



(22) Date de dépôt/Filing Date: 1999/12/23

(41) Mise à la disp. pub./Open to Public Insp.: 2001/01/07

(45) Date de délivrance/Issue Date: 2004/11/23

(30) Priorité/Priority: 1999/07/07 (199 31 290.7) DE

(51) Cl.Int.⁷/Int.Cl.⁷ B24B 21/00, B24D 18/00

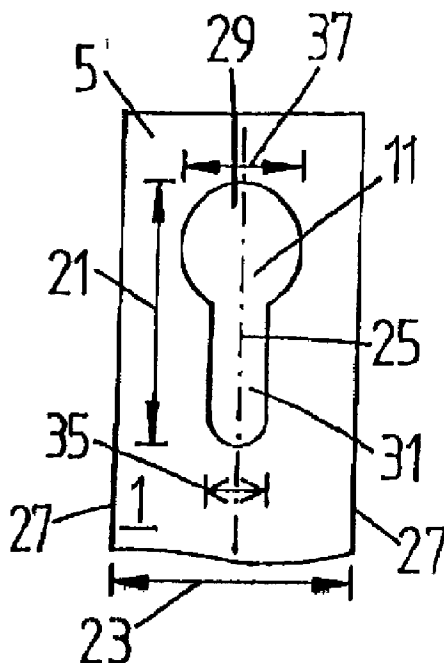
(72) Inventeur/Inventor:
EISENBLATTER, GERD, DE

(73) Propriétaire/Owner:
GERD EISENBLATTER GMBH, DE

(74) Agent: GOWLING LAFLEUR HENDERSON LLP

(54) Titre : COURROIES DE TRAITEMENT DE MATIERE, EN PARTICULIER COURROIES DE BROYAGE, DE
PONCAGE ET/OU DE POLISSAGE, ET METHODE DE FABRICATION DE TELLES COURROIES

(54) Title: MATERIAL PROCESSING BELTS, IN PARTICULAR GRINDING, SANDING AND/OR POLISHING BELTS,
AND A METHOD OF MANUFACTURING SUCH BELTS



(57) Abrégé/Abstract:

The invention relates to material processing belts and to a method of manufacturing such belts. A material processing belt is described which possesses a working surface, a first and a second end as well as joining means at the ends to form an endless belt. The material processing belt is further characterized by the fact that the joining means take the form of a separable positive-locking connection having at least one opening at the first end as well as at least one mating element at the second end. In a further material processing belt possessing an endless ring shape, a first working surface is provided, and a second working surface is provided on the side opposite the first working surface. A method for manufacturing material processing belts from belting material supplied by the metre is characterized by the fact that a first and a second blank of a material processing belt are produced from adjacent parts of the said belting, and by the fact that in the first blank at least one opening, and in the second blank at least one mating element are produced in one common processing step, using one or more punch tools.

Abstract

The invention relates to material processing belts and to a method of manufacturing such belts. A material processing belt is described which possesses a working surface, a first and a second end as well as joining means at the ends to form an endless belt. The material processing belt is further characterized by the fact that the joining means take the form of a separable positive-locking connection having at least one opening at the first end as well as at least one mating element at the second end. In a further material processing belt possessing an endless ring shape, a first working surface is provided, and a second working surface is provided on the side opposite the first working surface. A method for manufacturing material processing belts from belting material supplied by the metre is characterized by the fact that a first and a second blank of a material processing belt are produced from adjacent parts of the said belting, and by the fact that in the first blank at least one opening, and in the second blank at least one mating element are produced in one common processing step, using one or more punch tools.

Material processing belts, in particular grinding, sanding and/or polishing
belts, and a method of manufacturing such belts

The present invention relates to material processing belts, in particular grinding, sanding and/or polishing belts, and to a method of manufacturing material processing belts.

A material processing belt of the type referred to here, in particular a grinding, sanding and/or polishing belt, possesses a working surface, a first and second end, and also joining means provided at the ends for the purpose of forming an endless belt.

Such grinding, sanding or polishing belts are used in the form of ring-shaped endless belts for grinding, sanding or polishing circular pipes or tubes, circular wooden workpieces, or similar items. For this purpose, the abrasive belt is, on the one hand, slipped laterally onto the workpiece to be processed and, on the other hand, it is placed around the belt drive roller of an abrasive belt machine. However, in order to be able to process enclosed workpieces, where it is not possible to slide the abrasive belt laterally onto the workpiece, the abrasive belt must be separated and placed around the item to be worked and it must then be rejoined to form a ring once more.

One way of rejoining the separated abrasive belt is to arrange the belt to form a ring and then to bond a special fabric tape over the entire length of the belt. Although this method is very effective and reliable, it is also on the other hand very time-consuming. In addition, it requires considerable amounts of adhesive tape.

Another way of rejoining separated grinding, sanding and polishing belts to form an endless ring-shaped belt is known from WO 97/20 663. In the case of the grinding, sanding and polishing belts described there, the ends are joined together not by bonding the entire belt but by bonding only a relatively short section near the ends of the belt.

Good results have already been achieved with this solution. However, adhesive tape is still required to reclose the belt, and opening up such an adhesive joint is still relatively time-consuming because a tool, such as a pair of scissors, is needed.

Furthermore, the adhesive joints cannot be repeatedly resealed. Consequently, this frequently means that a new piece of adhesive tape is required. This results in undesired consumption of material and means that each material processing belt can only be opened and closed a limited number of times.

In addition, in the case of the prior art material processing belts, when the working surface is exposed to heavy wear while in operation, the material processing belt frequently has to be replaced.

As a result of the disadvantages of the state-of-the-art material processing belts, one of the tasks of the present invention is to propose a material processing belt, in particular a grinding, sanding or polishing belt, that is easily separated, that can easily be rejoined to form a ring-shaped endless belt, and that also has a long service life. In addition, a method for manufacturing such material processing belts is proposed.

This task is solved by means of a material processing belt having a working surface (3), a first and a second end (5, 7), as well as joining means at the ends of the belt in order to form an endless belt, characterized in that the joining means take the form of a separable positive-locking connection (9) having at least one opening (11) at the first end (5) as well as at least one mating element (13) at the second end (7), also by a material processing belt having an endless ring shape, and possessing a first working surface (15) and a second working surface (17) on the side opposite the first working surface (15), whereby in a first state of the material processing belt (1) the first working surface (15) is positioned on the outside, and whereby in a second state of the material processing belt (1) the second working surface (17) is positioned on the outside, and whereby the material processing belt (1) may be reversibly changed from the first state to the second state, and by a method for manufacturing material processing belts characterized in that a first and second blank of a material processing belt (1) are manufactured from adjacent parts of the said belting material, and also characterized in that in the first blank at least one opening (11) and in the second blank at least one mating element (13) are produced in a common processing step using one or more punching tools.

Advantageous further developments and embodiments of the material processing belts according to the invention or of the methods for the manufacture thereof are claimed in the sub-claims.

According to the invention, in the case of a material processing belt of the type described above, the joining means take the form of a separable positive-locking connection having at least one opening at the first end and at least one mating element at the second end of the belt.

One core idea of the invention is that the two ends of a material processing belt are joined by means of a positive-locking connection and that the ends of the material processing belt are appropriately formed. Tests have surprisingly revealed that material-processing belts whose ends are joined in the manner according to the invention by a positive-locking connection possess extremely good running properties. Compared to an adhesive joint, the transition at the joint is smoother, so that the presence of the transition point is scarcely noticeable when the belt is in operation.

Furthermore, one important advantage of the solution according to the invention is that the positive-locking connection can be opened and closed as often as required. In addition, no further materials and/or tools are required to produce and undo the connection. This also means, in particular, that no waste material is produced. In addition, the positive-locking connection can be opened and closed very quickly, which is also of considerable practical benefit.

Finally, it is advantageous that the material processing belts do not have to be pre-closed, but can be shipped and stored in the open state, thereby saving space.

Furthermore, according to the present invention, a material processing belt, and in particular an endless, ring-shaped grinding, sanding and polishing belt, is provided with a first working surface and a second working surface on the opposite side to the first working surface; in a first state of the material processing belt the first working surface is situated on the outside, and in a second state of the material processing belt the second surface is situated on the outside, and the material processing belt can be reversibly changed over from the first state to the second state.

The advantages of this material processing belt are in particular evident when the belt is fitted with a separable positive-locking connection, because it is then possible to open and rejoin the material processing belt very quickly and easily so that the respective other working surface is now located on the outside.

Furthermore, one major advantage of such a material processing belt is that practically the entire surface can be used as a working surface. As a result, the service life of such a material processing belt is increased and costs of materials can be saved.

Finally, in the case of a method for manufacturing material processing belts from belting material supplied by the metre, the invention provides for a first blank and a second blank of a material processing belt to be manufactured from adjacent sections of the said belting material, and it also provides for at least one opening to be produced in the first blank and at least one mating element to be produced in the second blank, using one or more punch tools in one common processing step.

The core idea in this case is that two blanks for material processing belts situated adjacent to each other in the belting material supplied by the metre can be processed in one common processing step, thereby speeding up the manufacturing process.

In particular, with this method, it is possible to do away with time-consuming adjusting and tensioning processes as well as adjustments of the workpieces, which also require a lot of apparatus. In addition, the method according to the invention creates fewer rejects and only a very small amount of waste material.

The material processing belt having a working surface (3), a first and a second end (5, 7), as well as joining means at the ends of the belt in order to form an endless belt, characterized in that the joining means take the form of a separable positive-locking connection (9) having at least one opening (11) at the first end (5) as well as at least one mating element (13) at the second end (7) can be advantageously further developed by providing at least two openings at the first end and a corresponding number of mating elements at the second end. As a result, the tensile forces acting on the joint when the belt is operating are distributed over several positive-locking connections. This can be advantageous, in particular in the case of relatively wide grinding, sanding and polishing belts.

In a preferred embodiment of a material processing belt, at least one opening is in the form of a punched hole and at least one mating element has a head-shaped configuration. This permits particularly easy and rapid separation and rejoining and offers high load-bearing capacity while in

operation. By a head-shaped formation is meant here in particular a one-piece structure consisting of a wide section, the "head", and a neck-like narrow section at the end of the belt.

Such a material processing belt can be advantageously further developed by cutting the hole so that it is elongate in configuration and so that its length corresponds approximately to the width of the material processing belt. The second end of the belt, carrying the mating element, can then be inserted in a simple manner into the hole on the first end of the belt in order to join the two ends of the belt together.

In this regard, it is especially preferred to design the material processing belt in such a way that the longitudinal axis of the hole runs parallel to the longitudinal sides of the material processing belt and so that the hole possesses a first and a second section, the dimension of the first section, in the transverse direction of the material processing belt, being larger than the corresponding dimension of the second section. It is further advantageous in this connection if the hole is positioned in such a way that the first section faces towards the first end and the second section faces away from the first end. Finally, it is advantageous for the mating element to be formed by cutting indentations at opposite points on both longitudinal sides at the second end of the belt.

In the case of a hole and a mating element designed in the described manner, the positive-locking connection is closed as follows: First, the second end is introduced into the elongated hole until the indentations at the second end lie approximately in the plane of the first end. Then, the second end is displaced in the hole until the neck section formed by the indentations is situated in the first section of the hole, whose dimension in the transverse direction of the material processing belt is preferably large enough to permit the positive-locking connection to be formed by twisting the second end in the hole.

If the carrier material of the material processing belt exhibits mechanical properties that do not permit a positive-locking connection of adequate stability to be formed by a hole and mating

element, it may be advantageous to reinforce the area around at least one hole and/or around at least one mating element.

This can advantageously be done by applying a hard-setting agent to the area surrounding at least one hole and/or at least one mating element to achieve the reinforcing effect.

In order to make it still easier to separate and close the positive-locking connection, it may also be advantageous for the edges and/or corners of the material processing belt to be rounded. This makes it easier, for example, to introduce the second end into the longitudinal hole and then to twist said second end in the hole.

The presence of two working surfaces on the material processing belt having an endless ring shape, and possessing a first working surface (15) and a second working surface (17) on the side opposite the first working surface (15), whereby in a first state of the material processing belt (1) the first working surface (15) is positioned on the outside, and whereby in a second state of the material processing belt (1) the second working surface (17) is positioned on the outside, and whereby the material processing belt (1) may be reversibly changed from the first state to the second state; permits, for example, the first working surface to have the form of a grinding or sanding surface and the second working surface to have the form of a polishing surface. Such a material processing belt is an extremely practical tool, especially when it is provided with an easily separable positive-locking connection, because many work processes require that first grinding or sanding and then polishing is carried out. Thus, the material processing belt described here is at one and the same time both a grinding/sanding and a polishing belt.

For other applications, it may however also be preferred that the first and second working surfaces are designed as grinding/sanding or as polishing surfaces. Such material processing belts may, for example, be preferred when very large surfaces need to be ground, sanded or polished, i.e. when it can be expected that at least one working surface will be worn out during the processing. When this happens, it is not necessary to obtain and install a second material processing belt, but instead, once the first working surface of a material processing belt has been worn away, the belt can be reversed and then the second working surface can be used.

Similarly, for certain applications, it may also be useful to have material processing belts whose first and second working surfaces are designed as grinding or sanding surfaces having abrasive grit of various sizes or as polishing surfaces having different degrees of fineness.

In a preferred further development of the method according to the invention according to claim 15, the first blank and the second blank are separated from each other, after undergoing the common processing step. If it is intended to round off the edges of punched holes and indentations in the material, for example, in a further processing step following the common processing step, it may be advantageous if both blanks are not yet separated from each other.

If, however, it is not planned to carry out any further processing steps when manufacturing the material processing belts, it may be advantageous if the first blank and the second blank are separated from each other during the common processing step.

If the belting supplied by the metre is made of a relatively tough or hard material, it may be desirable to reduce the punching force required. This can be done by carrying out the punching operations at staggered intervals in order to distribute the necessary punching force.

In preferred embodiments of the methods according to the invention, the belting supplied by the metre consists of one of the following materials: belting made of felt or non-woven material, textile belting with a layer of abrasive grit, a composite material having a layer of glass filaments and a layer of non-woven nylon material permeated with abrasive grit, or a composite material having two abrasive belts which are bonded together, back-to-back.

If the hole or the mating element does not possess sufficient mechanical strength, it may be preferred to employ a further development of the method, wherein an area surrounding at least one hole and/or surrounding at least one mating element is reinforced by applying a hard-setting material. This can be done, for example, by immersing the ends of the belt blanks in an appropriate agent, such as bone glue, phenolic resin or similar.

In the following, the invention is explained on the basis of the Figures, namely:

Fig. 1 which shows three examples of holes punched at the first end of a material processing belt according to the invention;

Fig. 2 which shows three examples of the mating elements at the second end of a material processing belt according to the invention;

Fig. 3 which shows an example of a material processing belt according to the invention, said belt possessing two openings at the first end and correspondingly two mating elements at the second end;

Fig. 4 which shows a cross section through a material processing belt according to the invention, said belt having two working surfaces.

In Fig. 1, drawings a, b and c depict three embodiments of openings 11 at the first end 5 of a material processing belt 1 according to the invention. In each case, the openings 11 are made by punching holes of different configuration. In each case they are elongate in shape, with the longitudinal axis 25 of the hole running parallel to the longitudinal sides 27 of the material processing belt 1, and the length 21 of the hole corresponding to the width 23 of the material processing belt 1.

In addition, the holes in each case possess a first section 29 and second section 31. The dimension 37 of the first section 29 in the transverse direction of the material processing belt 1 is larger than the dimension 35 of the second section 31. The first section 29, which has the larger dimension 37, faces towards the first end 5, and correspondingly the second section 31 faces away from the end 5. In the example illustrated in 1a, the first section has the form of a round hole and the second section has the form of an elongated hole. In the embodiment illustrated in 1b, the hole is T-shaped. Finally, Fig. 1c shows an example of a hole that is substantially trapezoidal in shape. The dimension of the

hole in the transverse direction of the material processing belt 1 decreases with increasing distance from the first end 5.

In Fig. 2, the drawings a, b and c depict three examples of possible head-shaped mating elements 13 for the openings 11 shown in Fig. 1. Equivalent parts are denoted by the same reference numbers in Figures 1 and 2. Each of the mating elements shown in Fig. 2 can be connected to each of the openings 11 shown in Fig. 1. The mating elements 13 provided at the second end 7 of a material processing belt are in each case formed by cutting indentations 39 at opposite points on the longitudinal sides 27 of the material processing belt 1. These indentations 39 create a neck-like narrowing of the belt. The variants depicted differ as regards the shape of the indentations 39, which in 2a are rounded, in 2b square and in 2c trapezoidal in shape.

Given the different shapes of the opening 11 and the mating element 13, and by combining the different variants, it is possible to create positive-locking connections having various degrees of strength.

Fig. 3 shows an example of a material processing belt 1 in which a positive-locking connection is achieved by means of two openings 11 at the first end 5 and correspondingly two head-shaped mating elements 13 at the second end 7.

In the case of relatively wide material processing belts 1 it is possible, in this way, to achieve more uniform distribution of the forces acting on the positive-locking connection when the belt is in operation.

Fig. 4 shows an example of a material processing belt 1 having a first and a second working surface 15 or 17. The material processing belt 1 consists of two textile belts 51 coated with a first and second layer 53 and 55 respectively of abrasive grit. The first working surface 15 is formed by the first layer of abrasive grit 53 and the second working surface 17 is formed by the second layer of abrasive grit

55. The textile belts 51 are joined to each other at the sides opposite the layers of abrasive grit 53 and 55 respectively by means of a layer of adhesive 49.

CLAIMS

1. A material processing belt, the material processing belt comprising:
 - a working surface;
 - a first end;
 - a second end; and
 - means for joining the first end and the second end to form an endless belt, the joining means being a separable positive-locking connection comprising:
 - at least one opening at the first end, the at least one opening being elongate in shape with a length approximately equal to a width of the belt; and
 - at least one mating element at the second end.
2. A material processing belt according to claim 1 wherein at least two openings are provided at the first end and a corresponding number of mating elements are provided at the second end.
3. A material processing belt according to claims 1 or 2 wherein the at least one opening having the form of a punched hole and the at least one mating element having a head-shaped configuration.
4. A material processing belt according to claim 3 wherein a longitudinal axis of the hole runs parallel to longitudinal sides of the belt and the hole comprises:
 - a first section, the first section having a dimension transverse to the longitudinal sides of the belt; and
 - a second section, the second section having a dimension transverse to the longitudinal sides of the belt wherein the dimension of the first section is larger than the dimension of the second section.
5. A material processing belt according to claim 4 wherein the first section faces towards the first end and the second section faces away from the first end.
6. A material processing belt according to any one of claims 1 or 3 to 5 wherein the mating element is formed by indentations provided at the second end, at opposite points on the two longitudinal sides.

7. A material processing belt according to any of claims 1 to 6 wherein an area adjacent to the least one opening and/or adjacent to the least one mating element is reinforced.
8. A material processing belt according to claim 7 wherein the area around the least one opening and/or around at least one mating element is reinforced by applying a hard-setting agent.
9. A material processing belt according to any of claims 1 to 8 wherein corners and/or edges of the belt are rounded.
10. A material processing belt, the material processing belt comprising:
a first end;
a second end;
joining means for joining the first and the second end of the belt to form an endless ring shape, the joining means being a separable positive-locking connection comprising:
at least one opening at the first end, the at least one opening being elongate in shape with a length approximately equal to a width of the belt; and
at least one mating element at the second end;
a first working surface on a first side of the belt; and
a second working surface on a second side of the belt, wherein the first or the second working surface is an outward facing surface of the belt.
11. A material processing belt according to claim 10 wherein the first working surface is a grinding or sanding surface and the second working surface is a polishing surface.
12. A material processing belt according to claim 10 wherein the first and second working surfaces are both grinding or sanding surfaces or polishing surfaces.
13. A material processing belt according to claim 12 wherein the first and second surfaces are grinding or sanding surfaces, the first surface comprising grits of a first

size and the second surface comprising grits of a second size, the second size different from the first size.

14. A material processing belt according to claim 12 wherein the first and second surfaces are polishing surfaces, the first surface having a first degree of fineness and the second surface having a second degree of fineness, the second degree of fineness different from the first degree of fineness.

15. A method of manufacturing a material processing belt as defined in any one of claims 1 to 9 from belting material supplied by the metre, the method comprising the steps of:

manufacturing a first and a second blank of the material processing belt from adjacent parts of the belting material: and

producing in the first blank at least one opening and in the second blank at least one mating element in a common processing step using one or more punching tools.

16. A method according to claim 15 wherein the first blank and the second blank are separated from each other following the common processing step.

17. A method according to claim 15 wherein the first blank and the second blank are separated from each other during the common processing step.

18. A method according to any one of claims 15 to 17 wherein the punching operations are carried out at staggered intervals in order to distribute the required punching force.

19. A method according to any one of claims 15 to 18 wherein the belting supplied by the metre consists of one of the following materials:

- felt or non-woven belting
- textile belting with a layer of abrasive grit
- a composite material comprising a layer of glass filaments and a layer of non-woven nylon material permeated with abrasive grit
- a composite material having two abrasive belts which are bonded together back to

back.

20. A method according to any one of claims 15 to 19 wherein in that an area around the at least one opening and/or an area around the at least one mating element is reinforced by applying a hard-setting agent

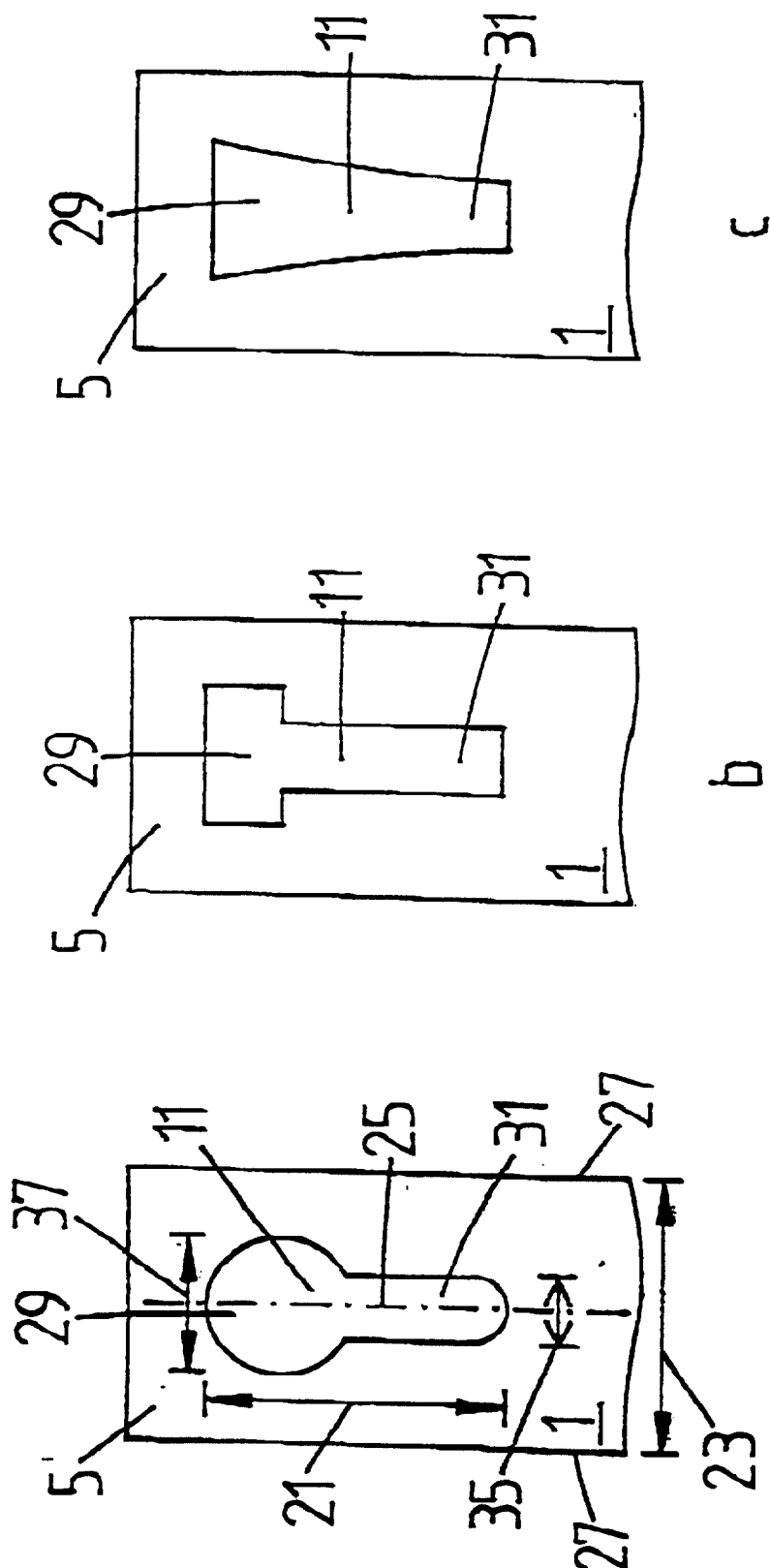


Fig.1

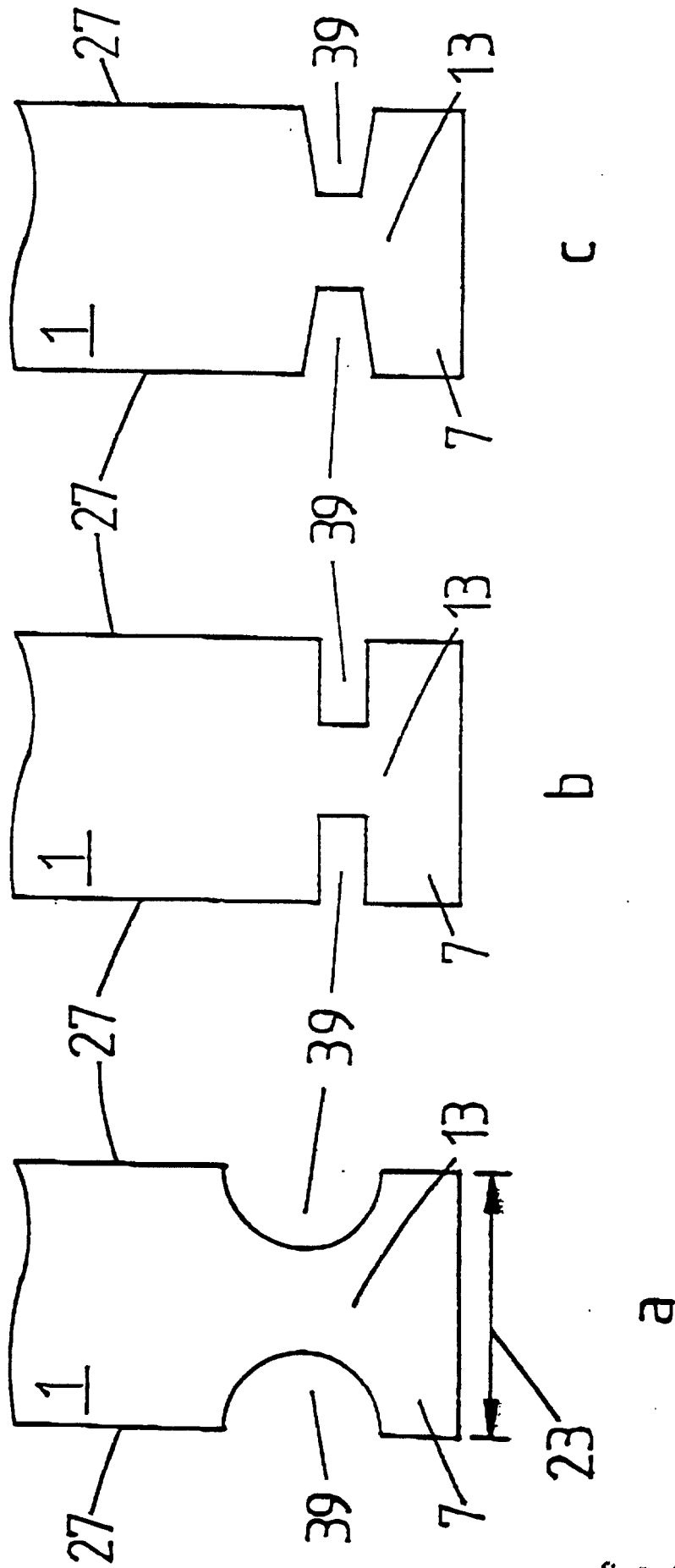


Fig. 2

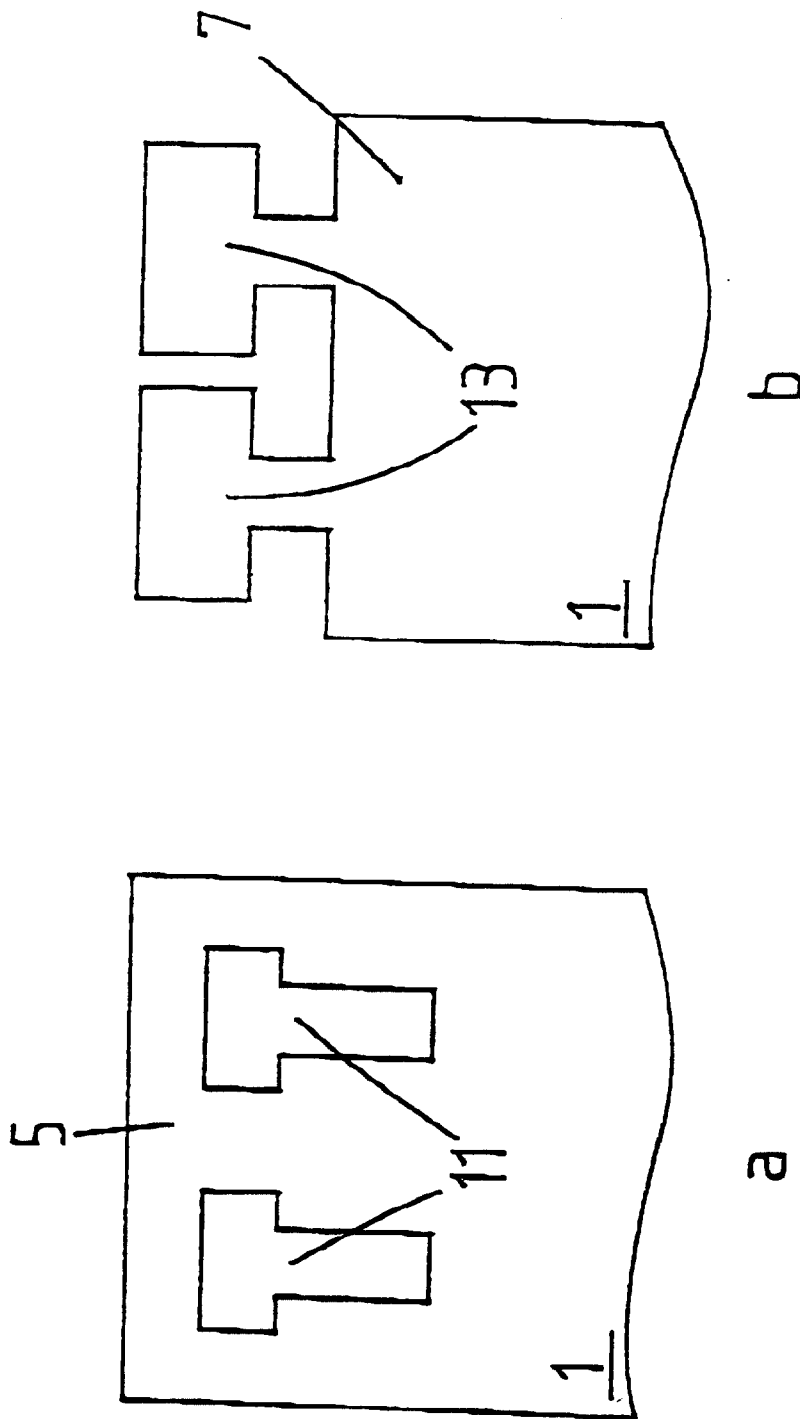


Fig. 3

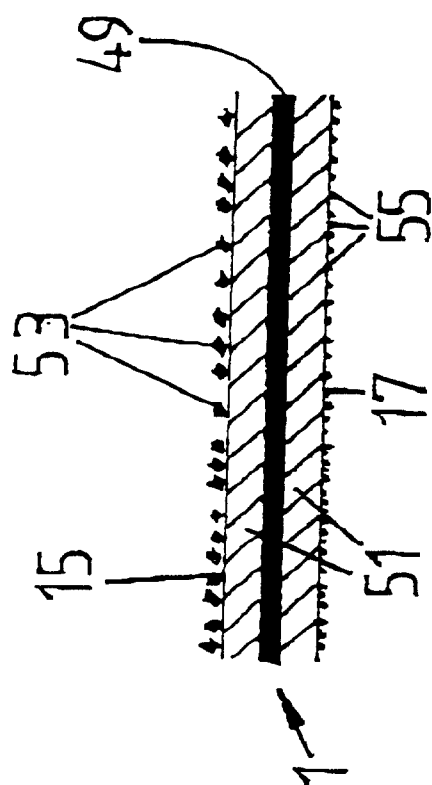


Fig.4

