

(19)



Europäisches Patentamt
European Patent Office
Office européen des brevets



(11)

EP 1 238 149 B1

(12)

EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention
of the grant of the patent:

13.04.2005 Bulletin 2005/15

(21) Application number: **00983595.0**

(22) Date of filing: **21.11.2000**

(51) Int Cl.7: **D21F 3/02**

(86) International application number:
PCT/SE2000/002284

(87) International publication number:
WO 2001/042560 (14.06.2001 Gazette 2001/24)

(54) **SHOE PRESS UNIT AND METHOD FOR EVACUATING OIL FROM A SHOE PRESS UNIT**

SCHUHPRESSE UND VERFAHREN ZUR ÖLABFÜHRUNG IN EINER SCHUHPRESSE

UNITE DE PRESSE A SABOT ET PROCEDE D'EVACUATION D'HUILE D'UNE UNITE DE PRESSE
A SABOT

(84) Designated Contracting States:
**AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU
MC NL PT SE TR**

(30) Priority: **08.12.1999 SE 9904493**

(43) Date of publication of application:
11.09.2002 Bulletin 2002/37

(73) Proprietor: **Metso Paper, Inc.**
00130 Helsinki (FI)

(72) Inventors:
• **GUSTAVSSON, Lars**
S-652 26 Karlstad (SE)

• **ANDERSSON, Sven-Ove**
S-663 02 Hammarö (SE)
• **ALSING, Mattias**
S-654 65 Karlstad (SE)

(74) Representative: **Johansson, Lars E. et al**
Hynell Patenttjänst AB
Patron Carls väg 2
683 40 Hagfors/Uddeholm (SE)

(56) References cited:
DE-A1- 4 402 754 **DE-A1- 19 615 654**
SE-B- 464 922

Note: Within nine months from the publication of the mention of the grant of the European patent, any person may give notice to the European Patent Office of opposition to the European patent granted. Notice of opposition shall be filed in a written reasoned statement. It shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).

Description

TECHNICAL FIELD

[0001] The invention relates to a method for oil evacuation from a shoe press unit, which shoe press unit comprises a beam, a shoe element arranged movably on said beam by means of a pressing unit and having a pressing surface, an oil evacuation arrangement with at least one inlet opening, a number of evacuation ducts and an outlet pipe, and also a flexible belt interacting with said shoe element, oil being supplied during operation to lubricate between said pressing surface and said belt, an oil excess with kinetic energy being pressed out at an upstream edge region of said pressing surface, and an oil excess being evacuated from said shoe press unit by said oil evacuation arrangement, at least part of said oil excess being squirted directly into said inlet opening. The invention also relates to a shoe press unit.

STATE OF THE ART

[0002] A method and a device for a shoe press unit as described above under technical field are previously known from, for example, US 5,935,385. In order to reduce the friction and thus also the heat generation between the belt and the shoe, oil is supplied during operation in order to lubricate and cool between said pressing surface and said belt. The oil is supplied in an excess which is pressed out at an upstream edge region (on the belt entry side) of said pressing surface. The oil excess is then evacuated from said shoe press unit by an oil evacuation arrangement. According to US 5,935,385, the inlet opening to said oil evacuation arrangement is arranged on the beam and at a distance from the shoe element. Therefore, the evacuation arrangement does not move together with the shoe.

[0003] During operation of a shoe press, an oil excess is pressed out from the converging zone which is formed between the edge region of the pressing surface and the belt. If the shoe press then has an oil evacuation arrangement with an inlet opening which is located in a region outside the region of the direct oil squirting which is brought about during operation, the kinetic energy present in the oil cannot always be utilized. If the oil evacuation arrangement is not provided with means which can prevent the oil from flowing in different directions, oil may also accumulate inside the shoe press unit. This in turn leads to the oil which accumulates inside the shoe press being mixed with air, which makes evacuation of the oil more difficult and also means that extra subsequent measures have to be taken in order to separate the air from the oil before re-use. In addition, heat may be given off from the pressed-out excess oil before it is evacuated, which results in an undesirable temperature increase inside the shoe press unit. From the point of view of operation economy also, it is disadvantageous to have an accumulation of oil inside the

shoe press unit because this requires an increased power input.

BRIEF DESCRIPTION OF THE INVENTION

[0004] It is one object of the present invention to eliminate or at least to minimize at least one of the above-mentioned disadvantages, which is achieved by means of a method for evacuating oil evacuation from a shoe press unit according to claim 1.

[0005] The invention affords many advantages. In the first place, the positioning and arrangement of the inlet opening means that a large part of the kinetic energy from the pressed-out oil is useful for evacuation of excess oil. Furthermore, the construction of the oil evacuation arrangement results in efficient evacuation being brought about. Moreover, the invention makes it possible for the temperature in the shoe press unit to be kept at a lower level because a large part of the hot oil is evacuated without having time to give off its heat inside the shoe press unit. Furthermore, the efficient evacuation results in a reduction in the energy consumption for operation of the shoe press unit because no or only an insignificant quantity of excess oil accumulates inside the shoe press unit.

[0006] Further aspects of the method are defined in dependent claims 2 to 8.

[0007] The invention also relates to a shoe press unit according to claim 9.

[0008] Further aspects of the shoe press unit are defined in dependent claims 10 to 20.

DESCRIPTION OF THE FIGURES

[0009] The invention will be described in greater detail below with reference to the appended drawings, in which:

- Fig. 1 shows a preferred embodiment of the invention in cross section,
- Fig. 2 shows a preferred embodiment of the invention partly in cross section, installed in a closed shoe press unit,
- Fig. 3 shows a perspective view of a preferred component according to the invention, and
- Fig. 4 shows in cross section an alternative embodiment of an evacuation duct according to the invention.

DETAILED DESCRIPTION

[0010] Fig. 1 shows in cross section the principles of a shoe press unit according to the invention. According to principles known per se, the shoe press unit comprises a support beam 1, in which a recess is arranged for a pressing unit 3, 5 for a shoe element 2. The pressing unit 3, 5 consists in a manner known per se of a hydraulic piston which is arranged in a sealing manner inside a

hydraulic cylinder 5, so that the shoe element 2 can be moved hydraulically to and fro in a direction which is at right angles in relation to the extent of the shoe element 2 in the cross machine direction. A support heel 9 is arranged at one short end of the shoe element 2. An endless, flexible belt/jacket 6 is arranged in a manner known per se so as to interact, by means of its one surface 6A, with a pressing surface 21 of the shoe element 2 and, by means of its other surface 6B, with a counter-roll 10. The endless belt 6 rotates anti-clockwise, as illustrated in the diagram. The heel 9 is therefore arranged at the downstream end of the shoe element 2. Arranged to the left in the diagram of the upstream end of the shoe element is a distribution chamber 7 which in a known manner supplies the pressing surface 21 with oil via ducts 71. Also shown is an oil evacuation arrangement 4 which comprises an inlet opening 41 arranged in a trough-shaped container (see Fig. 3), a first evacuation duct 48A, a rubber bellows 48C, an upper connection duct 48B and an outlet pipe 49. It is clear that the rubber bellows 48C can offer good flexibility in many directions, not only for vertical movement between the two ducts 48A, 48B but also with regard to angular deviations and also displacements in the transverse direction which may occur under certain operating conditions. The two ducts 48A, 48B are suitably made from a dimensionally stable material, for example metal, so that they cannot be compressed by outer overpressure. Fig. 1 also shows that the shoe press unit is provided with a secondary oil evacuation arrangement 11 which is suitably used as an oil evacuation system when at a standstill. The figure also shows that the shoe press unit is provided with belt guides 12 which are arranged on a support plate 13 and the purpose of which is to make possible installation/removal of the belt/jacket 6.

[0011] Fig. 2 shows in greater detail certain parts of a shoe press unit according to the invention. It can be seen that the shoe element 2 is of symmetrical design, according to the preferred embodiment shown, in each edge region of said pressing surface 21. At the upstream end of the shoe element 2, an edge region Z_1 - Z_2 is marked, which constitutes a region with a convexly curved surface 21 A. As can be seen, the extent L of this edge region 2 1 A is considerably shorter than the concave part 21 of the pressing surface. Within this edge region 21A is a line X at which contact first takes place between the belt 6 and the pressing surface 21 of the shoe element.

[0012] Arranged on the distribution chamber 7 is the lower part of the oil evacuation arrangement 4. The latter comprises a guide plate 42, a container 45, 44, 46, 43A, 43B, an evacuation duct 48 and the inlet opening 41 which is slot-shaped. The container consists of a first longitudinal wall element 45, a plane bottom 44, a second longitudinal wall element 46 and two end walls 43A, 43B. The upstream longitudinal wall 46 is divided into a lower section 46A and an upper section 46B. The lower wall section 46A is arranged at an acute angle in relation

to the bottom 44 and a plane P which contains the plane bottom 44. According to the preferred embodiment, the angle χ is approximately 60-70°. The upper section 46B is arranged at a smaller acute angle in relation to said plane P. In this way, the upper section 46B is imparted an inclination which differs only by a few degrees from the tangent of the belt 6 in the region of said upper section 46B. The upper section therefore converges slightly towards the inner surface of the belt. The end 41B of the upper section forms the second delimiting surface of the inlet opening 41. It is advantageous if this second delimiting surface 41B is positioned close to, or in certain cases even in contact with, the inner surface of the belt 6, so that as small a gap as possible is formed between them. The downstream wall element 45 is also arranged at an acute angle in relation to said plane P. According to the preferred embodiment, it forms an angle β which is essentially the same as the angle χ of the other wall element 46A. End walls 43A, 43B are arranged at either short end of the container. The first delimiting surface 41A of the inlet opening 41 is formed by the upper edge of the downstream longitudinal wall element 45. All the components forming part of the container are made of thin sheet metal. In the preferred case, the sheet is 2 mm thick. Extending at right angles from said first delimiting surface 41 A in the direction of and up to the shoe element 2 is a guide plate 42. The guide plate 42 is also made from thin sheet metal and it and the container are suitably made from one and the same piece of sheet metal which is suitably first stamped out and then bent into the desired final shape, after which the end walls 43A, 43B are connected in a sealing manner, suitably by means of welding, to the parts which have been bent up to form the container. Arranged in the bottom of the container is a circular hole 44A, in which an evacuation pipe 48A is arranged, suitably welded, in a sealing manner. The container is fixed by means of screw connections 50 to the distribution chamber 7 which is in turn connected (usually screwed) to one longitudinal side wall 23 of the shoe element. The evacuation arrangement 4 is therefore firmly anchored on the shoe element 2, so that these are movable as a unit. For the purpose of enabling movement of the shoe element and the evacuation arrangement 4, there is in the support beam 1 a recess 1 A, inside which the evacuation pipe 48A can move freely upwards and downwards.

[0013] As already mentioned, the evacuation arrangement 4 is positioned with its second delimiting surface 41B of the inlet opening 41 relatively close to the surface of the belt, so that the distance S between them during operation is sufficiently small to prevent any significant quantity of oil escaping between the inlet opening 41 and the belt 6. The distance S should preferably not be permitted to exceed 10 mm. The inlet opening 41 should moreover be positioned in such a manner that the quantity of excess oil which is pressed out can squirt directly into the inlet opening 41. According to the preferred embodiment, this is brought about by virtue of the

fact that the tangent Tx of the convexly curved surface at the contact line X between the belt 6 and the shoe element 2 extends between the first delimiting surface 41A and the second delimiting surface 41B. In this case, the geometries between said edge region 21 A and the inlet opening should be arranged so that the tangent Tx (which can be considered to represent a kind of median vector for the oil excess which normally squirts out in a divergent manner) of said contact line X deviates by a maximum of 15° from at least one of the imaginary straight lines Y1 and Y2 which extend between said contact line X and the first delimiting surface 41 A and, respectively, the second delimiting surface 41B of the inlet opening 41. Furthermore, the inlet opening 41 should be positioned close to the upstream edge region 21A, suitably between 10-150 mm, but more preferably at a maximum of 100 mm, from the edge region 21A.

[0014] The device according to Figs 1 and 2 functions in the following manner. When the machine is started up for operation, the inner surface of the belt is provided with an oil film in order to lubricate between the belt 6 and the pressing surface 21 of the shoe element 2 but also in order to cool the shoe press unit. Oil supply usually takes place in a number of different positions, inter alia through the distribution chamber 7 which lubricates in the central zone of said pressing surface 21 (see Fig. 1) and also usually at least somewhere else directly on the inner surface of the belt. In other respects, the shoe press unit is operated in a manner known per se, the shoe element 2 exerting, by means of the pressing unit 3, 5, a pressure against the counter-roll 10 so that a fibre web lying in between is subjected to the desired treatment, for example dewatering. In this connection, the oil excess which accompanies the belt 6 to the upstream end of the shoe element will be pressed out of the converging zone formed between the inner surface 6A of the belt and the upstream edge region 21 A of the shoe element. The excess oil O is in this way imparted kinetic energy and will squirt backwards, counter to the direction of movement of the belt, into the inlet opening 41 to be collected inside the container 43A, 43B, 44, 45, 46. By virtue of a slight overpressure inside the shoe press unit (when a closed shoe press unit is used), the oil collected in the container will be pressed out through the first part 48A of the evacuation duct, on through the rubber bellows 48C and then, via the connection pipe 48B, into the outlet pipe 49, to arrive finally in a collecting vessel (not shown). In certain applications, the outlet pipe 49 is connected to an underpressure in order to ensure adequate oil evacuation. It is usual to try to operate a closed shoe press unit with an inner overpressure of less than 50 mbar.

[0015] A certain quantity of oil will not be removed but will instead follow the surface in the edge region 21A of the shoe element down towards the end wall 23 of the shoe element. By virtue of the guide plate 42, however, which bears against the end wall 23 of the shoe element, this quantity of oil will also be guided towards the inlet

opening 41. In the embodiment shown in Fig. 1, gravity assists in this connection in bringing about this extra oil inflow to the container. It should be pointed out, however, that this is not a necessity because a certain underpressure can be brought about in the region adjacent to the inlet opening 41 so that this inflow of excess oil can take place even without the influence of gravity. The fact that the evacuation arrangement is arranged with the evacuation pipe 48A vertical does not therefore constitute a limitation of the invention shown.

[0016] Fig. 3 shows in perspective the abovementioned container 43A, 43B, 44, 45, 46 in the form of a unit with a guide plate 42 and an evacuation pipe 48A. It can also be seen that the guide plate 42 is provided with a number of holes 47 for arranging fixing screws 50. By virtue of the fact that the evacuation arrangement in the preferred case is sectioned, in such a manner that a number of containers of limited length are arranged next to one another on the shoe element 2, the inlet opening 41, which preferably extends along the entire width of the container, of each container will always be optimally positioned in relation to the squirting oil irrespective of deflection of the beam 1. According to the preferred embodiment, the length of each container is approximately 1 metre. The length of a container should suitably not be less than 500 mm or more than 1500 mm, so that optimum evacuation can be achieved. For the same reason, the diameter of the evacuation duct/pipe should not be too small; suitably it is approximately 60 mm. The diameter should preferably not be less than 10 mm and should suitably not exceed 50 mm.

[0017] Fig. 4 shows a first alternative embodiment according to the invention, the evacuation duct 48 being provided with two telescopically arranged parts 48A, 48B. The first part 48A of the evacuation duct is in this connection provided with a relatively large diameter D1, while the second part 48B of the evacuation duct is provided with a considerably smaller diameter D2. The two duct parts are arranged so that, in the rest position, they overlap over a considerable length 1 which is preferably at least the same as the diameter of the first duct part 48A. Arranged in the annular gap 60 formed between the overlapping pipe parts is a seal 61 which, according to the preferred embodiment, is fixed to the end of the second duct part 48B. Movement is therefore possible between the seal 61 and the first duct part 48A, a sliding movement taking place in the cylindrical contact region 62 between the seal 61 and the inner surface of the first duct part 48A.

[0018] According to another alternative embodiment according to the invention, the evacuation pipe 48A which is fixed to the container is sufficiently long to be capable of entering the outlet pipe 49 through its opening 49A. In this case, a seal, for example one or more O-rings, is arranged directly in the opening 49A on the outlet pipe 49, these seals interacting directly with the outer surface of the evacuation pipe 48A. By virtue of the fact that the outlet pipe 49 can be made with a large

diameter, suitably between 100-200 mm, the end of the evacuation pipe 48A can move freely inside the outlet pipe 49 because the maximum stroke length of a shoe element 2 does not normally ever exceed 50 mm, usually lying between 20-35 mm.

[0019] In many applications, it is advantageous if the sealing connection between the first duct part 48A and the adjacent part of the oil evacuation arrangement is flexible in more than one direction so that the connection is flexible in the lateral direction also, because the shoe element can during operation be caused (by lateral forces and/or heat) to make certain lateral movements, which movements the first duct part 48A has to be capable of following without the risk of complications.

[0020] The invention is not limited by what has been disclosed above but can be varied within the scope of the patent claims below. Therefore, it is clear, for example, that the evacuation arrangement can be made of many other materials than thin sheet metal, for example a polymer material. It is also clear that the inlet opening 41 of the evacuation arrangement can be divided (for example for reasons of strength) so that a number of to a greater or lesser extent elongate openings next to one another is formed. It is also clear that the component parts of the evacuation arrangement do not necessarily have to be made of/from one and the same material, but can be made from a number of different components/materials, which can be arranged with/connected to one another in many alternative ways which will be self-evident to the person skilled in the art. It is also clear that it is only for the purpose of exemplification that the evacuation arrangement is arranged on a distribution chamber. The evacuation arrangement can of course be arranged directly on the shoe element 2 for example, along its side surface 23 for example. Furthermore, it is clear that the container can consist of a device of very different design from that shown above, for example with a considerably smaller "container space" and/or with a cross-sectional shape which is entirely different (for example oval), according to the space available in the shoe press for which it is intended to be used. It is also clear that devices other than a rubber bellows 48C can be provided for making the flexible, sealing connection between two part pipes in the evacuation arrangement, for example a fibre-reinforced flexible and impermeable polymer material other than rubber, or a liquidtight fabric material.

Claims

1. Method for evacuating oil from a shoe press unit, which shoe press unit comprises a beam (1) and a shoe element (2) movably arranged on said beam (1) by means of a pressing unit (3, 5), said shoe element (2) having a pressing surface (21) with an upstream edge region (21 A), said upstream edge region (21 A) comprising a convexly curved surface,

the shoe press unit further comprising a rotatable flexible endless belt (6) interacting with said pressing surface (21) of said shoe element (2) and arranged in such a way that the upstream contact line (X) of said belt (6) with said shoe element (2) is located on said convexly curved surface, lubricating oil being supplied during operation between said pressing surface (21) and said belt (6), wherein an oil excess pressed out with kinetic energy at said upstream edge region (21 A) is evacuated from said shoe press unit by means of an oil evacuation arrangement (4) comprising an inlet opening (41) and an evacuation duct (48), **characterized in that** said inlet opening (41) is formed by a container firmly connected to said shoe element (2) on the upstream side thereof, to which container said evacuation duct (48) is connected, that said inlet opening (41) is arranged so that the tangent (T_x) to said convexly curved surface at said contact line (X) extends into said inlet opening (41), whereby a large part of said oil excess is squirted directly into said inlet opening (41), that said evacuation duct (48) is connected to an outlet pipe (49) firmly connected to said beam (1), and that at least a part of said evacuation duct (48) is movably arranged with respect to said outlet pipe (49).

2. Method according to claim 1, **characterized in that** said evacuation duct (48) comprises a first tubular part (48A) which is firmly connected to said container, said first tubular part (48A) being preferably essentially rigid.

3. Method according to claim 2, **characterized in that** said first tubular part (48A) is arranged movable inside a through-hole (1A) in said beam (1) and is of sufficient length to project on the other side of said through-hole (1A).

4. Method according to claim 3, **characterized in that** said first tubular part (48A) is arranged movable with respect to said outlet pipe (49) while being connected thereto in a sealing manner.

5. Method according to claim 4, **characterized in that** the connection between said first tubular part (48A) and said outlet pipe (49) comprises a sealing means in form of a flexible tubular means (48C), such as a rubber bellow.

6. Method according to claim 5, **characterized in that** said flexible tubular means (48C) is connected at one end to said first tubular part (48A) and at the other end to a second tubular part (48B) of said evacuation duct (48) which is firmly connected to said outlet pipe (49).

7. Method according to claim 1, **characterized in that**

said shoe press unit is a closed shoe press unit which is operated with an inner overpressure lying between 10 and 500 mbar, preferably below 200 mbar and more preferably below 50 mbar.

8. Method according to claim 7, **characterized in that** said outlet pipe (49) is connected to an underpressure acting from outside the shoe press unit in order to ease the evacuation of said oil excess.

9. Shoe press unit comprising:

- a beam (1),
- a shoe element (2) movably arranged on said beam (1) by means of a pressing unit (3, 5), said shoe element (2) having a pressing surface (21) with an upstream edge region (21A), said upstream edge region (21A) comprising a convexly curved surface,
- a rotatable flexible endless belt (6) interacting with said pressing surface (21) of said shoe element (2) and arranged in such a way that the upstream contact line (X) of said belt (6) with said shoe element (2) is located on said convexly curved surface,
- means (7) for supplying lubricating oil during operation between said pressing surface (21) and said belt (6), and
- an oil evacuation arrangement (4) for evacuating an oil excess pressed out during operation at said upstream edge region (21A), said oil evacuation arrangement (4) comprising an inlet opening (41) and an evacuation duct (48), **characterized in that** said oil evacuation arrangement (4) comprises at least one container forming said inlet opening (41), which container is firmly connected to said shoe element (2) on the upstream side thereof, and to which container said evacuation duct (48) is connected, that said inlet opening (41) is arranged so that the tangent (T_x) to said convexly curved surface at said contact line (X) extends into said inlet opening (41), whereby a large part of said oil excess is squirted directly into said inlet opening (41), that said evacuation duct (48) is connected to an outlet pipe (49) firmly connected to said beam (1), and that at least a part of said evacuation duct (48) is movably arranged with respect to said outlet pipe (49).

10. Shoe press unit according to claim 9, **characterized in that** said evacuation duct (48) comprises a movable part (48A) firmly connected to said container in a sealing manner, said container preferably comprising side wall elements (43A, 43B, 45, 46) and a bottom wall element (44).

11. Shoe press unit according to claim 10, **character-**

ized in that said movable part (48A) interacts with a sealing means (48C, 61) in such a way that said movable part (48A) is connected to said outlet pipe (49) in an essentially sealed manner.

12. Shoe press unit according to claim 11, **characterized in that** said sealing means comprises a flexible tubular device (48C), preferably a rubber bellow, said flexible tubular device (48C) being connected at one end sealingly around said movable part (48A) and at the other end to a second part (48B) of said evacuation duct (48), which second part (48B) is firmly connected to said outlet pipe (49).

13. Shoe press unit according to claim 12, **characterized in that** said second part (48B) consists of a tubular connection piece, preferably a metal pipe, which connection piece is connected to said outlet pipe (49) in a sealing manner.

14. Shoe press unit according to claim 11, **characterized in that** said sealing means is arranged at an inlet opening (49A) of said outlet pipe (49), said sealing means interacting directly with the outer surface of said movable part (48A) at one end thereof, said sealing means preferably comprising at least one O-ring.

15. Shoe press unit according to claim 11, **characterized in that** said movable part (48A) is tubular, that said evacuation duct (48) comprises a second tubular part (48B), said movable tubular part (48A) and said second tubular part (48B) being telescopically arranged with respect to one another, and that said sealing means (61) is arranged in an annular gap formed between the overlapping parts of said movable tubular part (48A) and said second tubular part (48B).

16. Shoe press unit according to claim 10, **characterized in that** said inlet opening (41) is delimited by first and second delimiting surfaces (41A, 41B) extending in a cross-machine direction, said first delimiting surface (41A) being located relatively farther from the belt (6) and said second delimiting surface (41B) being located relatively closer to the belt (6), and that a shielding means (42) is provided in the region between the shoe element (2) and said first delimiting surface (41A), said shielding means (42) extending preferably substantially rectilinearly.

17. Shoe press unit according to claim 16, **characterized in that** the shortest distance (S) between said second delimiting surface (41B) and the inner surface (6A) of said belt (6) is between 0 and 10 mm and is preferably less than 5 mm.

18. Shoe press unit according to claim 10, **character-**

ized in that the cross-machine direction extent of said container is between 500 and 1500 mm.

19. Shoe press unit according to claim 10, **characterized in that** said movable part (48A) has a diameter of between 30 and 100 mm, preferably of between 50 and 70 mm.

20. Shoe press unit according to claim 18, **characterized in that** said oil evacuation arrangement (4) comprises at least two containers arranged next to each other inside said press shoe unit.

Patentansprüche

1. Verfahren zum Abführen von Öl aus einer Schuhpresseneinheit, wobei die Schuhpresseneinheit einen Balken (1) und ein Schuhelement (2) aufweist, das beweglich an dem Balken (1) mittels einer Presseinheit (3, 5) angeordnet ist, wobei das Schuhelement (2) eine Pressfläche (21) mit einem stromaufwärtigen Randbereich (21A) hat, wobei der stromaufwärtige Randbereich (21A) eine konvex gekrümmte Fläche aufweist, wobei die Schuhpresseneinheit des weiteren einen drehbaren flexiblen endlosen Riemen (6) aufweist, der mit der Pressfläche (21) des Schuhelements (2) zusammenwirkt und derart angeordnet ist, dass sich die stromaufwärtige Kontaktlinie (X) des Riemens (6) mit dem Schuhelement (2) an der konvex gekrümmten Fläche befindet, wobei Schmieröl während des Betriebs zwischen der Pressfläche (21) und dem Riemen (6) geliefert wird, wobei ein Ölüberschuss, der mit kinetischer Energie aus dem stromaufwärtigen Randbereich (21A) herausgepresst wird, aus der Schuhpresseneinheit mittels eines Ölabföhraufbaus (4) abgeführt wird, der eine Einlassöffnung (41) und einen Abföhrrkanal (48) aufweist,

dadurch gekennzeichnet, dass

die Einlassöffnung (41) durch einen Behälter ausgebildet ist, der mit dem Schuhelement (2) an seiner stromaufwärtigen Seite fest verbunden ist, wobei mit dem Behälter der Abföhrrkanal (48) verbunden ist,

die Einlassöffnung (41) so angeordnet ist, dass sich die Tangente (T_x) gegenüber der konvex gekrümmten Fläche an der Kontaktlinie (X) in die Einlassöffnung (41) erstreckt, wodurch ein großer Teil des Ölüberschusses direkt in die Einlassöffnung (41) gespritzt wird,

der Abföhrrkanal (48) mit einem Einlassrohr (49) verbunden ist, das fest mit dem Balken (1) verbunden ist, und

zumindest ein Teil des Abföhrrkanals (48) in Bezug auf das Auslassrohr (49) beweglich angeordnet ist.

2. Verfahren gemäß Anspruch 1, **dadurch gekennzeichnet, dass** der Abföhrrkanal (48) einen ersten röhrenartigen Teil (48A) aufweist, der mit dem Behälter fest verbunden ist, wobei der erste röhrenartige Teil (48A) vorzugsweise im Wesentlichen steif ist.

3. Verfahren gemäß Anspruch 2, **dadurch gekennzeichnet, dass** der erste röhrenartige Teil (48A) beweglich innerhalb eines Durchganglochs (1A) in dem Balken (1) angeordnet ist und eine ausreichende Länge hat, um an der anderen Seite des Durchganglochs (1A) vorzuzugan.

4. Verfahren gemäß Anspruch 3, **dadurch gekennzeichnet, dass** der erste röhrenartige Teil (48A) in Bezug auf das Auslassrohr (49) beweglich angeordnet ist, während er mit diesem in einer abdichtenden Weise verbunden ist.

5. Verfahren gemäß Anspruch 4, **dadurch gekennzeichnet, dass** die Verbindung zwischen dem ersten röhrenartigen Teil (48A) und dem Auslassrohr (49) eine Abdichteinrichtung in der Form einer flexiblen röhrenartigen Einrichtung (48C), wie bspw. einen Gummibalg, aufweist.

6. Verfahren gemäß Anspruch 5, **dadurch gekennzeichnet, dass** die flexible röhrenartige Einrichtung (48C) an einem Ende mit dem ersten röhrenartigen Teil (48A) und an dem anderen Ende mit einem zweiten röhrenartigen Teil (48B) des Abföhrrkanals (48) verbunden ist, der mit dem Auslassrohr (49) fest verbunden ist.

7. Verfahren gemäß Anspruch 1, **dadurch gekennzeichnet, dass** die Schuhpresseneinheit eine geschlossene Schuhpresseneinheit ist, die mit einem Innenüberdruck arbeitet, der zwischen 10 und 500 mbar liegt, vorzugsweise unterhalb 200 mbar, wobei unterhalb 50 mbar noch eher vorzuziehen ist.

8. Verfahren gemäß Anspruch 7, **dadurch gekennzeichnet, dass** das Auslassrohr (49) mit einem Unterdruck verbunden ist, der von der Außenseite der Schuhpresseneinheit wirkt, um das Abführen des Ölüberschusses zu erleichtern.

9. Schuhpresseneinheit mit:

- einem Balken (1),
- einem Schuhelement (2), das beweglich an dem Balken (1) mittels einer Presseinheit (3, 5)

angeordnet ist, wobei das Schuhelement (2) eine Pressfläche (21) mit einem stromaufwärtigen Randbereich (21A) hat, wobei der stromaufwärtige Randbereich (21A) eine konvex gekrümmte Fläche aufweist,

- einem drehbaren flexiblen endlosen Riemen (6), der mit der Pressfläche (21) des Schuhelements (2) zusammenwirkt und derart angeordnet ist, dass die stromaufwärtige Kontaktlinie (X) des Riemens (6) mit dem Schuhelement (2) sich an der konvex gekrümmten Fläche befindet,
- einer Einrichtung (7) zum Liefern von Schmieröl während des Betriebs zwischen der Pressfläche (21) und dem Riemen (6), und
- einem Ölabföhraufbau (4) zum Abführen eines Ölüberschusses, der während des Betriebs an dem stromaufwärtigen Randbereich (21A) herausgepresst worden ist, wobei der Ölabföhraufbau (4) eine Einlassöffnung (41) und einen Abführkanal (48) aufweist,

dadurch gekennzeichnet, dass

der Ölabföhraufbau (4) zumindest einen Behälter aufweist, der die Einlassöffnung (41) ausbildet, wobei der Behälter mit dem Schuhelement (2) an seiner stromaufwärtigen Seite fest verbunden ist, und wobei mit dem Behälter der Abführkanal (48) verbunden ist,

die Einlassöffnung (41) so angeordnet ist, dass die Tangente (T_x) gegenüber der konvex gekrümmten Fläche an der Kontaktlinie (X) sich in die Einlassöffnung (41) erstreckt, wodurch ein großer Teil des Ölüberschusses direkt in die Einlassöffnung (41) gespritzt wird,

der Abführkanal (48) mit einem Auslassrohr (49) verbunden ist, das mit dem Balken (1) fest verbunden ist, und

zumindest ein Teil des Abführkanals (48) in Bezug auf das Auslassrohr (49) beweglich angeordnet ist.

10. Schuhpresseneinheit gemäß Anspruch 9,

dadurch gekennzeichnet, dass

der Abführkanal (48) ein bewegliches Teil (48A) aufweist, das mit dem Behälter in einer abdichtenden Weise fest verbunden ist, wobei der Behälter vorzugsweise Seitenwandelemente (43A, 43B, 45, 46) und ein Bodenwandelement (44) aufweist.

11. Schuhpresseneinheit gemäß Anspruch 10,

dadurch gekennzeichnet, dass

der bewegliche Teil (48A) mit einer Abdichteinrichtung (48C, 61) derart zusammenwirkt, dass der bewegliche Teil (48A) mit dem Auslassrohr (49) in einer im Wesentlichen abgedichteten Weise verbunden ist.

12. Schuhpresseneinheit gemäß Anspruch 11,

dadurch gekennzeichnet, dass

die Abdichteinrichtung eine flexible röhrenartige Vorrichtung (48C), vorzugsweise einen Gummibalg, aufweist, wobei die flexible röhrenartige Vorrichtung (48C) an einem Ende in abdichtender Weise um den beweglichen Teil (48A) herum und an dem anderen Ende mit einem zweiten Teil (48B) des Abführkanals (48) verbunden ist, wobei der zweite Teil (48B) mit dem Auslassrohr (49) fest verbunden ist.

13. Schuhpresseneinheit gemäß Anspruch 12,

dadurch gekennzeichnet, dass

der zweite Teil (48B) aus einem röhrenartigen Verbindungsstück, vorzugsweise ein Metallrohr, besteht, wobei das Verbindungsstück mit dem Auslassrohr (49) in einer abdichtenden Weise verbunden ist.

14. Schuhpresseneinheit gemäß Anspruch 11,

dadurch gekennzeichnet, dass

die Abdichteinrichtung an einer Einlassöffnung (49A) des Auslassrohrs (49) angeordnet ist, wobei die Abdichteinrichtung direkt mit der Außenfläche des beweglichen Teils (48A) an einem Ende von diesem zusammenwirkt, wobei die Abdichteinrichtung vorzugsweise zumindest einen O-Ring aufweist.

15. Schuhpresseneinheit gemäß Anspruch 11,

dadurch gekennzeichnet, dass

der bewegliche Teil (48A) röhrenartig ist,

der Abführkanal (48) einen zweiten röhrenartigen Teil (48B) aufweist, wobei der bewegliche röhrenartige Teil (48A) und der zweite röhrenartige Teil (48B) teleskopartig in Bezug aufeinander angeordnet sind, und

die Abdichteinrichtung (61) in einem ringartigen Zwischenraum angeordnet ist, der zwischen den überdeckenden Teilen des beweglichen röhrenartigen Teils (48A) und des zweiten röhrenartigen Teils (48B) ausgebildet ist.

16. Schuhpresseneinheit gemäß Anspruch 10,

dadurch gekennzeichnet, dass

die Einlassöffnung (41) durch eine erste und eine zweite Begrenzungsfläche (41A, 41B) begrenzt ist, die sich in einer Maschinenquerrichtung erstrecken, wobei die erste Begrenzungsfläche (41A) relativ weiter weg von dem Riemen (6) angeordnet ist und die zweite Begrenzungsfläche (41B) relativ näher zu dem Riemen (6) hin angeordnet ist, und

eine Abschrimeinrichtung (42) in dem Bereich zwischen dem Schuhelement (2) und der ersten Begrenzungsfläche (41A) vorgesehen ist, wobei sich die Abschrimeinrichtung (42) vorzugsweise im We-

sentlichen geradlinig erstreckt.

17. Schuhpresseneinheit gemäß Anspruch 16,
dadurch gekennzeichnet, dass
der kürzeste Abstand (S) zwischen der zweiten Begrenzungsfläche (41B) und der Innenfläche (6A) des Riemens (6) zwischen 0 und 10 mm und vorzugsweise geringer als 5 mm ist. 5
18. Schuhpresseneinheit gemäß Anspruch 10,
dadurch gekennzeichnet, dass
die Erstreckung des Behälters in der Maschinenquerrichtung zwischen 500 und 1500 mm beträgt. 10
19. Schuhpresseneinheit gemäß Anspruch 10,
dadurch gekennzeichnet, dass
der bewegliche Teil (48A) einen Durchmesser von zwischen 30 und 100 mm, vorzugsweise von zwischen 50 und 70 mm, hat. 15
20. Schuhpresseneinheit gemäß Anspruch 18,
dadurch gekennzeichnet, dass
der Ölabföhr Aufbau (4) zumindest zwei Behälter aufweist, die nebeneinander innerhalb der Schuhpresseneinheit angeordnet sind. 20
25

Revendications

1. Procédé pour évacuer de l'huile hors d'une unité de presse à sabot, ladite unité de presse à sabot comprenant : une poutre (1) et un élément de sabot (2) agencé d'une façon mobile sur ladite poutre (1) au moyen d'une unité de pressage (3, 5), ledit élément de sabot (2) ayant une surface de pressage (21) comportant une région de bord amont (21A), ladite région de bord amont (21A) comprenant une surface courbe convexe, l'unité de presse à sabot comprenant en outre une courroie sans fin rotative flexible (6) interagissant avec ladite surface de pressage (21) dudit élément de sabot (2) et agencée d'une manière telle que la ligne de contact amont (X) de ladite courroie (6) avec ledit élément de sabot (2) soit située sur ladite surface courbe convexe, de l'huile de lubrification étant fournie pendant l'opération entre ladite surface de pressage (21) et ladite courroie (6), dans lequel un excédent d'huile éjecté avec une énergie cinétique à ladite région de bord amont (21A) est évacué hors de ladite unité de presse à sabot au moyen d'un système d'évacuation d'huile (4) comprenant une ouverture d'entrée (41) et un conduit d'évacuation (48), **caractérisé en ce que** ladite ouverture d'entrée (41) est formée par un récipient fermement connecté audit élément de sabot (2) sur le côté amont de celui-ci, récipient auquel ledit conduit d'évacuation (48) est connecté, **en ce que** ladite ouverture d'entrée (41) est agencée de telle sorte que la tangente 30
35
40
45
50
55

(T_x) à ladite surface courbe convexe à ladite ligne de contact (X) s'étende dans ladite ouverture d'entrée (41), une grande partie dudit excédent d'huile étant projetée directement dans ladite ouverture d'entrée (41), **en ce que** ledit conduit d'évacuation (48) est connecté à un tuyau de sortie (49) fermement connecté à ladite poutre (1), et **en ce qu'** au moins une partie dudit conduit d'évacuation (48) est agencée d'une façon mobile par rapport audit tuyau de sortie (49).

2. Procédé selon la revendication 1, **caractérisé en ce que** ledit conduit d'évacuation (48) comprend une première partie tubulaire (48A) fermement connectée audit récipient, ladite première partie tubulaire (48A) étant de préférence essentiellement rigide.
3. Procédé selon la revendication 2, **caractérisé en ce que** ladite première partie tubulaire (48A) est agencée d'une façon mobile à l'intérieur d'un trou traversant (1A) dans ladite poutre (1) et a une longueur suffisante pour être saillante sur l'autre côté dudit trou traversant (1A).
4. Procédé selon la revendication 3, **caractérisé en ce que** ladite première partie tubulaire (48A) est agencée d'une façon mobile par rapport audit tuyau de sortie (49) tout en étant connectée à celui-ci d'une façon étanche.
5. Procédé selon la revendication 4, **caractérisé en ce que** la connexion entre ladite première partie tubulaire (48A) et ledit tuyau de sortie (49) comprend un moyen d'étanchéité se présentant sous la forme d'un moyen tubulaire flexible (48C), par exemple un soufflet en caoutchouc.
6. Procédé selon la revendication 5, **caractérisé en ce que** ledit moyen tubulaire flexible (48C) est connecté par une première extrémité à ladite première partie tubulaire (48A), et par l'autre extrémité à une deuxième partie tubulaire (48B) dudit conduit d'évacuation (48) qui est fermement connectée audit tuyau de sortie (49).
7. Procédé selon la revendication 1, **caractérisé en ce que** ladite unité de presse à sabot est une unité de presse à sabot fermée qui est actionnée avec une surpression intérieure comprise entre 10 et 500 mbars, de préférence inférieure à 200 mbars, et plus préférentiellement inférieure à 50 mbars.
8. Procédé selon la revendication 7, **caractérisé en ce que** ledit tuyau de sortie (49) est connecté à une dépression agissant à partir de l'extérieur de l'unité de presse à sabot en vue de faciliter l'évacuation dudit excédent d'huile.

9. Unité de presse à sabot, comprenant :

- une poutre (1),
- un élément de sabot (2) agencé d'une façon mobile sur ladite poutre (1) au moyen d'une unité de pressage (3, 5), ledit élément de sabot (2) ayant une surface de pressage (21) comportant une région de bord amont (21A), ladite région de bord amont (21A) comprenant une surface courbe convexe,
- une courroie sans fin rotative flexible (6) interagissant avec ladite surface de pressage (21) dudit élément de sabot (2) et agencée d'une manière telle que la ligne de contact amont (X) de ladite courroie (6) avec ledit élément de sabot (2) soit située sur ladite surface courbe convexe,
- un moyen (7) pour fournir de l'huile de lubrification pendant l'opération entre ladite surface de pressage (21) et ladite courroie (6), et
- un système d'évacuation d'huile (4) pour évacuer un excédent d'huile éjecté pendant l'opération à ladite région de bord amont (21A), ledit système d'évacuation d'huile (4) comprenant une ouverture d'entrée (41) et un conduit d'évacuation (48), **caractérisée en ce que** ledit système d'évacuation d'huile (4) comprend au moins un récipient formant ladite ouverture d'entrée (41), ledit récipient étant fermement connecté audit élément de sabot (2) sur le côté amont de celui-ci, récipient auquel ledit conduit d'évacuation (48) est connecté, **en ce que** ladite ouverture d'entrée (41) est agencée de telle sorte que la tangente (T_x) à ladite surface courbe convexe à ladite ligne de contact (X) s'étende dans ladite ouverture d'entrée (41), une grande partie dudit excédent d'huile étant projetée directement dans ladite ouverture d'entrée (41), **en ce que** ledit conduit d'évacuation (48) est connecté à un tuyau de sortie (49) fermement connecté à ladite poutre (1), et **en ce qu'**au moins une partie dudit conduit d'évacuation (48) est agencée d'une façon mobile par rapport audit tuyau de sortie (49).

10. Unité de presse à sabot selon la revendication 9, **caractérisée en ce que** ledit conduit d'évacuation (48) comprend une partie mobile (48A) fermement connectée audit récipient d'une façon étanche, ledit récipient comprenant de préférence des éléments de parois latérales (43A, 43B, 45, 46) et un élément de paroi inférieure (44).

11. Unité de presse à sabot selon la revendication 10, **caractérisée en ce que** ladite partie mobile (48A) interagit avec un moyen d'étanchéité (48C, 61) d'une manière telle que ladite partie mobile (48A) soit connectée audit tuyau de sortie (49) d'une fa-

çon essentiellement étanche.

12. Unité de presse à sabot selon la revendication 11, **caractérisée en ce que** ledit moyen d'étanchéité comprend un dispositif tubulaire flexible (48C), de préférence un soufflet en caoutchouc, ledit dispositif tubulaire flexible (48C) étant connecté par une première extrémité d'une façon étanche autour de ladite partie mobile (48A), et par l'autre extrémité à une deuxième partie (48B) dudit conduit d'évacuation (48), ladite deuxième partie (48B) étant fermement connectée audit tuyau de sortie (49).

13. Unité de presse à sabot selon la revendication 12, **caractérisée en ce que** ladite deuxième partie (48B) est constituée d'une pièce de connexion tubulaire, de préférence un tuyau de métal, ladite pièce de connexion étant connectée audit tuyau de sortie (49) d'une façon étanche.

14. Unité de presse à sabot selon la revendication 11, **caractérisée en ce que** ledit moyen d'étanchéité est agencé à une ouverture d'entrée (49A) dudit tuyau de sortie (49), ledit moyen d'étanchéité interagissant directement avec la surface extérieure de ladite partie mobile (48A) à une première extrémité de celle-ci, lesdits moyens d'étanchéité comprenant de préférence au moins un joint torique.

15. Unité de presse à sabot selon la revendication 11, **caractérisée en ce que** ladite partie mobile (48A) est tubulaire, **en ce que** ledit conduit d'évacuation (48) comprend une deuxième partie tubulaire (48B), ladite partie tubulaire mobile (48A) et ladite deuxième partie tubulaire (48B) étant agencées d'une façon télescopique l'une par rapport à l'autre, et **en ce que** ledit moyen d'étanchéité (61) est agencé dans un espace annulaire formé entre les parties chevauchantes de ladite partie tubulaire mobile (48A) et de ladite deuxième partie tubulaire (48B).

16. Unité de presse à sabot selon la revendication 10, **caractérisée en ce que** ladite ouverture d'entrée (41) est délimitée par des première et deuxième surfaces de délimitation (41A, 41B) s'étendant dans une direction transversale de la machine, ladite première surface de délimitation (41A) étant située relativement plus loin de la courroie (6), et ladite deuxième surface de délimitation (41B) étant située relativement plus près de la courroie (6), et **en ce qu'**un moyen d'écran (42) est prévu dans la région entre l'élément de sabot (2) et ladite première surface de délimitation (41A), ledit moyen d'écran (42) s'étendant de préférence d'une façon essentiellement rectiligne.

17. Unité de presse à sabot selon la revendication 16, **caractérisée en ce que** la distance la plus courte

(S) entre ladite deuxième surface de délimitation (41B) et la surface intérieure (6A) de ladite courroie (6) est comprise entre 0 et 10 mm, et est de préférence inférieure à 5 mm.

5

18. Unité de presse à sabot selon la revendication 10, **caractérisée en ce que** l'étendue dudit récipient dans la direction transversale de la machine est comprise entre 500 et 1500 mm.

10

19. Unité de presse à sabot selon la revendication 10, **caractérisée en ce que** le diamètre de ladite partie mobile (48A) est compris entre 30 et 100 mm, de préférence entre 50 et 70 mm.

15

20. Unité de presse à sabot selon la revendication 18, **caractérisée en ce que** ledit système d'évacuation d'huile (4) comprend au moins deux récipients agencés l'un à côté de l'autre à l'intérieur de ladite unité de presse à sabot.

20

25

30

35

40

45

50

55

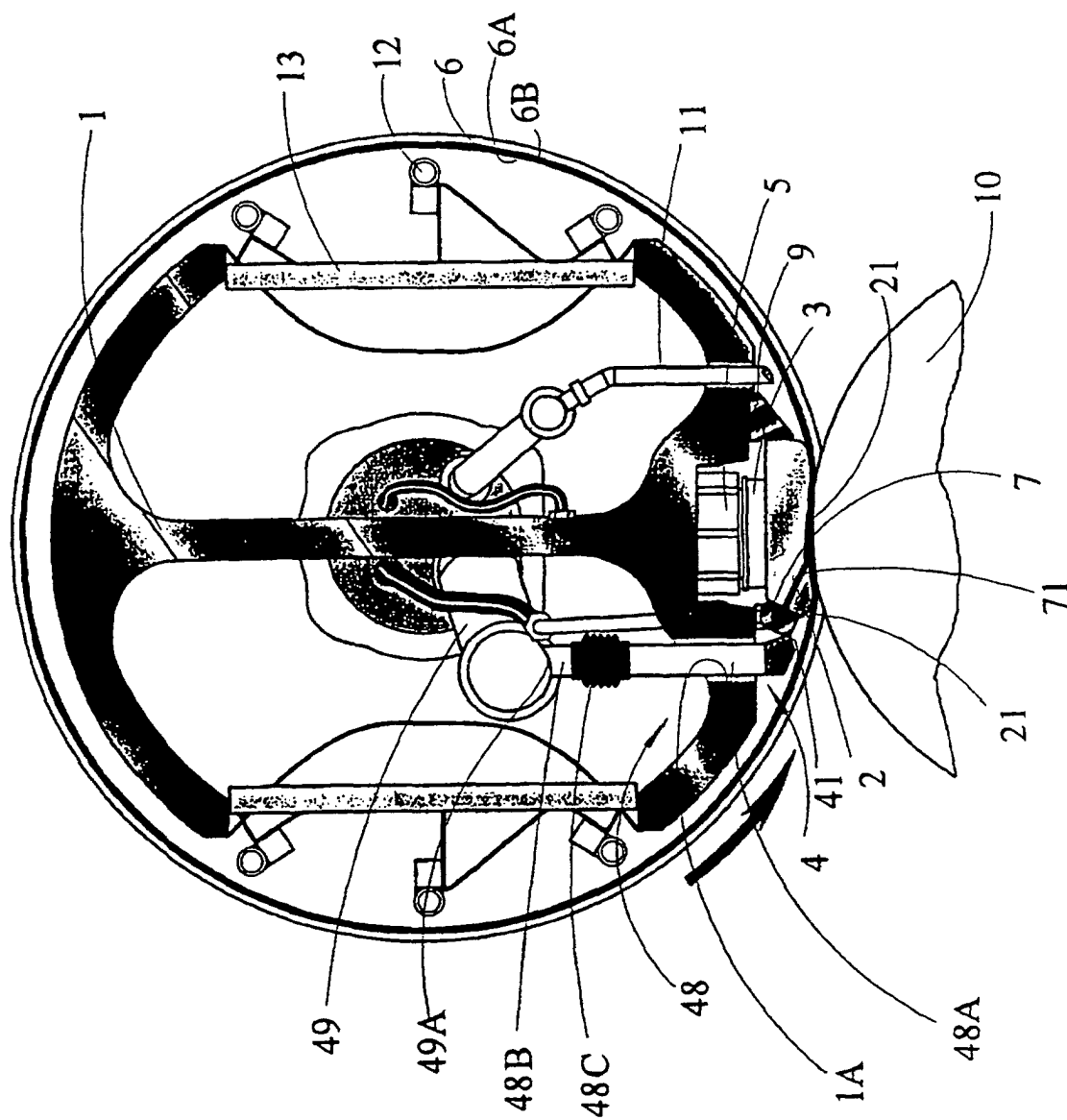


Fig. 1

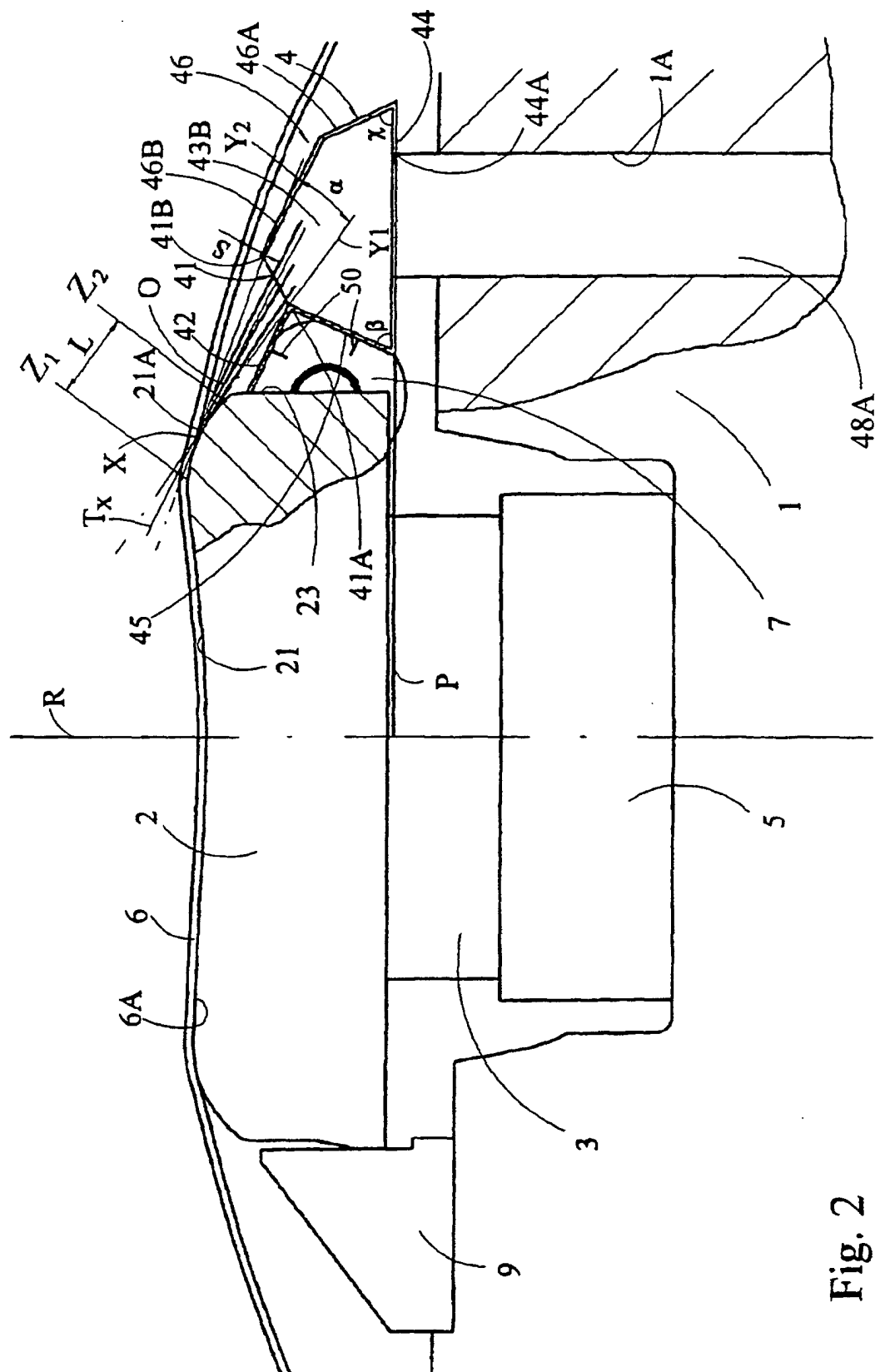


Fig. 2

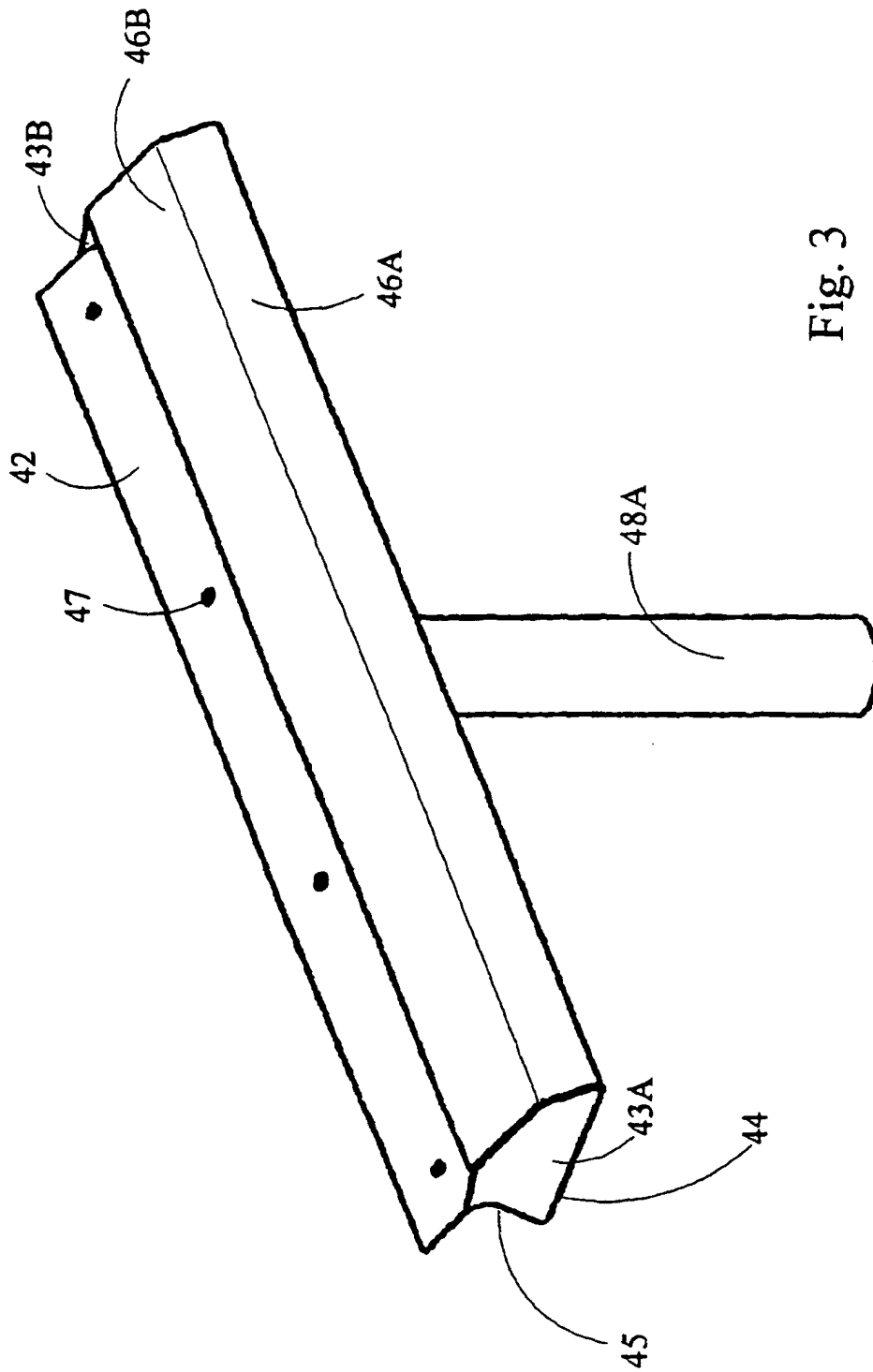


Fig. 3

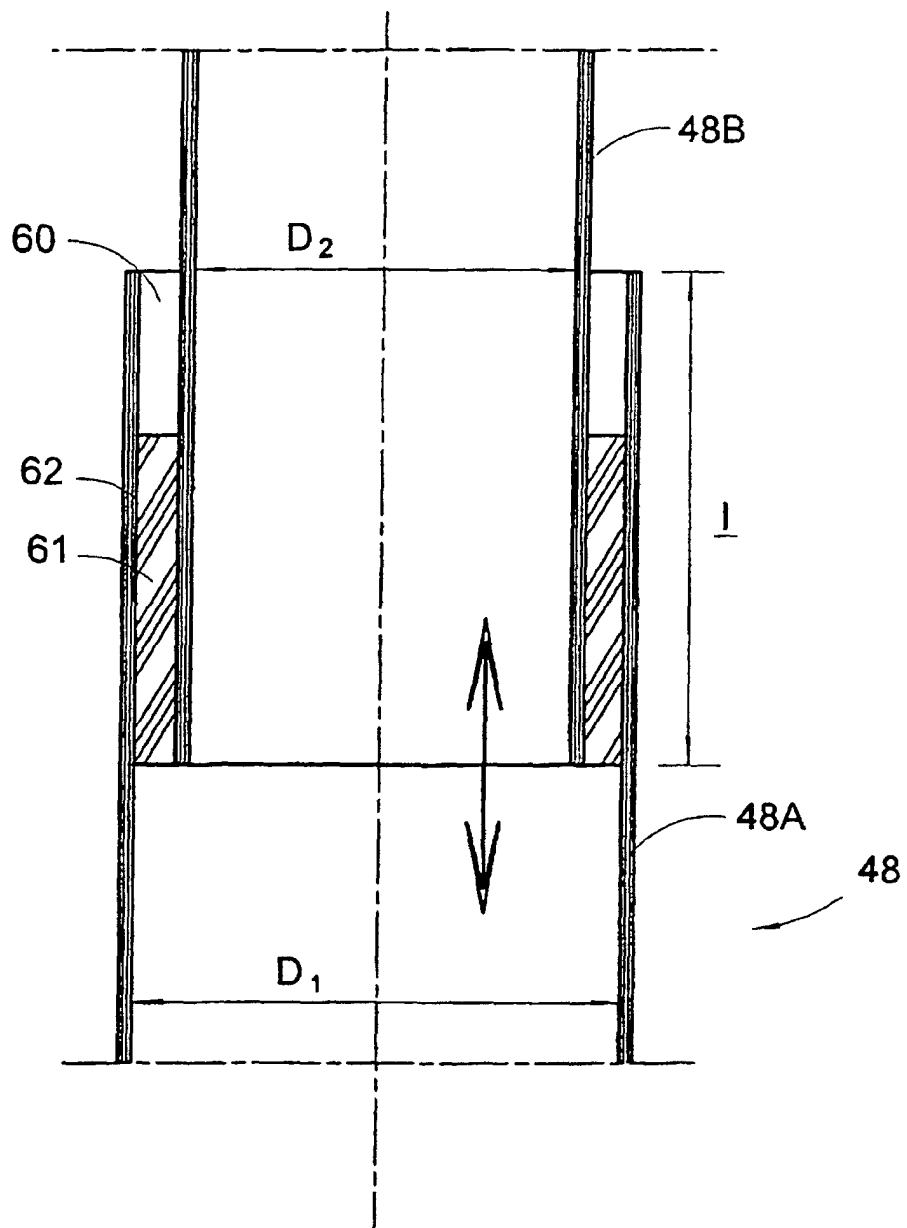


Fig. 4