-A- 2 330 880
DE-A- 2 507 897	DE-A- 3 436 954
DE-B- 1 229 230	DE-B- 1 232 721
DE-B- 1 751 213	DE-B- 1 946 565
DE-C- 227 335	DE-C- 597 460
DE-C- 702 204	DE-C- 1 229 230
DE-C- 1 759 299	DE-C- 1 946 565
DE-U- 1 989 099	DK-A- 120 202
FR-A- 540 910	FR-A- 707 546

GB-A- 188 078	GB-A- 618 556
JP-A-58 047 911	SE-C- 177 343
SE-C- 177 783	

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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, said method consisting in the combination that use is made of a rotary tool having chains, that the tool is moved upwards through the chimney, while the inside of the chimney is processed with strokes of a high intensity from the chains by rotation of the tool, thereby increasing the width in the clear of the chimney, and that the tool on the upper side during the movement upwards is guided by means of a guiding unit supported by the unprocessed internal surface of the chimney, and an apparatus to be used in connection with said 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 mounted at right angles to the rotatable shaft and consisting of simple, elongated, ringshaped chain links, the tool having a guiding unit on the upper side of the holder.

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 pivot-

ally 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 into 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.

DE-A-2,216,086 describes a technique, wherein the tool is lowered from the top of the chimney to the bottom thereof, whereupon the tool guided by guide means is moved upwards through the chimney, thereby increasing the width in the clear of the chimney.

DE-A-2,330,880 describes a technique, wherein the material pulverized during the reaming of the chimney is withdrawn at the bottom of the chimney by means of a vacuum cleaner.

Provisions, whereby a lining is inserted into the inside of a chimney, and the outer dimension of the lining being somewhat less than the greater value in the clear of the chimney, and the remaining void between the lining and the inner wall of the chimney being filled with a material capable of providing an intimate bond between the inner wall of the chimney and the lining, are described in DE-B-1,946,565.

From GB-A-618,556 is known a method and a tool for increasing the width in the clear of a chimney and being of the type described in the introduction. In this known apparatus a rotating brush fitted on a shaft is provided for removing soot from a chimney to be swept. The apparatus is introduced into the bottom of the chimney and pushed upwards by means of a rod during sweeping of the chimney, the brush being guided by a spring which is twisted or wound in such a manner that its exterior dimensions are in the form of a coiled ball sliding on the interior of the chimney. It is also indicated that the apparatus can be used for the removal of clinkers or other semi-hard deposits

in the chimney. For this purpose the brush is replaced by lengths of chains fitted on the shaft on the same level, whereupon the apparatus can remove some comparatively loose clinkers or hard or caked soot from the chimney. However, if a thick layer of clinkers or similar semi-hard deposits are present in the chimney, the lengths of chains fitted on the shaft on the same level are likely to be bent or knocked off from the level in which it is moved when hitting an obstacle to the effect that such deposits are not removed. In addition hereto, it is difficult to push the tool upwards by means of the rod since the required power must be exerted in the narrow space within the chimney, in addition to which there is a risk that the rod is bent as it is moved upwards through the chimney.

None of the above mentioned specifications, however, clearly describe a method respectively a tool, whereby it is possible not only to remove soot from the inside of a chimney but also, in a subsequent operation, to provide a lining in the reamed chimney, the lining having at option the same inside diameter as the original inside diameter of the chimney.

It is therefore an object of the invention to provide a method that can be used for increasing the width in the clear of the 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 the lining tube can be inserted into the chimney.

According to the invention, this object is achieved by a method of the above mentioned type, which is characterized in that the chains are disposed on several immediately adjoining levels, the chains in the different levels being fixedly mounted such that on rotation a chain is prevented by the chains in the adjacent levels from being knocked off the level in which it is moving when hitting an obstacle, that the rotary tool is lowered from the top of the chimney to the bottom thereof (before being moved upwards through the chimney), that the width in the clear of the chimney is increased 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 into 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.

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 would have been necessary to subject the flexible shaft to a pressure in the longitudinal direction thereof, whereby the shaft would easily be deflected with detrimental 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 into the chimney since owing to its radially yieldable means, it occupies such a radial dimension that it can be descended through the chimney. 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 into the smoothly milled chimney, whereupon the remaining void between the outer side of the lining and 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 into 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 the chimney by means of a rotary tool of the above mentioned type, which is characterized in that the chains are disposed on several immediately adjoining levels, the chains in the different levels being fixedly mounted such that on rotation a chain is prevented by the chains in the adjacent levels from being knocked off the level in which it is moving when hitting an obstacle, that the rotatable shaft, immediately above the holder, is rotatably mounted in the guiding unit having external dimensions at right angles to the rotatable shaft that 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.

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 can 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 shaft 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, 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 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 in 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 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 the 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 the 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 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 into 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 into 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 into 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 into 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 groundmoist consistency, 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, Bregnerødvej 127, DK-3460 Birkerød, Denmark.

KAMINENT is a registered trade mark for an element chimney, supplied by Kählers Teglværk, Teglværksvej, Svenstrup, DK-4229 Korsør, Denmark.

ANKI is a registered trade mark for chimney elements and chimney linings, supplied by Petri & Haugsted A/S, Islevdalvej 181, DK-2640 Rødovre, 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 Lemvig-Müller & Co., Vestergade 16, DK-1456 København 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 (1) by means of a rotary tool having radially yieldable means, said method consisting in the combination that use is made of a rotary tool having chains (5), that the tool is moved upwards through the chimney (1), while the inside of the chimney is processed with strokes of a high intensity from the chains (5) by rotation of the tool, thereby increasing the width in the clear of the chimney (1), and that the tool on the upper side during the movement upwards is guided by means of a guiding unit (15) supported by the unprocessed internal surface of the chimney (1), **characterized in** that the chains (5) are disposed on several immediately adjoining levels, the chains (5) in the different levels being fixedly

5 mounted such that on rotation a chain (5) is prevented by the chains (5) in the adjacent levels from being knocked off the level in which it is moving when hitting an obstacle, that the rotary tool is lowered from the top of the chimney (1) to the bottom thereof (before being moved upwards through the chimney), that the width in the clear of the chimney (1) is increased 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 (1), for instance by a vacuum cleaner, that a lining (19) of an internal diameter corresponding to the original width in the clear is inserted into the widened width in the clear, the external diameter of the lining (19) being slightly less than said greater value of the width in the clear of the chimney (1), and that a remaining void between the lining (19) and the inner wall of the chimney (1) 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 (19).

2. Apparatus to be used in connection with 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) mounted at right angles to the rotatable shaft (6) and consisting of simple, elongated, ringshaped chain links, the tool having a guiding unit (15) on the upper side of the holder (4), **characterized in** that the chains (5) are disposed on several immediately adjoining levels, the chains (5) in the different levels being fixedly mounted such that on rotation a chain (5) is prevented by the chains (5) in the adjacent levels from being knocked off the level in which it is moving when hitting an obstacle, that the rotatable shaft (6), immediately above the holder (4), is rotatably mounted in the 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 (16, 27) for lowering and lifting the guiding unit (15), the shaft (6), the holder (4) and the chains (5) in the chimney (1).

3. Apparatus according to claim 2, **characterized in** that the holder (4) is in the form of a bolt (4), on which the chains (5) are firmly fixed by means of a nut, the chains (5) having an odd number of links, the bolt (4) being driven through the central link of each chain (5) and

that the chains (5) in each level are located at right angles to the chain (5) in the adjoining level.

4. Apparatus according to claims 2-3, **characterized in** that the chains (5) consist of hard and heavy metal, for instance hardened steel, the uttermost chain link optionally containing diamond dust, and the chain links preferably having a material thickness of 5-6 mm. 5
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5. Apparatus according to claims 2-4, **characterized in** that the chains (5) are preferably disposed on eight levels. 15
6. Apparatus according to claims 2-5, **characterized in** that the rotatable shaft (6) is flexible, and that the means for lowering and lifting the guiding unit (15), the shaft (6) and the bolt (4) with the chains (5) in the chimney (1) comprise a rack (27), which can be arranged on the top of the chimney (1) and has a pulley (16) for controlling the flexible shaft (6). 20

Patentansprüche 25

1. Verfahren zum Erweitern des Kanals eines Schornsteins (1) mittels eines Drehwerkzeugs mit radial nachgebenden Mitteln, bei welchem Verfahren eine Kombination verwendet wird, wobei ein Drehwerkzeug mit Ketten (5) benutzt wird, dass das Drehwerkzeug aufwärts durch den Schornstein (1) bewegt wird, wobei die Schornsteininnenwand durch Drehen des Drehwerkzeugs mit hochintensiven Schlägen der Ketten (5) bearbeitet wird, wobei die lichte Weite des Schornsteins (1) erweitert wird, und dass das Drehwerkzeug auf der Oberseite während des Hochziehens von einem Führungsblock (15) geführt wird, unterstützt von der unbearbeiteten Innenwandung des Schornsteins (1), dadurch **gekennzeichnet**, dass die Ketten (5) auf mehreren unmittelbar benachbarten Ebenen angeordnet sind, wobei die Ketten (5) auf den verschiedenen Ebenen fest montiert sind, und nach Drehen einer Kette (5) ist sie von Ketten (5) auf den benachbarten Ebenen daran verhindert, aus der Ebene, worin sie sich bewegt, geschlagen zu werden, wenn sie ein Hindernis trifft, dass das Drehwerkzeug vom Höhepunkt bis dem Boden des Schornsteins (1) heruntergelassen wird, (ehe es aufwärts durch den Schornstein bewegt wird), dass die lichte Weite des Schornsteins (1) auf einen grösseren Wert als der ursprünglichen lichten Weite des Schornsteins (1) erweitert wird, dass das während des Erweiterungsvorgangs anfallende staubförmige Gut bsp.

bsp. mittels eines Staubsaugers an der Sohle des Schornsteins (1) abgezogen word, dass eine Auskleidung (19) deren Innendurchmesser der ursprünglichen lichten Weite des Kanals des Schornsteins entspricht, in dessen erweiterten Kanal eingesetzt wird, wobei der Ausendurchmesser der Auskleidung (19) geringfügig kleiner als der grössere Wert der lichten Weite des Schornsteins (1) ist, und dass ein zwischen der Auskleidung (19) und der Schornsteininnenwand verbleibender Leerraum mit einem Material, bsp. einer Masse, die eine innige Verbindung zwischen der Innenwand des Schornsteins und der Aussenwand der Auskleidung (19) zu erzeugen vermag, ausgefüllt wird.

2. Vorrichtung zur Durchführung des Verfahrens nach Anspruch 1 zum Erweitern des Kanals eines Schornsteins (1) mittels eines Drehwerkzeugs, das einen Halter (4) aufweist, der am freien Ende einer Drehbaren Welle (6) montiert und mit Ketten bestückt ist, die rechtwinklig zu der drehbaren Welle (6) befestigt sind und aus einfachen, langgestreckten ringförmigen Kettengliedern bestehen, wobei das Werkzeug auf der Oberseite des Halters (4) einen Führungsblock (15) aufweist, dadurch **gekennzeichnet**, dass die Ketten (5) auf unmittelbar benachbarten Ebenen angeordnet sind, wobei die Ketten (5) auf den verschiedenen Ebenen fest montiert sind, und nach Drehen einer Kette (5) ist sie von Ketten (5) auf den benachbarten Ebenen daran verhindert, aus der Ebene, worin sie sich bewegt, geschlagen zu werden, wenn sie ein Hindernis trifft, dass die drehbare Welle (6) unmittelbar über dem Halter (4) in dem Führungsblock (15) drehbar montiert ist, dessen Aussenabmessungen rechtwinklig zur Welle (6) nur geringfügig kleiner als die ursprüngliche lichte Weite des Kanals des Schornsteins (1) sind, und dass das Drehwerkzeug Mittel (16, 27) zum Herunterlassen und Hochziehen des Führungsblocks (15), der Welle (6), des Halters (4) und der Ketten (5) im Schornstein (1) aufweist.
3. Vorrichtung nach Anspruch 2, dadurch **gekennzeichnet**, dass der Halter (4) die Form eines Bolzens (4) 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 (4) durch das zentrale Glied der Ketten (5) hindurchgeführt ist, und dass die Ketten (5) auf jeder Ebene rechtwinklig zur Kette (5) auf der benachbarten Ebene angebracht sind.

4. Vorrichtung nach den Ansprüchen 2-3, dadurch **gekennzeichnet**, dass die Ketten (5) aus einem harten und schweren Werkstoff, z.B. gehärtetem Stahl, bestehen, wobei die äussersten Kettenglieder wahlweise Diamantstaub 5 enthalten und die Kettenglieder vorzugsweise eine Materialdicke von 5-6 mm besitzen.
5. Vorrichtung nach den Ansprüchen 2-4, dadurch **gekennzeichnet**, dass die Ketten (5) 10 vorzugsweise auf acht Ebenen angeordnet sind.
6. Vorrichtung nach den Ansprüchen 2-5, dadurch **gekennzeichnet**, dass die drehbare 15 Welle (6) biegsam ist und dass die Mittel zum Herunterlassen und Hochziehen des Führungsblocks (15), der Welle (6), und des Bolzens (4) mit den Ketten (5) im Schornstein (1) aus einem Hebezeug bestehen, das am oberen 20 Ende des Schornstein angebracht ist und eine Rolle (16) zur Führung der flexiblen Welle (6) aufweist.

Revendications

1. Procédé d'élargissement du conduit d'une cheminée (1) au moyen d'un outil rotatif des 25 moyens radialement suples, en ce que la procédé se comporte d'une combinaison d'emploi d'un outil rotatif ayant des chaînes (5), que l'outil est remonté à travers la cheminée (1), que durant la remontage l'intérieur de la cheminée (1) es traité par des coups de force 30 haute par les chaînes (5) par rotation d'outil tout en élargissant le conduit de la cheminée (1), et que l'outil à la face supérieure est pendant le mouvement à travers conduissit par des moyens de guidage (15) supporté par la face intérieure de la cheminée (1), **caracterisé** 40 en ce que les chaînes (5) sont disposées à plusieurs niveaux immédiatement contigüs, les chaînes (5) des niveaux differents étant montée telle que durant rotation une chaîne est empêchée par les chaînes (5) des niveaux 45 contigüs d'être fait sauter le niveau auquel elle marche en frappant un obstacle, que l'outil rotatif est soulevé du sommet de la cheminée (1) vers le fond de celle-ci (avant étant faire marcher vers le sommet à travers de la cheminée) 50 que la largeur du conduit de la cheminée (1) est élargissé 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 (1), 55 par un aspirateur par exemple, qu'un garnissage (19) ayant un diamètre interne correspondant à la largeur initiale du conduit est inséré

dans la partie élargie du conduit, le diamètre externe du garnissage (19) étant légèrement inférieur à ladite valeur supérieure de largeur dans le conduit, et que le vide restant entre la garnissage (19) et la paroi interne de la cheminée (1) es rempli d'un matériau, par exemple une masse capable de produire une liaison intime entre la paroi interne de la cheminée (1) et la paroi externe du garnissage (19).

2. Appareil pour effectuer 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 perpendiculairement à l'arbre rotatif (6) et composées par des chaînons en forme d'anneau simple, allongé, l'outil ayant au-dessus du support (4) un dispositif de guidage (15) **caracterisé** en ce que les chaînes (5) sont disposées à plusieurs niveaux immédiatement contigüs, les chaînes (5) étant fixées de facon immovible telle que durant rotation une chaîne est empêchée par les chaînes (5) des niveaux d'être faire sauter le niveau auquel elle marche en frappant un obstacle, que l'arbre rotatif (6), immédiatement au-dessus du support (4), est fixé de facon 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 e soulever le dispositif de guidage (15), l'arbre (6), le support (4) et les chaînes (15) dans la cheminée (1).
3. Appareil selon la revendication 2, **caracterisé** en ce que le support (4) a la forme d'un boulon (4), que les chaînes (5) sont fixées de facon 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 à chaque niveau fixées perpendiculairement à la chaîne du niveau immédiatement contigüs.
4. Appareil selon les revendications 2-3, **caracterisé** en ce que les chaînes (5) sont composées d'un matériau lourd et dur, de l'acier trempé par exemple, les chaînons des extrémités pouvant contenir de la poussière de diamant, les chaînons ayant une épaisseur de 5-6 mm.
5. Appareil selon les revendications 2-4, **caracterisé** en ce que les chaînes (5) sont dispo-

sées de préférence sur huit niveaux.

6. Appareil selon les revendications 2-5, **caractérisé** en l'outil rotatif (6) étant flexible et en ce que les moyens pour descendre et lever le dispositif de guidage (15), l'arbre (6), le support (4) ayant les chaînes (5) de la cheminée (1) comprennent un ratelier (27) placé sur le sommet de la cheminée (1) ayant une poulie (16) pour guider l'arbre flexible (6).

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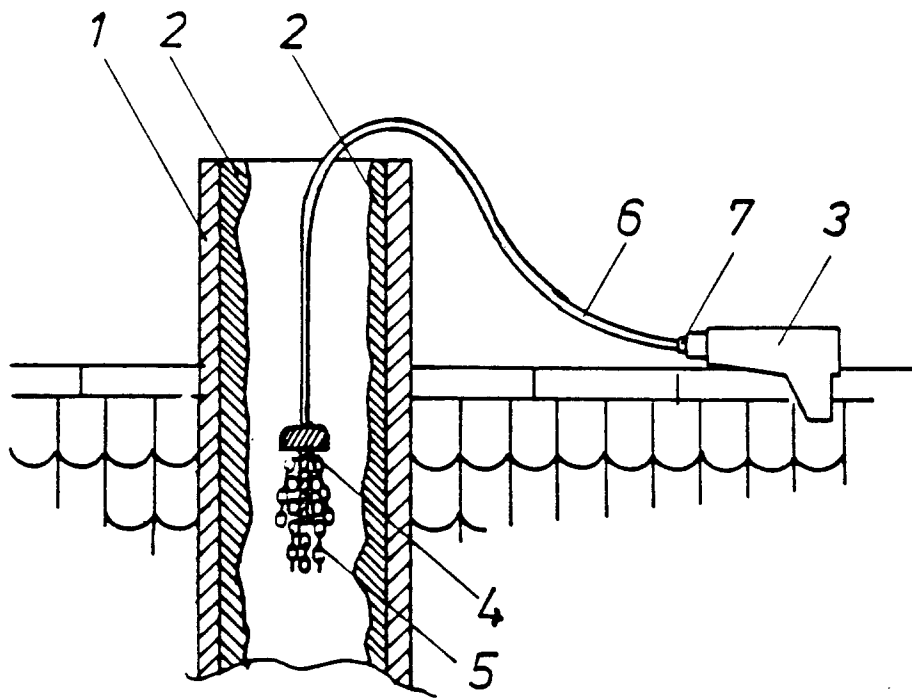


Fig. 1

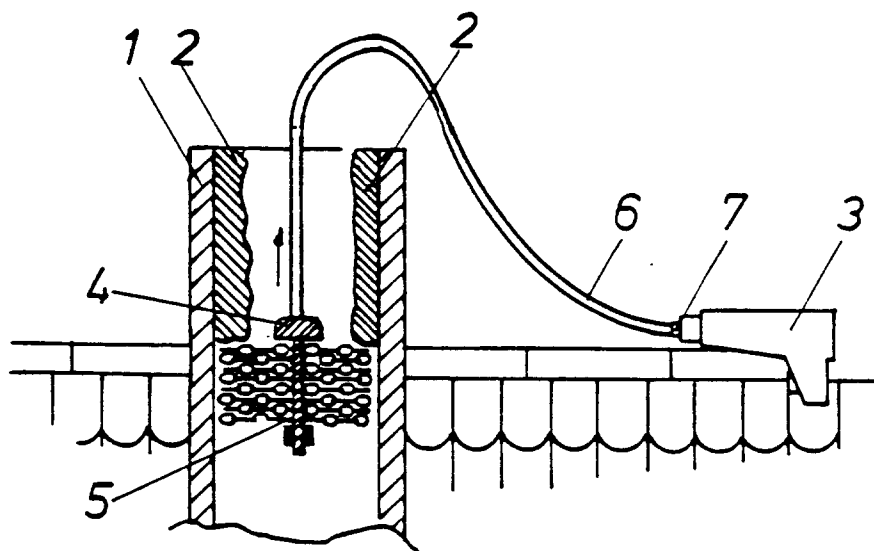


Fig. 2

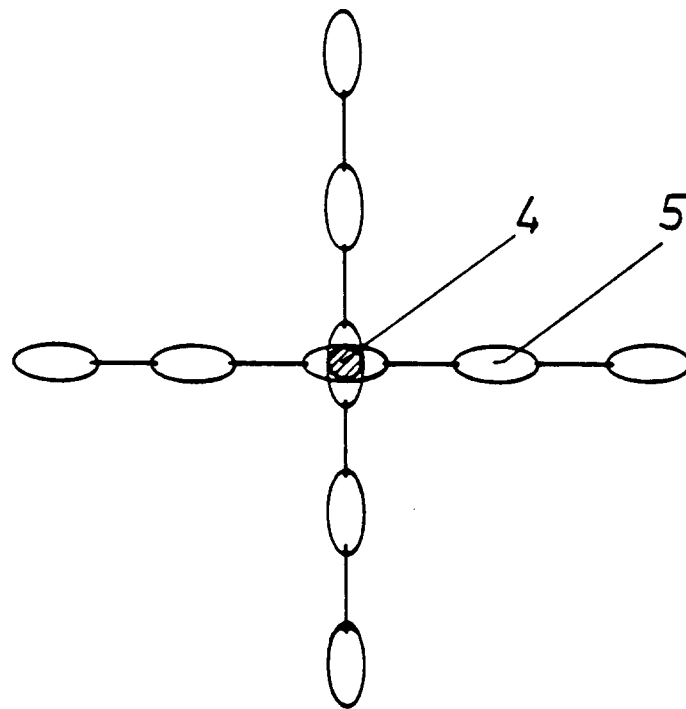


Fig.3

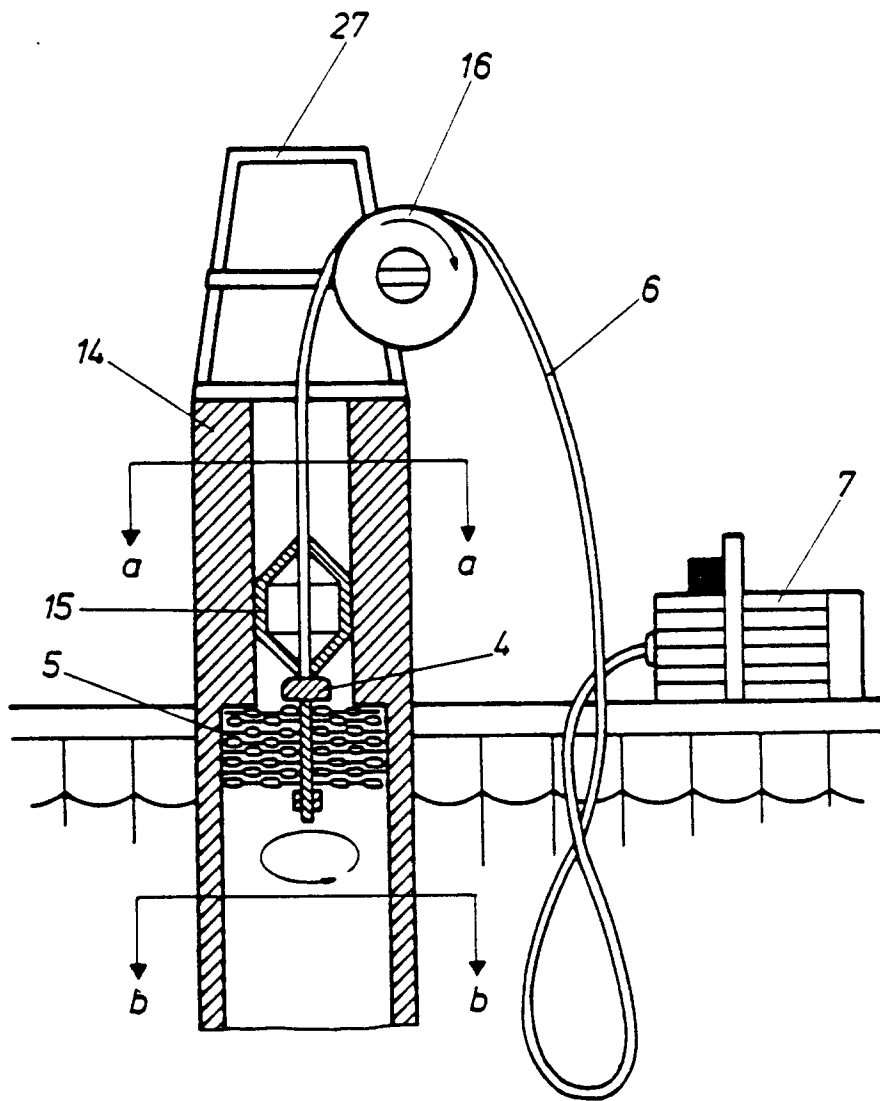


Fig. 4

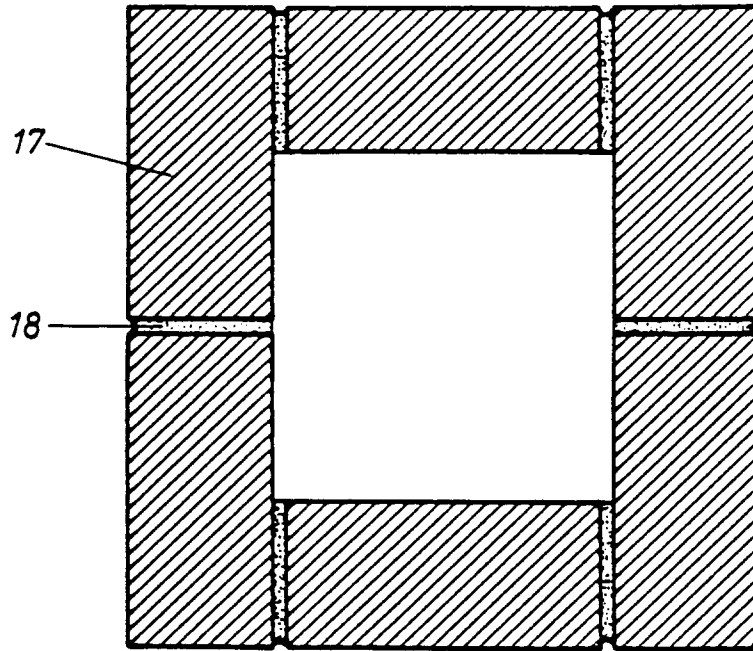


Fig. 5

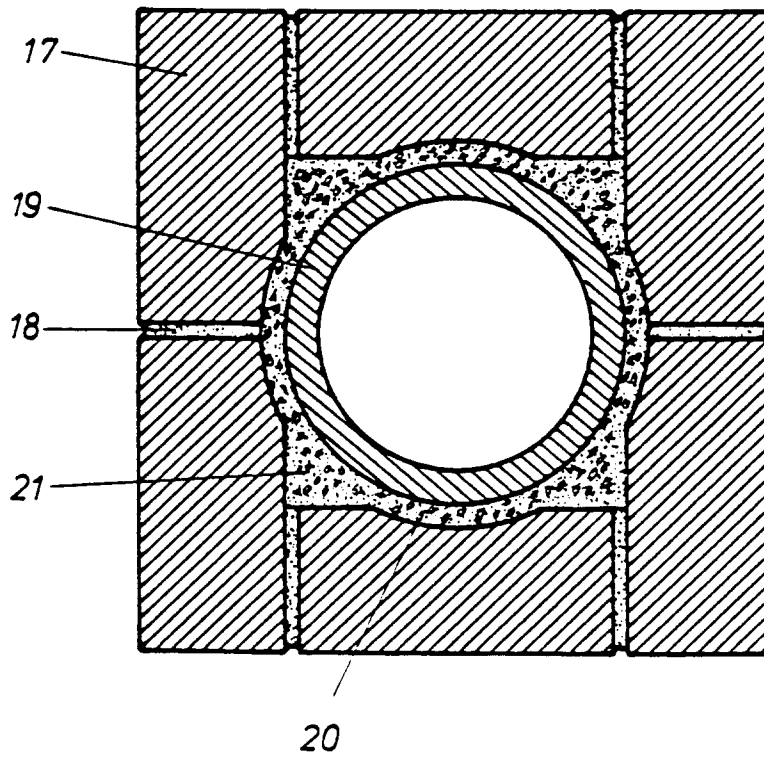


Fig. 6

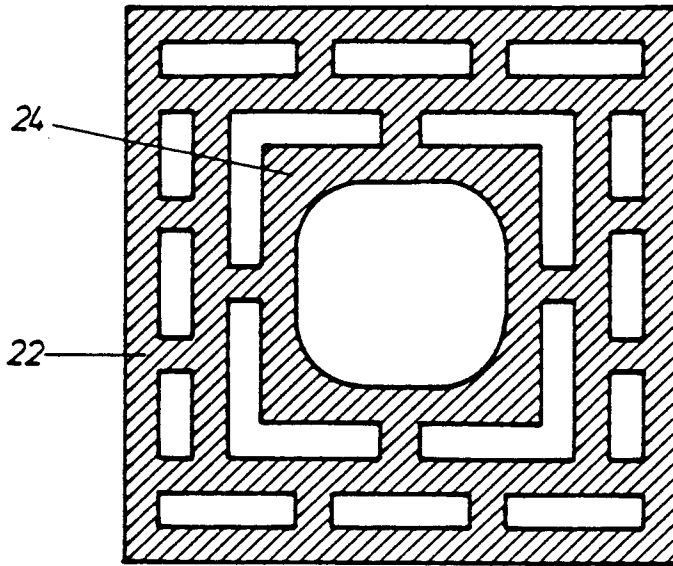


Fig. 7

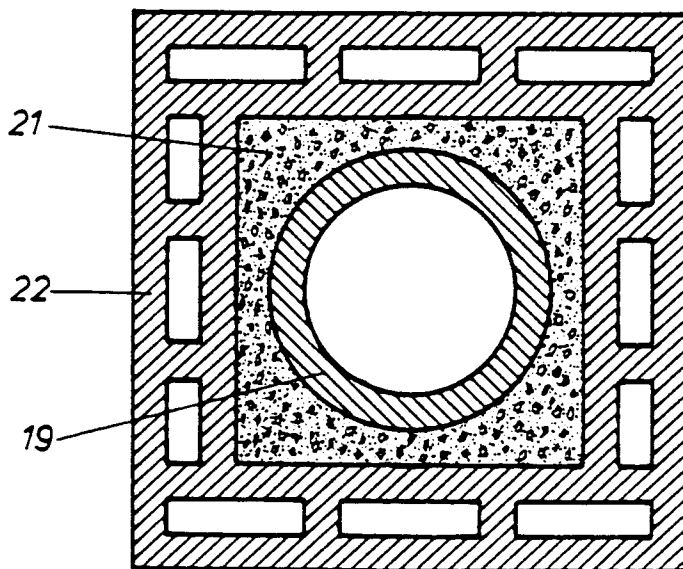


Fig. 8

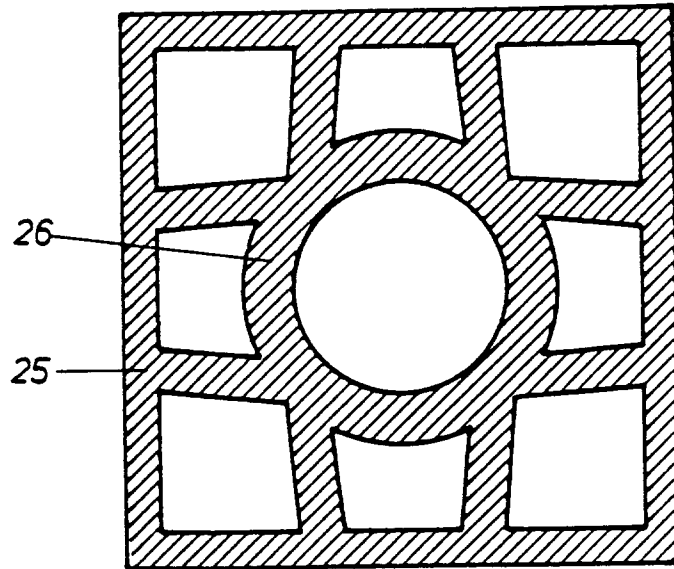


Fig. 9

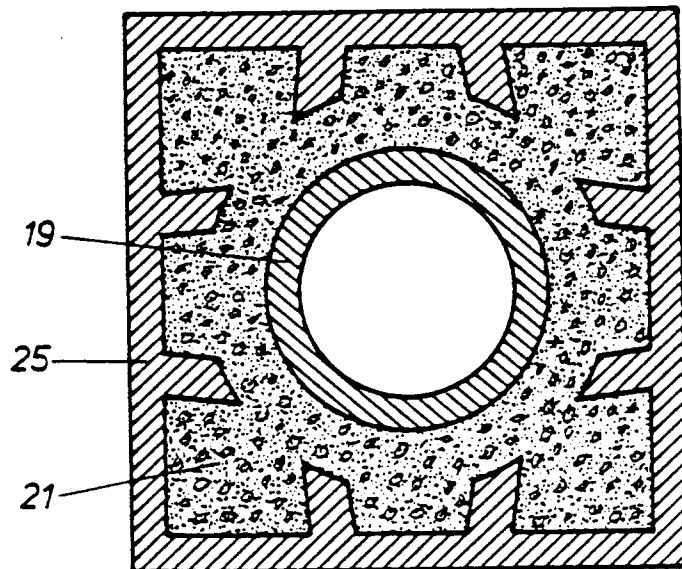


Fig. 10