US 20070251061A1

(19) United States

(12) Patent Application Publication (10) Pub. No.: US 2007/0251061 A1

Heiselbetz (43) Pub. Date: Nov. 1, 2007

(54) FASTENING COMPONENT, IN PARTICULAR A SPACER ELEMENT

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(21) Appl. No.: **11/790,366**

(22) Filed: **Apr. 25, 2007**

(30) **Foreign Application Priority Data**

Apr. 28, 2006 (DE) 10 2006 019 852.2

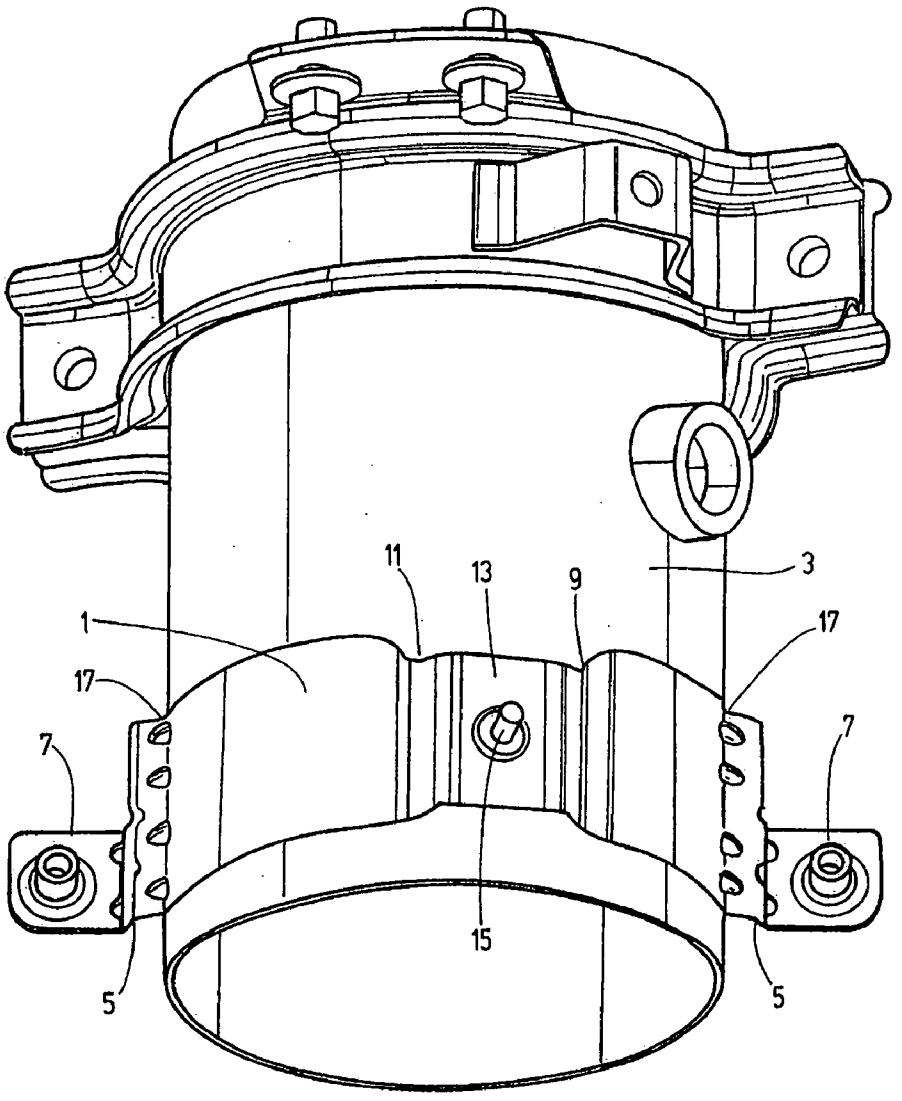
Publication Classification

(51) **Int. Cl.**
A44B 1/04 (2006.01)

(52) **U.S. Cl.** **24/278**

(57) **ABSTRACT**

A fastening component, a spacer element in particular, for structural components such as heat shields (**25**, **37**) with a strip-like enclosing element (**1**) for application in certain sections on a heating element (**3**) to be shielded, has on the enclosing component (**1**) spring-loaded connecting components (**21**) by means of which the enclosing element (**1**) may be fastened on the heating element (**3**) so as to be stationary.



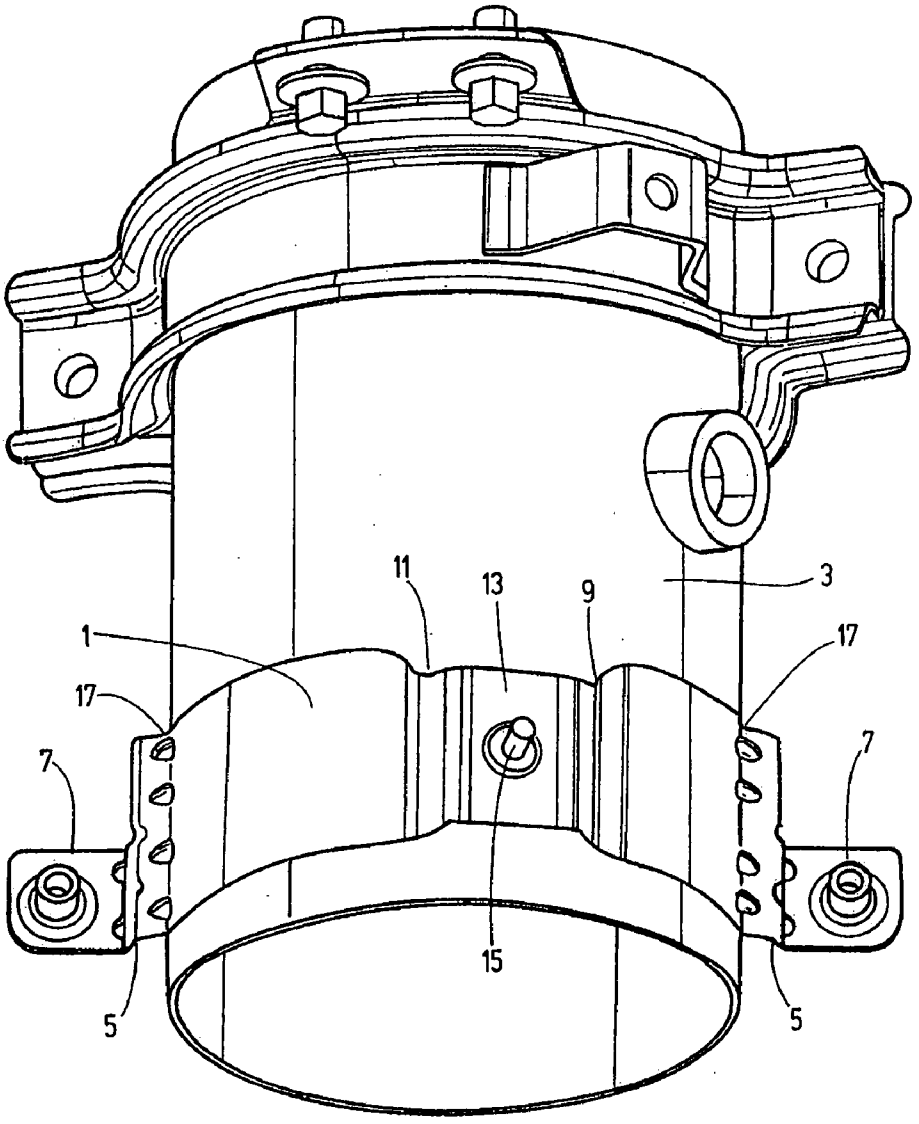


Fig.1

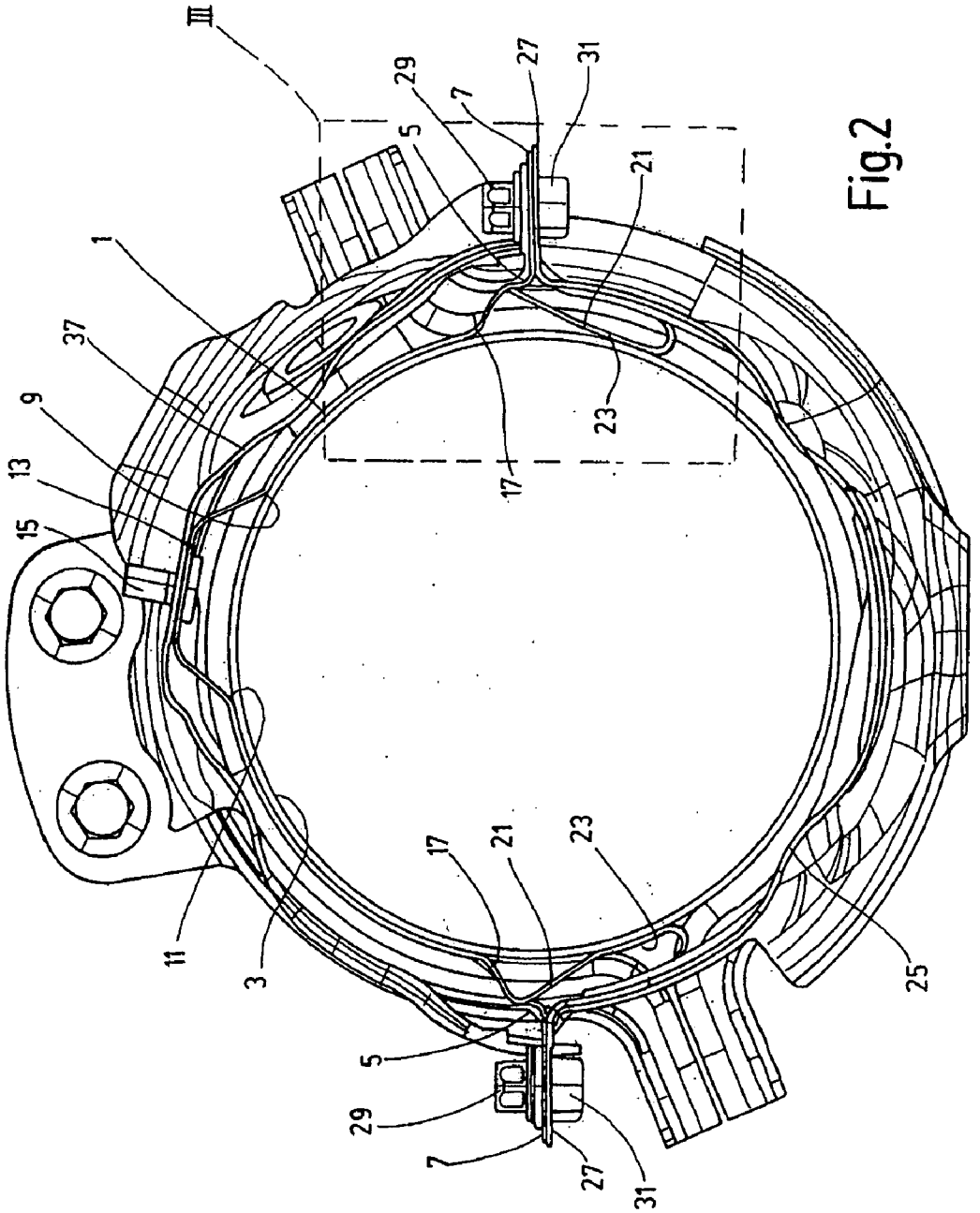


Fig.2

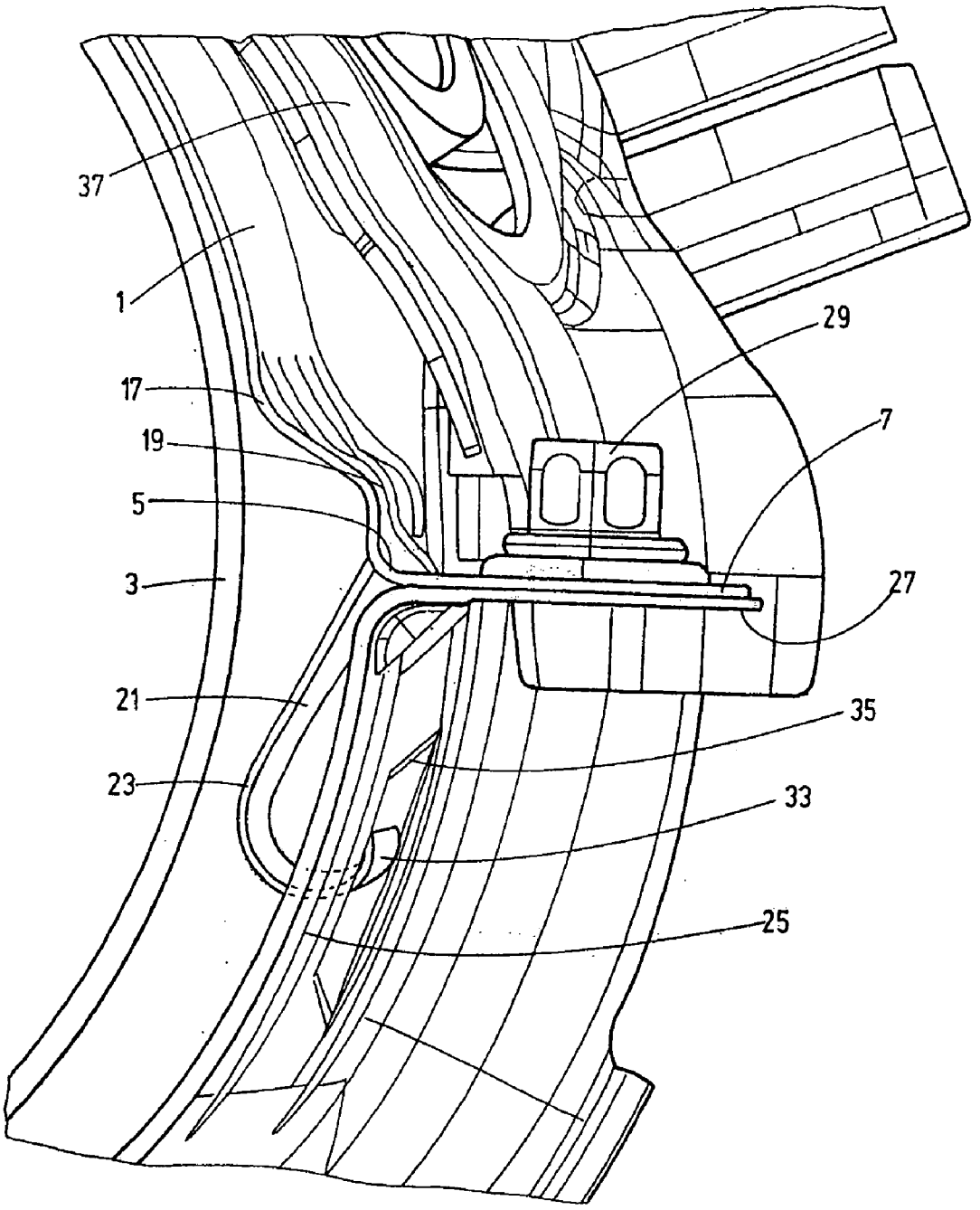


Fig.3

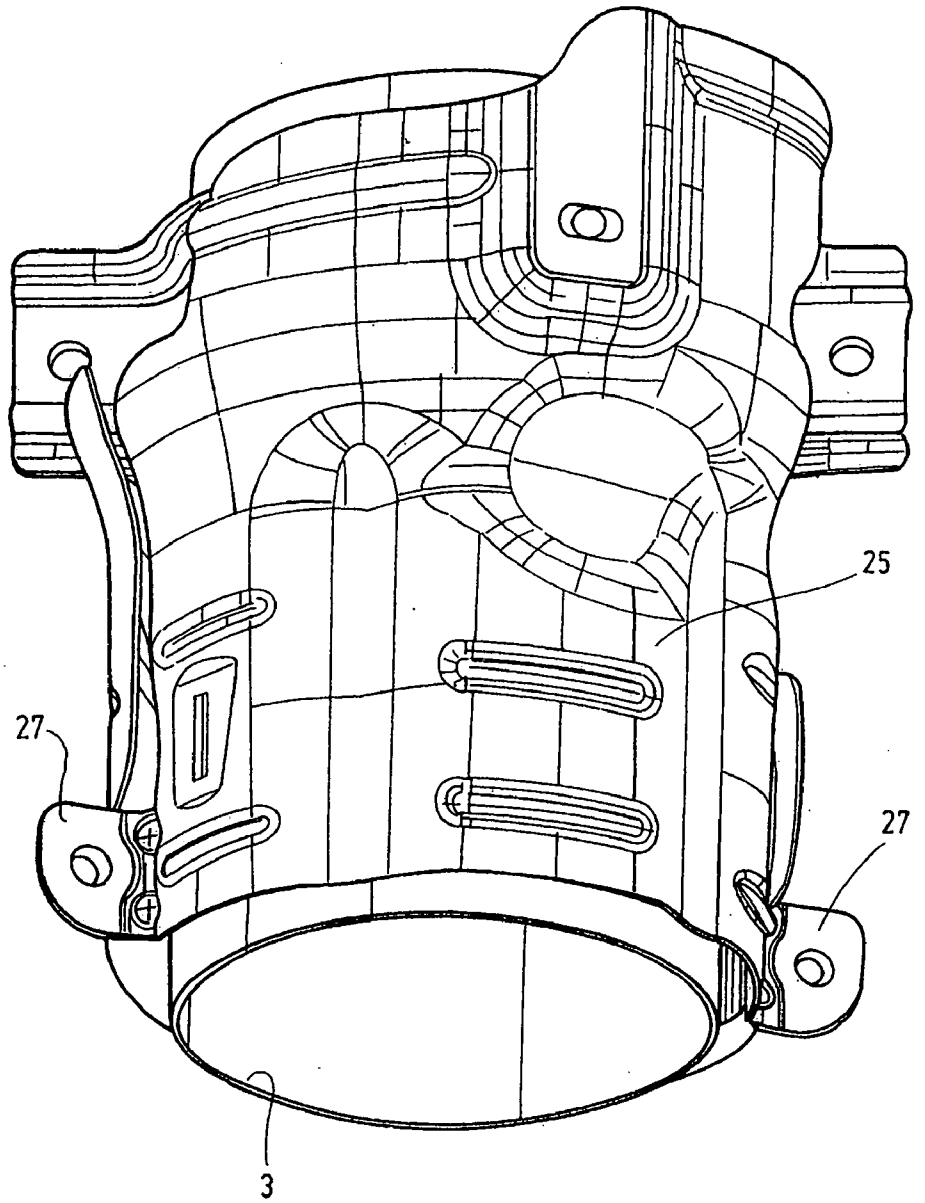


Fig.4

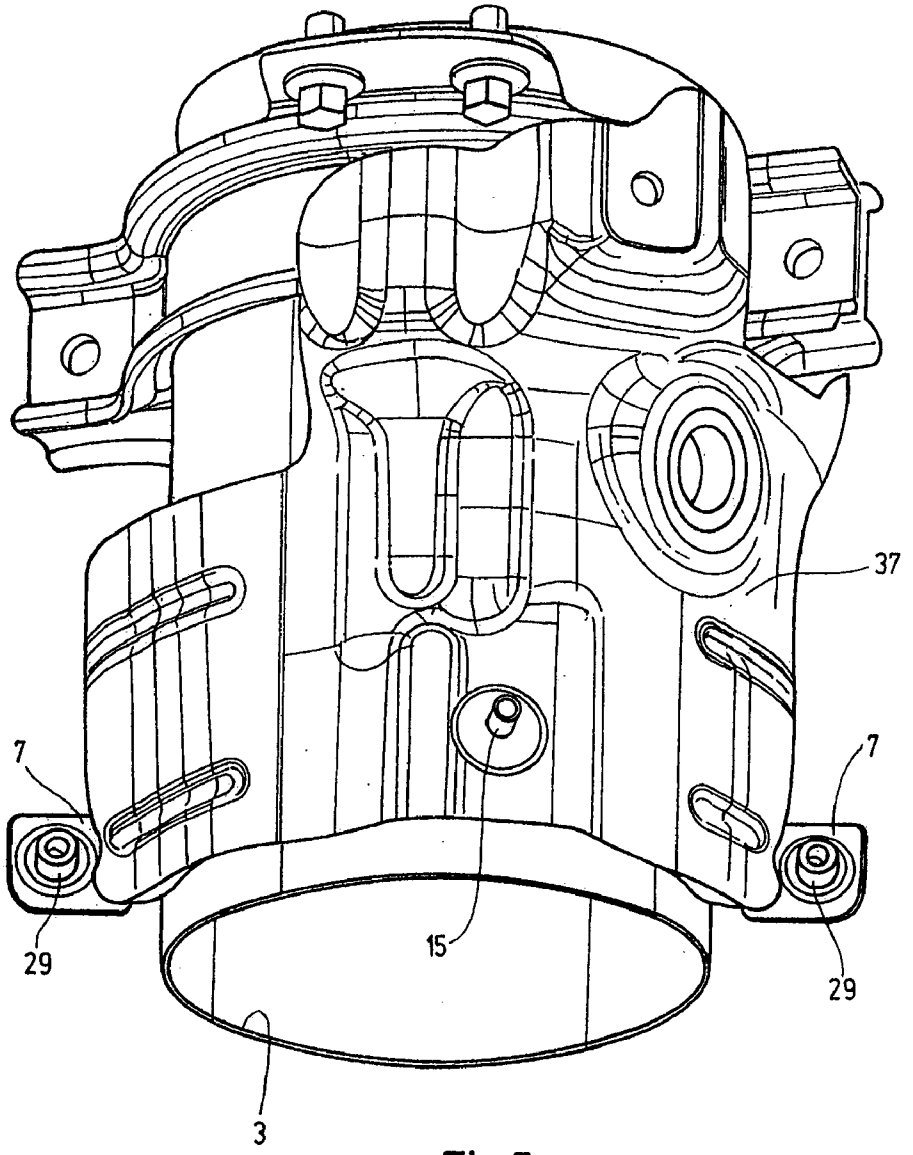


Fig.5

FASTENING COMPONENT, IN PARTICULAR A SPACER ELEMENT

[0001] The invention relates to a fastening component, in particular a spacer element, for structural components such as heat shields.

[0002] Structural components such as heat shields which form a shielding system or part of a shielding system are widely employed in motor vehicle technology in particular in order to protect heat-sensitive structural elements such as sensors, fuel lines, pressure sensors, etc. from thermal overloading. While the heat developed by an economical performance-optimated diesel engine on the cylinder or crankshaft housing may be low, such is by no means the case with "hot zones" such as those in exhaust gas manifolds, turbochargers, catalytic converters, etc., so that heat shields must be present in the appropriate places. This applies especially in the area of catalytic converters, which represent strong heat sources because of their high temperature in individual phases.

[0003] Heat sources such as these often necessitate more or less complete encapsulation, it being essential for the heat shields forming the encapsulation to be fastened in a predetermined position, the spacing desired between the heat shield and the hot heating element being ensured at least in partial areas. It is found difficult in many instances to meet this requirement. What may be involved, for example, are installation situations in which there are no fastening options for unambiguous positioning of heat shields. Assembly itself of heat shields may also be difficult and time consuming because sufficient free space is not available in a particular engine compartment.

[0004] In connection with these problems the object of the invention is to provide a fastening component permitting fastening of the structural components in question in a clear-cut position a distance from a heating element at low installation cost.

[0005] It is claimed for the invention that this object is obtained by means of a fastening component according to patent claim **1** in its entirety.

[0006] The invention accordingly provides that the fastening component has a strip-shaped enclosing component which in turn may be mounted on the heating element by means of spring-loaded connecting components. The enclosing element may thus be "clipped" onto the heating element by a simple and convenient method. This may also be accomplished with low installation cost in the event of confined spatial relationships. The clipped-on enclosing element then forms the base, that is, the primary mounting positions, for suitable heat shields, for example, for the purpose of effecting encapsulation of a catalytic converter forming a heating element.

[0007] By preference the enclosing component is in the form of a band clamp the length of which is such that it encloses the outer circumference of the heating element, such as the round body of a catalytic converter, over approximately one-half of the enclosing length. An enclosing component of this shape makes it convenient to clip the component on from the side and ensures adequate fixation on the heating element, in particular if, as claimed for the invention, an advantageous exemplary embodiment, the connecting components are in the form of leaf tension springs which extend away from both ends of the band clamp as extensions of the latter.

[0008] By preference the tensioning springs are shaped so that they are in tensioning contact with the enclosed heating element by way of one free end and so that they are bent outward away from the heating element between the tensioning area and its free end. In addition to their tensioning function proper, that is, fastening the enclosing component, the tensioning springs may also form a spacer element for a heat shield by their end area bent outward and/or may be engaged with such a shield in such a way that an anchorage is formed which is flexible or may permit a specified relative movement of the heat shield.

[0009] In especially advantageous exemplary embodiments the band clamp forming the enclosing element is shaped in partial length areas following the trace of the outer circumference of the heating element and in other partial length areas is provided with bending sections for extension at a distance from the heating element. Hence, suitable configuration of the bending sections results in simplicity in production of spacer elements for heat shields in contact with such elements.

[0010] By preference the band clamp has on both ends a bending section spaced a distance from the heating element. The configuration may be such that the tensioning springs extend from an area of the bending sections spaced a distance from the heating element areas diagonally to the outer surface of the heating element. This makes available a spring path suitable for compensating for thermal dimension changes.

[0011] In exemplary embodiments in which the band clamp has on both ends an extension bending at an angle outward from the outer circumference of the heating element enclosed, such extensions may form fastening points for built-on components such as heat shields, for example, by provision on the extensions of at least one threaded opening, preferably with a nut mounted on it, for formation of a screw coupling.

[0012] The configuration arrived at may be such that a screw connection element spaced a distance from the heating element for fastening a second heat shield is provided on the band clamp in the area of the ends between the bending sections of the latter.

[0013] It is especially advantageous for the configuration arrived at in an exemplary embodiment such as this to be such that the first and the second heat shield form at least partial encapsulation of approximately one half of the enclosing areas of the heating element positioned diametrically opposite each other. This results both in essentially complete encapsulation of the heating element involved and in cohesion of the shielding system formed in this manner, in that fastening of the heat shields results both from closed linkage of the enclosing component by means of the tensioning springs and from the circumstance that the two heat shields connected to the enclosing component enclose (encapsulate) the heating element on sides opposite each other.

[0014] The enclosing component may be produced simply and cost-efficiently by forming the strip-shaped band clamp and the tensioning springs serving as spring-loaded connecting components in one piece, preferably of high-grade steel possessing elastic properties.

[0015] The invention will be described in detail in what follows on the basis of an exemplary embodiment illustrated in the drawing, in which

[0016] FIG. **1** presents a perspective oblique view of an exemplary embodiment of the fastening component claimed for the invention mounted on a cylindrical catalytic converter housing, only a partial length area is shown;

[0017] FIG. **2** an end view drawn on a larger scale than that in FIG. **1**, of the open end of a catalytic converter housing, there being connected to the fastening component a first and a second heat shield which constitute encapsulation of the catalytic converter housing;

[0018] FIG. **3** a diagonal perspective view much larger than that in FIG. **2** showing only the area designated as III in FIG. **2**, a screw connection between the fist heat shield and the fastening component being shown only in part;

[0019] FIG. **4** the partial length area shown in FIG. **1** of the catalytic converter housing with heat shield mounted on it, its screw connection to the fastening component not being shown, and

[0020] FIG. **5** a presentation similar to that of FIG. **4**, but of the second side opposite that of the heat shield of FIG. **4**, with the heat shield connected to the fastening component.

[0021] The invention will be explained in what follows on the basis of an exemplary embodiment in which the fastening component claimed for the invention for positioning of structural elements is provided in the form of a first and a second heat shield which forms an encapsulation on the outer side of the catalytic converter. The invention is, of course, suitable for positioning of structural elements of other kinds.

[0022] FIG. **1** illustrates the fastening component in the form of a band clamp **1** in the form of a sheet metal possessing elastic properties, by preference of stainless steel. The band clamp **1** is fastened to elastic parts (not shown in FIG. **1**) described in detail in what follows, with reference to FIGS. **2** and **3**, on the cylindrical outer circumference of the catalytic converter **3**. As is to be seen in FIG. **2**, the measured length of the band clamp **1** is such that it extends over approximately one-half of the circumference of the catalytic converter **3**. Each of the two ends **5** of the band clamp **1** has a flat extension **7** projecting radially outward in relation to the circular curvature of the band clamp **1**.

[0023] As is shown in FIG. **2**, and especially in FIG. **3**, the band clamp **1** does not have over its entire length a circular extension following the external circumference of the catalytic converter **3** but rather has bending sections at which the band clamp **1** is spaced a distance from the enclosed catalytic converter **3**. Such is the case of the area of length positioned in the center between the ends **5**, where there is formed by bending sections **9** and **11** (FIG. **2**) a level section of length **13** radially offset outward which forms a spacer element and a support for a bolting element **15**. In addition, there is in front of each end **5** of the band clamp **1** a bending section **17** displaced radially outward by the ends **5** of the band clamp, so that a spacer element is formed, of which one, designated **19**, is to be seen in FIG. **3**.

[0024] At each end **5** of the band clamp **1** there extends from the spacer element **19** a length of a flat tensioning spring **21** serving as an extension of the band clamp **1**. As is shown with particular clarity in FIG. **3**, the respective tensioning spring **21** extends diagonally radially inward and adjoins a tensioning area **23** under spring tension on the outer circumference of the catalytic converter **3**. If the band clamp **1** is clipped onto the catalytic converter **3** from the side, that is, into the position shown in FIG. **1**, the band clamp **1** is immobilized on the tensioning area **23** by the force of tensioning springs **21**.

[0025] As a further development of the mounting process for encapsulation of the catalytic converter **3** a first heat shield **25**, which, as is to be seen in FIG. **4**, is more or less in the form of a half-shell, is connected to the band clamp **1** clipped onto the catalytic converter **3**. As has already been pointed out, the band clamp **1** has on each of its ends **5** an extension **7** running outward at a angle. These extensions form a mounting position for the first heat shield **25**, which, as is to be seen in FIG. **4**, analogously to the extensions **7** of the band clamp **1**, has extensions **27** extending at an angle laterally outward. These extensions **27**, provided with bolt holds, may be bolted onto the extensions **7** on the band clamp **1**, specifically, by means of a bolting fixture which in each instance has a forced in nut **29** and fixing bolt **31** (the latter has been omitted from FIG. **3**).

[0026] As is shown the most clearly in FIG. **3**, the flat springs **21** are bent radially outward in an arc in their section extending to the free end **33** and adjoining the tensioning area **23** and are engaged by their outer end **33** in a recess **35** (shown only in FIG. **3**) in the first heat shield **25**. The dimensions of the recess **35** are such that a relative movement may be executed in the circumferential direction in order to compensate for thermal changes in dimension. As is to be seen in FIGS. **2** and **4**, the heat shield **25** is provided with local curvatures and shaped so that its interior is spaced at least in some sections a distance from the catalytic converter **3** enclosed.

[0027] In order to complete the encapsulation, there is presented in FIG. **5** a diagonal elevational view of a second heat shield **37** which, like the first heat shield **25**, forms a partial shell, fastened to it by means of the locking element **15** on the band clamp **1** (the part of total bolting element operating in conjunction with the bolting element for the second heat shield **37** is not shown in the figures). As is illustrated by FIG. **2** in particular, not only is the second heat shield **37** on the band clamp **1** immobilized by way of the bolting element **15** but also spaced at a distance from the catalytic converter **3** engaged by the spacer elements of the band clamp **1**, which arise from its bending sections **9**, **11**, and **17**. The band clamp **1** itself is fixed not only in position on the catalyst **3** both by the tensioning springs **21** but is secured from pulling away from the catalytic converter **3** in that the first heat shield **25** encloses the area surrounding the catalyst **3** not enclosed by the band clamp **1**. The second heat shield **37**, which is associated with the area enclosing the catalytic converter **3** surrounded by the band clamp **1**, also is unequivocally fixed in position by the connection with the bolting element **15** and is spaced relative to the catalytic converter **3** as desired a distance from the surrounded catalytic converter **3** by means of spacer elements (**19** in FIG. **3** and section **13** in FIG. **2**).

1. A fastening component, in particular a spacer element, for structural components such as heat shields (**25**, **37**) having a strip-like enclosing component (**1**) for application in certain sections to a heating element (**3**) to be shielded and having spring-loaded connecting points (**21**) provided by means of which the enclosing component (**1**) may be fastened on the heating element (**3**) so as to be stationary.

2. The fastening component according to claim **1**, characterized in that the enclosing component is in the form of a band clamp (**1**) the length of which is dimensioned so that

it surrounds the outer circumference of the heating element (**3**) in part, by preference to approximately one-half the enclosing length.

3. The fastening component according to claim **2**, wherein the connecting components are in the form of flat tensioning springs (**21**) which extend away from the band clamp (**1**) as extensions of such band clamp.

4. The fastening component according to claim **3**, wherein the tensioning springs are in a form (**21**) such that they are applied under spring tension to the heating element (**3**) by way of a tensioning area (**23**) on the heating element (**3**) enclosed and wherein they are bent outward area away from the heating element (**3**) between the tensioning area (**23**) and their free end (**33**).

5. The fastening component according to claim **4**, wherein the band clamp (**1**) is shaped in partial length areas so as to follow the course of the outer circumference of the heating element (**3**) and in other partial length areas is provided with bending sections (**9**, **11**, **17**) for extension at a distance from the heating element (**3**).

6. The fastening component according to claim **5**, wherein the band clamp (**1**) has on both ends (**5**) an end bending section (**17**) spaced on each end thereof a distance from the heating element (**3**).

7. The fastening component according to claim **6**, wherein the tensioning springs (**21**) extend from an area (**19**) spaced at a distance from the heating element (**3**) of the end bending sections (**17**) to the tensioning area (**23**) diagonally to the outer surface of the heating element (**3**) enclosed.

8. The fastening component according to claim **2**, wherein the band clamp (**1**) has on both ends (**5**) an extension (**7**) extending from the outer circumference of the enclosed heating element (**3**) to the extension bent outward which forms fastening points for built-on components such as heat shields (**25**).

9. The fastening component according to claim **8**, wherein the fastening points on the extensions (**7**) are provided, for formation of a threaded joint, with a heat shield (**25**) having at least one screw hole, preferably with a forced-in nut (**29**) mounted thereon.

10. The fastening component according to claim **9**, wherein there is provided on the band clamp (**1**), in the area of bending sections (**9**, **11**) between its ends (**5**), a bolting element (**15**) spaced a distance from the enclosed heating element (**3**) for fastening of a second heat shield (**37**).

11. The fastening component according to claim **10**, wherein each of the first and second heat shields (**25**, **37**) forms at least in part an encapsulation of approximately one-half the enclosing areas of the heating element (**3**) diametrically opposite each other.

12. The fastening component according to claim **2**, wherein the strip-like band clamp (**1**) is formed to be integral with the spring-loaded connecting springs (**21**), by preference a band clamp of a stainless steel possessing elastic properties.

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