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(72) Inventors:

- **ERONEN, Ville**
40740 Jyväskylä (FI)
- **HÄMÄLÄINEN, Timo**
40420 Jyskä (FI)

• **KUPIAINEN, Seppo****40270 Palokka (FI)**• **LAHTINEN, Juha****40720 Jyväskylä (FI)**• **LAMMINPARRAS, Sami****41900 Petäjävesi (FI)**• **OLLILA, Timo****40740 Jyväskylä (FI)**• **SNELLMAN, Jorma****40500 Jyväskylä (FI)**• **VAUHKONEN, Sampo****40900 Säynätsalo (FI)**• **VIRTANEN, Janne****41800 Korpilahti (FI)**• **YLÖNEN, Taneli****41160 Tikkakoski (FI)**(74) Representative: **TBK****Bavariaring 4-6****80336 München (DE)****(54) BELT ROLL FOR A FIBRE WEB MACHINE**

(57) The invention relates to a belt roll for a fibre web machine. The belt roll (10) includes a non-rotating pressure shaft (11), which includes a loading zone (39). Moreover, the belt roll (10) includes loading cylinders (17) supported to the pressure shaft (11) in the loading zone (39). Furthermore, the belt roll (10) includes a pressure shoe (12) connected to the loading cylinders (17) and adapted to move in relation to the pressure shaft (11), which pressure shoe (12) extends essentially over the length of the

loading zone (39). The belt roll (10) also includes a loading oil line (18) for the feeding of pressurised oil to the loading cylinders (17) in order to load the pressure shoe (12). As part of the loading oil line (18), the pressure shoe (12) includes a channel (19), which extends to the point of the loading cylinders (17), and there is a connection (20) from the channel (19) to multiple loading cylinders (17).

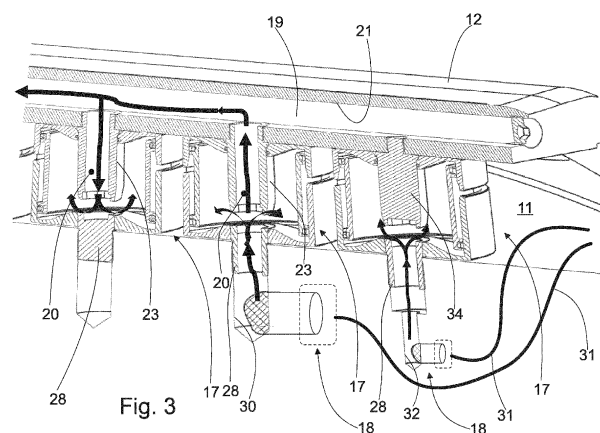


Fig. 3

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Description

[0001] The invention relates to a belt roll for a fibre web machine, which belt roll includes

- a non-rotating pressure shaft, which includes a loading zone,
- loading cylinders supported on the pressure shaft in the loading zone,
- a pressure shoe connected to the loading cylinders and adapted to move in relation to the pressure shaft, which pressure shoe extends essentially over the length of the loading zone, and
- a loading oil line for the feeding of pressurised oil to the loading cylinders in order to load the pressure shoe.

[0002] The belt roll has a static pressure shaft, around which a flexible and endless belt is arranged. The belt roll is adapted as a pair of rolls with a counter roll which has a rigid shell. The belt roll has a pressure shoe, the curvature of which corresponds to the curvature of the shell of the counter roll. In this case, an extended nip area is formed, whereby the pressing time and pressing length are many times greater than in a linear nip. The pressure shoe is supported to the pressure shaft by means of loading cylinders, with which the pressure shoe is loaded against the counter roll. The belt slides on the surface of the pressure shoe lubricated by a layer of oil. In practice, pressurised oil is needed to lubricate the pressure shoe and also to operate the loading cylinders. FI patent number 127174 discloses a cast shaft for a roll of a fibre web machine, which cast shaft has a loading zone.

[0003] The belt roll has up to more than 30 loading cylinders. In order to supply loading oil, an axial centre bore has been machined in the pressure shaft, from which centre bore the loading oil line then continues to the loading cylinders via radial bores. Moreover, it is also possible to use pipes as part of the loading oil line. However, the centre bore requires a reservation in the web of the pressure shaft. In this case, the pressure shaft must be made thicker than what the nip load would require. Furthermore, cast iron is non-homogeneous and may contain pores. In this case, the centre bore and the radial bores may leak loading oil when pressurised. Moreover, there are bores over the entire length of the pressure shaft, which impairs the loading capability of the pressure shaft. It has also been presented that lubrication oil pipes and inserts be fastened in connection with the pressure shoe or that grooves be machined in connection with it, where the grooves are sealed by means of covers. In this case, however, it is necessary to machine and adapt precise surfaces, the small bore connections of which serve as capillaries for the lubrication oil.

[0004] The object of the present invention is to accomplish a novel kind of a belt roll for a fibre web machine, which belt roll operates more reliably than earlier but

which is simpler and more inexpensive than previously. The characteristic features of the belt roll according to the present invention are described in the enclosed claims. In the belt roll according to the present invention, the supply of loading oil is implemented in a new kind of way. Surprisingly, the base material of the pressure shoe can be used as the channel for the loading oil close to the point of use, in other words the loading cylinder. The channel can be formed, for example, by drilling or by arranging a tubular space in the pressure shoe in casting, printing or extrusion. It is advantageous to drill a precise channel in steel of uniform quality, which channel can be adapted to the loading cylinders using spacious connections. The base material of the pressure shoe also includes the thicker support section below the thin shoe profile, which support section can also be isolated from the profile section in order to prevent the conduction of heat.

[0005] In the application, the loading oil is distributed by the channel through the pressure shoe to the loading cylinders of the same zone. In this way, at least the middlemost loading cylinders that constitute the main loading zone have a connection with the channel of the pressure shoe. A zone is composed of at least two or more loading cylinders or even of all of the loading cylinders of the belt roll. However, advantageously at least the outermost loading cylinders are independently loadable. Sections in the other direction are also formed in the channel, which sections are at angle with respect to the longitudinal channel so that the loading oil can be distributed to the loading cylinders.

[0006] From the channel and its sections, the loading oil is distributed to the loading cylinder along a connection. The connections formed are hollow sleeves, which function at least as fittings that locate the pressure shoe, in other words align the pressure shoe and the cylinder heads of the loading cylinders to each other. There can also be sleeves between the pressure shaft and the cylinder base of the loading cylinder, because the loading oil can surprisingly be supplied through at least one loading cylinder to be distributed to the other loading cylinders of the zone or independently to individual loading cylinders, for example to the outermost loading cylinders. Moreover, there are also almost as many solid pins as the second guide means and/or fastening means of loading cylinders with no through flow, because the loading oil is supplied in a centralised manner through the pressure shoe. Such a sleeve structure enables the unobstructed and unthrottled flow of a medium, such as loading oil, between the pressure shoe and the loading cylinder as well as between the pressure shaft and the loading cylinder. Moreover, the sleeves constitute a dimensionally accurate alignment between parts that are adapted by their outer dimensions, in the simplest configuration by means of sliding fits on both sides. Advantageously, the sleeves are fastenable to one of said parts or, if necessary, they can even be used for fastening the pieces together. It is also possible to use the sleeve for discharg-

ing the pressure of the loading cylinders, in which case the sleeve of the cylinder base of at least one loading cylinder has a remotely-openable valve and a channel out to the surface of the shaft.

[0007] The invention is described below in detail by making reference to the enclosed drawings that illustrate some embodiments of the invention, in which:

- Figure 1 shows an extended nip arrangement formed by a belt roll and a counter roll, seen from the machine direction,
- Figure 2 shows a drawing in principle of the cross section of the extended nip arrangement of Figure 1,
- Figure 3 shows part of the belt roll according to the invention as a cross section in the machine direction,
- Figure 4 shows a belt roll according to the invention as a cross section from the centre line of a loading cylinder,
- Figure 5 shows an additional application of the loading cylinder according to the invention.

[0008] Figure 1 shows the principle of a shoe press 10 of a fibre web machine. The belt roll 10 includes a non-rotating pressure shaft 11 and a loadable pressure shoe 12 supported to the pressure shaft 11. As the name suggests, the belt roll also includes a flexible belt 13, which is adapted around the pressure shaft 11. Here, the internal shapes of the belt of the pressure shaft are illustrated by means of broken lines. The belt roll is also referred to as shoe roll or extended nip roll. The belt roll 10 together with a counter roll 14 form an extended nip between them, through which extended nip the fibre web is led to press the fibre web. The pressure shoe 12 extends essentially over the width of the entire extended nip. A variable crown counter roll is usually used, and it is pressed against the belt roll into the circumference of its belt. The above-mentioned pressure shoe 12 is shaped to follow the shape of the shell 15 of the counter roll 14. In Figure 1, the belt roll 10 is in the upper position.

[0009] Figure 2 shows the extended nip arrangement viewed from the ends of the rolls. The direction of rotation of the belt 13 is illustrated with an arrow. The belt roll 10 has rear support means 16 on the outlet side of the pressure shoe 12 between the pressure shoe 12 and the pressure shaft 11. The purpose of the rear support means is to keep the pressure shoe straight and to prevent the pressure shoe from going to the direction of travel of the fibre web, for example in situations where the fibre web travels into the press nip while folded many times over. One loading cylinder 17 is shown here, and there are many loading cylinders 17 side by side over the distance of the pressure shoe 12 (Figure 1). The loading cylinders are used for pressing the pressure shoe towards the counter roll. The fibre web to be pressed remains between the shells of the rolls, usually between two press felts or a press felt and a counter roll (not illustrated).

[0010] As stated above, the belt roll 10 includes a non-rotating pressure shaft 11, which includes a loading zone 39. The loading zone has a dimension to the longitudinal direction of the pressure shoe and to the direction of travel of the fibre web. Figure 1 shows the length of the loading zone 39, and Figure 2 shows the width of the loading zone 39. Here, the length is the cross-directional dimension of the fibre web machine, and correspondingly the width is the dimension in the machine direction. Moreover, the belt roll includes loading cylinders 17 supported to the pressure shaft 11 in the loading zone 39. The structure and functioning of the loading cylinder are described in more detail below in this text. Figure 3 shows three, partly four loading cylinders 17, which are connected to the pressure shoe 12 adapted to move in relation to the pressure shaft 11. The pressure shoe extends essentially over the length of the loading zone 39. Figure 3 only shows one end of the pressure shoe 12, which is usually a piece machined from solid steel. Furthermore, the belt roll includes a loading oil line 18 in order to feed pressurised oil to the loading cylinders 17 to load the pressure shoe 12. In the invention, as part of the loading oil line 18, the pressure shoe 12 includes a channel 19, which extends to the point of the loading cylinders 17. Moreover, there is a connection 20 from the channel 19 to multiple loading cylinders 17. In this case, different kinds of bores to the pressure shaft can be minimised. At the same time, the channel formed in the pressure shoe, which is made of steel, is tight and endures well the stresses of the oil pressure without leaking. Moreover, the connection from the channel to the loading cylinder is short and it can be machined in a simple manner.

[0011] Figures 3 and 4 show the implementation of the invention viewed from two different directions. First of all, the channel 19 includes a tubular space in the longitudinal direction of the pressure shoe 12, which tubular space is shared by at least two loading cylinders 17. The shared space extends essentially over the length of the entire pressure shoe. In the application shown, the tubular space is a bore 21. The bore can be formed from both ends of the pressure shoe, and then the unnecessary holes at the ends can be plugged. On the other hand, the bore can be made from one end only, in which case the other end remains intact, and hence plugging is unnecessary. Moreover, the channel 19 includes a section 22, which is in a direction diverging from the longitudinal direction of the pressure shoe 12, to each loading cylinder 17. In other words, the loading oil line is divided from the shared section to a separate section to each loading cylinder. The dimensions of the sections can be used for ensuring even distribution of pressure when the bore serves as a manifold. It is also possible to add means, which promote the even distribution of the flow of oil, in connection with the sleeve 23 or the cross-directional section 22, such as inserts to arrange the flow to be suitable for each loading cylinder. Advantageously, the cross-directional area of flow in the shared section of the channel is larger than in the cross-directional sections.

With the arrangement presented, it is sufficient to feed oil from one point into the bore 21, from where the oil flows to the loading cylinders 17. The cross-directional section 22 can be opened, for example, by means of a T-groove milling machine (Figure 4). It is also possible to utilise diagonal boring. In this case, it is possible to place the longitudinal bore of the pressure shoe to a point that is otherwise advantageous. In the application, the longitudinal bore is on the outlet side of the pressure shoe.

[0012] The connection ending from the channel to the loading cylinder can be implemented in various ways. In the application presented, the connection 20 is composed of a sleeve 23, which is adapted in the pressure shoe 12. It is easy to fasten the sleeve tightly to the pressure shoe by means of a threaded joint. Here, a recess with threading over some its distance is machined in the pressure shoe at the loading cylinder, which recess extends to the cross-directional section 22 of the above-mentioned channel 19. In this case, the loading oil can flow from the channel through the hollow sleeve into the loading cylinder. This is illustrated by the loading cylinder on the left in Figure 3. In addition to oil feeding, the sleeve guides the pressure shoe upon installation. The end of the sleeve is hence conical. The opening in the cylinder head of the loading cylinder is also advantageously conical at least over some its distance, which further facilitates the installation of the pressure shoe. Moreover, the jointing point between the sleeve and the loading cylinder is easily detectable. In practice, the sleeve is hence fastened to the pressure shoe, which transmits the loading medium. In this case, the pressure shoe can be made a part that is installable independently. This, in turn, enables the ordinary handling of the pressure shoe without a separate hoisting device, when the total mass of the pressure shoe does not increase. In practice, the mass of the pressure shoe decreases in the machining of the channel more than what the mass of the sleeves is.

[0013] After the machining and threading of the pressure shoe, it is easy to fasten the sleeve to the pressure shoe. The jointing to the loading cylinder is also implemented in a new and surprising manner. In the invention, the loading cylinder 17 includes a cylinder head 24, into which a hole 25 corresponding to the sleeve 23 is arranged by means of a seal 26 which has a sliding fit in relation to the sleeve 23. In other words, the diameter of the hole is bigger than the sleeve, and the seal allows movement between the sleeve and the cylinder head. In practice, the fitting of the seal is chosen to be a loose sliding fit within the boundaries permitted by the seal. In this case, the sleeves and hence also the pressure shoe are connected to the loading cylinders in a floating manner. The sliding fit is useful especially in a configuration where the pressure shoe with its sleeves can be placed to the loading cylinders, and the joints are formed without separate fastenings or tools.

[0014] Correspondingly, the shoe can be removed without tools. A long sliding guidance is attained by a

suitable length of the sleeve and by utilising the inner space of the loading cylinder.

[0015] When the pressure shoe is floating, the cylinder base 27 being part of the loading cylinder 17 is adapted to the pressure shaft 11 by a means 28. The means aligns the loading cylinder and keeps the cylinder base of the loading cylinder and hence the loading cylinder in place. In the invention, the means 28 is a solid pin or sleeve 29, which has several functions. Firstly, the sleeve keeps the loading cylinder in place, as in Figure 5. A corresponding situation is in the first loading cylinder from the left in Figure 3. For the sleeve, the pressure shaft has a bore, which has an inside thread corresponding to the sleeve. This is a blind bore, which prevents the escape of oil. If desired, it is possible to use a solid screw, in which case tightness is certain. However, the sleeve is also used in the other loading cylinders of the belt roll, so a single type of a sleeve is advantageously used in all loading cylinders.

[0016] The functionality of the sleeve is disclosed by the other two loading cylinders of Figure 3. Here, an interconnection is opened to the bore of the pressure shaft 11 at the middlemost loading cylinder. More precisely expressed, an oil feed channel 30 is machined in the pressure shaft 11 for the sleeve 29. In this case, the centre bore of the pressure shaft used earlier is unnecessary. A short bore in the cross direction of the pressure shaft is sufficient, in which case a bore to the non-density area of the centre area is avoided. Moreover, a single bore is sufficient to distribute the feed to all loading cylinders. In other words, the oil is supplied surprisingly through a short shaft bore to at least one loading cylinder and further through the loading cylinder into the pressure shoe, the longitudinal bore of which then distributes the oil to the other loading cylinders, which do not have a connection to the pressure shaft. An example location of the diagonal bore is shown in Figure 4 with broken lines. The loading oil can be supplied into the diagonal bore by an elastic tube 31, which can be slid via the pressure shaft opening and the hollow shaft pin to the outside of the belt roll (not illustrated). Figure 2 shows elastic tubes 31 adapted in the feed channel 30 and in the feed line 32, which elastic tubes 31 are adapted on the side of the pressure shaft 11. Alternatively, the oil can be fed directly into the pressure shoe by means of an elastic connection, in which case the shaft bores are unnecessary.

[0017] In principle, there is one feed channel 30 per loading zone. Most often, a belt roll has one main zone as the loading zone, in which case just one feed channel is sufficient. On the other hand, the above-mentioned elastic tube can be fastened to the pressure shoe and then connected to the channel. However, the pressure shoe moves, and the belt travels close on both sides of the pressure shoe, in which case it would be challenging to make the jointing. This being the case, the feed channel is easy to adapt to the static pressure shaft and then distribute the oil through one loading cylinder to the other loading cylinders. On the other hand, the loading zone

can be divided into more than one zone by adding a separate oil feed and by restricting the flows in zones in the pressure shoe.

[0018] In addition to one main zone, it is possible to use edge zones, in which case the nip load of the edge zones can be adjusted with respect to the main zone. In the application presented, a separate feed line 32 is arranged for the outermost loading cylinders 17. Advantageously, the feed line is formed in a corresponding manner as the feed channel. Generally speaking, both the feed channel 30 and the outlet channel 37 are adapted to open to the outer surface of the pressure shaft 11. The openings are highlighted with broken lines in Figure 3. In the cross section presented, the openings are polygons, because the surface of the pressure shaft in the end area of the pressure shaft is curved. In practice, the feed points are adaptable to the pressure shaft without separate reinforcements in the casting. The flow of the loading oil is illustrated by the black solid arrows. With the solution according to the invention, it is possible to make the bores at the feed and outlet points as short bores. In this case, the risk of leakage caused by non-density in the centre area of the cast pressure shaft is considerably small, much smaller than with a known centre bore. If necessary, the internal surfaces of the feed channel and outlet channel are sealed in order to prevent leaks.

[0019] In Figure 3, the edge zone has one loading cylinder, and the loading oil is fed in the manner described above through the sleeve screw of the loading cylinder. However, the interconnection to the channel 19 of the pressure shoe 12 is prevented by using a solid pin 34 instead of a sleeve. The pin still guides the pressure shoe and contributes to carrying the loads of the pressure shoe. If the pressure shoe is bored from one direction only, the bore ends before the edge zone. In this case, a sleeve can be used in the edge zone, too, which sleeve is hence similar at all loading cylinders containing various functions. A shared feed is supplied to two loading cylinders of different edge zones, which feed can be implemented with thin hoses.

[0020] Figure 5 shows a loading cylinder according to the invention separately. A special sleeve screw is used here, the functioning of which is described in more detail below in this text. Generally speaking, the outer diameter of the sleeve screw 29 is smaller than the inner diameter of the hole 25 in the cylinder head 24 of the loading cylinder 17. In this case, when assembling the belt roll, the loading cylinder is placed on the pressure shaft and fastened by the sleeve screw, which is slid through the cylinder head 24. In other words, the sleeve screw has room to go through the hole in the cylinder head. For tightening, the sleeve screw 29 has an internal shape for a wrench.

[0021] Advantageously, the cylinder head 24 and the cylinder base 27 are symmetrical turned pieces. The symmetry facilitates installation, when the installation direction of the loading cylinder is irrelevant. Advantageously, a blank that is forged into shape is also used.

In other words, it is possible to use forging into shape to form a blank, which contains clearly less material to machine than previously. Furthermore, the machining can be performed in a simple manner by turning. Moreover, a reshaped cylinder head is more stable than previously, without susceptibility to plastic deformations caused by pressure. At the same time, the structure of the loading cylinder can be made universal. In other words, all the loading cylinders of the belt roll are mutually similar. The sleeves and threaded sleeves are also similar to a large extent. In this case, it is possible to manufacture larger series than previously, which decreases the manufacturing costs. Moreover, a smaller number of different kinds of spare parts are needed than earlier, and the same spare parts can be used on several different belt rolls. Due to the standardisation, it is advantageous to make all the sleeves similar, which also eliminates the risk of mixing.

[0022] There is a floating piston 35 inside the cylinder head 24 and the cylinder base 27, which floating piston 35 is dually sealed both to the head 24 and to the cylinder base 27. The structure is simple and allows angular changes of the pressure shoe. In the application presented, the cylinder head is loaded against the pressure shoe, and the cylinder base is loaded against the pressure shaft. Advantageously, there is a bevel 36 in the surface corresponding to the pressure shoe 12 of the cylinder head 24 and/or the pressure shaft 11 of the cylinder base 27. In the application of Figure 5, the bevel 36 is both in the cylinder head and in the cylinder base. The bevel is small, and it is located in the area of the edges of the cylinder base and the cylinder head. When loaded, the edges expand. However, the bevel allows the deformations of the edges without excessively great tensions. In this case, it is possible to make the material thicknesses clearly thinner than in known loading cylinders. The mass of the loading cylinder according to the invention corresponds to the mass of a prior art cylinder head, so the mass of the loading cylinder is considerably smaller than known.

[0023] In accordance with Figure 5, the total area of the cylinder head of the loading cylinder is greater than the cross-directional area of the sleeve. In this case, when loaded, the head of the loading cylinder is subject to a greater lifting force, in which case the pressure shoe is loaded against the counter roll.

[0024] Figure 5 shows a third functionality of the sleeve screw 29. Here, an oil outlet channel 37 is machined in the pressure shaft 11 for the sleeve screw 29, and a quick outlet valve 38 is adapted in the sleeve screw 29. Like the feed channel, the outlet channel is a short bore in the pressure shaft. In this case, the oil can exit the quick outlet valve quickly into the belt roll. It is hence possible to release pressure from the loading cylinders quickly in order to avoid damage, for example in a disturbance situation. A necessary number of the quick outlet valves and outlet channels are arranged. Moreover, it is possible to adjust the discharge speed of the loading by the se-

lection of the sleeve screw. In a disturbance situation, the quick outlet valve is opened by using separate control pressure. The hoses for the control pressure have sufficient room to fit in the outlet channel (not illustrated). The quick outlet feature can be added to the belt roll by replacing the threaded sleeve used in initial installation with a more roomy quick discharge sleeve in connection with other arrangements. At the same time, an outlet channel is opened in the pressure shaft for outlet oil. In this case, the loading cylinder can be de-pressurised quickly, in which case it is possible to avoid damage in a failure situation.

[0025] Unlike in the application presented, the connection can be formed from a threaded sleeve, with which the loading cylinder is fastened to the pressure shoe. In other words, the loading cylinders can be fastened as part of the pressure shoe. In this case, the guiding sleeve is fastened to the pressure shaft, in which case the floating joint is between the loading cylinders and the pressure shaft. However, the module formed by the loading cylinders and the pressure shoe is heavy. Moreover, the sliding fit is in a recess, which complicates alignment and the installation of the module. However, the functioning and various functionalities correspond to those described above.

[0026] Irrespective of the application, long feed channels can be omitted in the pressure shaft, which may contain pores formed during casting and other discontinuities that cause leakage risks. At the same time, the bore reservations required earlier can be omitted in the centre part of the pressure shaft. In this case, the pressure shaft can be made more slender than previously, and the loading capability of the pressure shaft remains over the entire distance. Moreover, prior art demanding machining is avoided in the pressure shaft and the loading cylinders. In practice, the entire pressure shoe fits into the machine tool, in which case it is possible to ensure at the same time that the bores and machining are accurate in terms of dimensions and shape. When the sliding fit is on top of the loading cylinder, the jointing point is easily detectable and the guiding is alignable. At the same time, the pressure shoe can be handled without separate lifters. Moreover, it is easy to replace the pressure shoe with a new one without changing the loading cylinders. The handling of the pressure shoe itself is easy without special hoisting accessories.

[0027] When the supporting and structure of the belt roll and its loading means are simplified and when the manufacture is facilitated, the manufacturing costs are reduced as compared to prior art. Moreover, there are fewer design variables than earlier, and it is easier than previously to manage them. In this case, versatile solutions can be offered to production plants in a cost-effective manner, without compromising the functioning, serviceability and durability of the belt roll.

[0028] The invention relates to a belt roll for a fibre web machine. The belt roll (10) includes a non-rotating pressure shaft (11), which includes a loading zone (39). More-

over, the belt roll (10) includes loading cylinders (17) supported to the pressure shaft (11) in the loading zone (39). Furthermore, the belt roll (10) includes a pressure shoe (12) connected to the loading cylinders (17) and adapted to move in relation to the pressure shaft (11), which pressure shoe (12) extends essentially over the length of the loading zone (39). The belt roll (10) also includes a loading oil line (18) for the feeding of pressurised oil to the loading cylinders (17) in order to load the pressure shoe (12). As part of the loading oil line (18), the pressure shoe (12) includes a channel (19), which extends to the point of the loading cylinders (17), and there is a connection (20) from the channel (19) to multiple loading cylinders (17).

Claims

1. A belt roll for a fibre web machine, which belt roll (10) includes

- a non-rotating pressure shaft (11), which includes a loading zone (39),
- loading cylinders (17) supported on the pressure shaft (11) in the loading zone (39),
- a pressure shoe (12) connected to the loading cylinders (17) and adapted to move in relation to the pressure shaft (11), which pressure shoe (12) extends essentially over the length of the loading zone (39), and
- a loading oil line (18) for the feeding of pressurised oil to the loading cylinders (17) in order to load the pressure shoe (12),

characterised in that, as part of the loading oil line (18), the pressure shoe (12) includes a channel (19), which extends to the point of the loading cylinders (17), and there is a connection (20) from the channel (19) to multiple loading cylinders (17).

2. A belt roll according to claim 1, **characterised in that** the channel (19) includes a tubular space in the longitudinal direction of the pressure shoe (12), which tubular space is shared by at least two loading cylinders (17), as well as a section (22), which is in a direction diverging from the longitudinal direction of the pressure shoe (12), to each loading cylinder (17) in the same zone.

3. A belt roll according to claim 1 or 2, **characterised in that** the connection (20) is composed of a sleeve (23), which is adapted in the pressure shoe (12).

4. A belt roll according to claim 3, **characterised in that** the loading cylinder (17) includes a cylinder head (24), into which a hole (25) corresponding to the sleeve (23) is arranged by means of a seal (26) which has a sliding fit in relation to the sleeve (23).

5. A belt roll according to claim 4, **characterised in that** the loading cylinder (17) includes a cylinder base (27) adapted to the pressure shaft (11) by a means (28), which is a solid pin or sleeve (29). 5
6. A belt roll according to claim 5, **characterised in that** an oil feed channel (30) is machined in the pressure shaft (11) for the sleeve (29). 10
7. A belt roll according to claim 6, **characterised in that** there is one feed channel (30) per loading zone. 15
8. A belt roll according to any one of the claims 2 - 7, **characterised in that** the tubular space is composed of a bore (21) . 20
9. A belt roll according to claim 5, **characterised in that** an oil outlet channel (37) is machined in the pressure shaft (11) for the sleeve (29), and a quick outlet valve (38) is adapted in the sleeve screw (29). 25
10. A belt roll according to any one of the claims 6 - 9, **characterised in that** the feed channel (30) and the outlet channel (37) are adapted to open to the outer surface of the pressure shaft (11). 30
12. A belt roll according to claim 4 or 5, **characterised in that** there is a bevel (36) in the surface corresponding to the pressure shoe (12) of the cylinder head (24) and/or the pressure shaft (11) of the cylinder base (27). 35
13. A belt roll according to any one of the claims 1 - 10, **characterised in that** a separate feed line (32) is arranged for the outermost loading cylinders (17). 40
14. A belt roll according to claim 4 or 5, **characterised in that** the cylinder head (24) and the cylinder base (27) are symmetrical turned pieces. 45
15. A belt roll according to any one of the claims 1 - 10, **characterised in that** the loading oil line (18) includes an elastic tube (31), which is adapted to the side of the pressure shaft (11). 50

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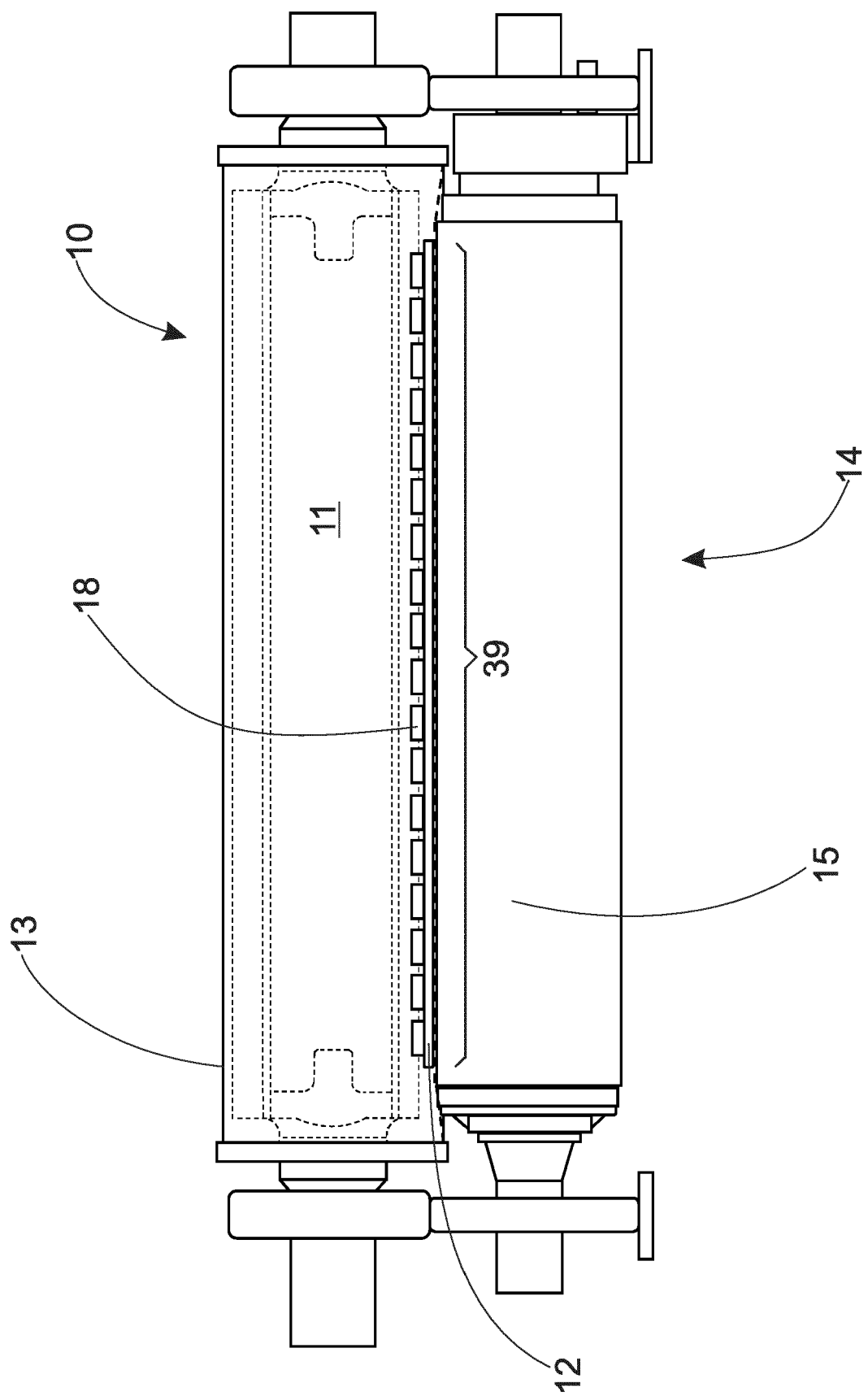


Fig. 1

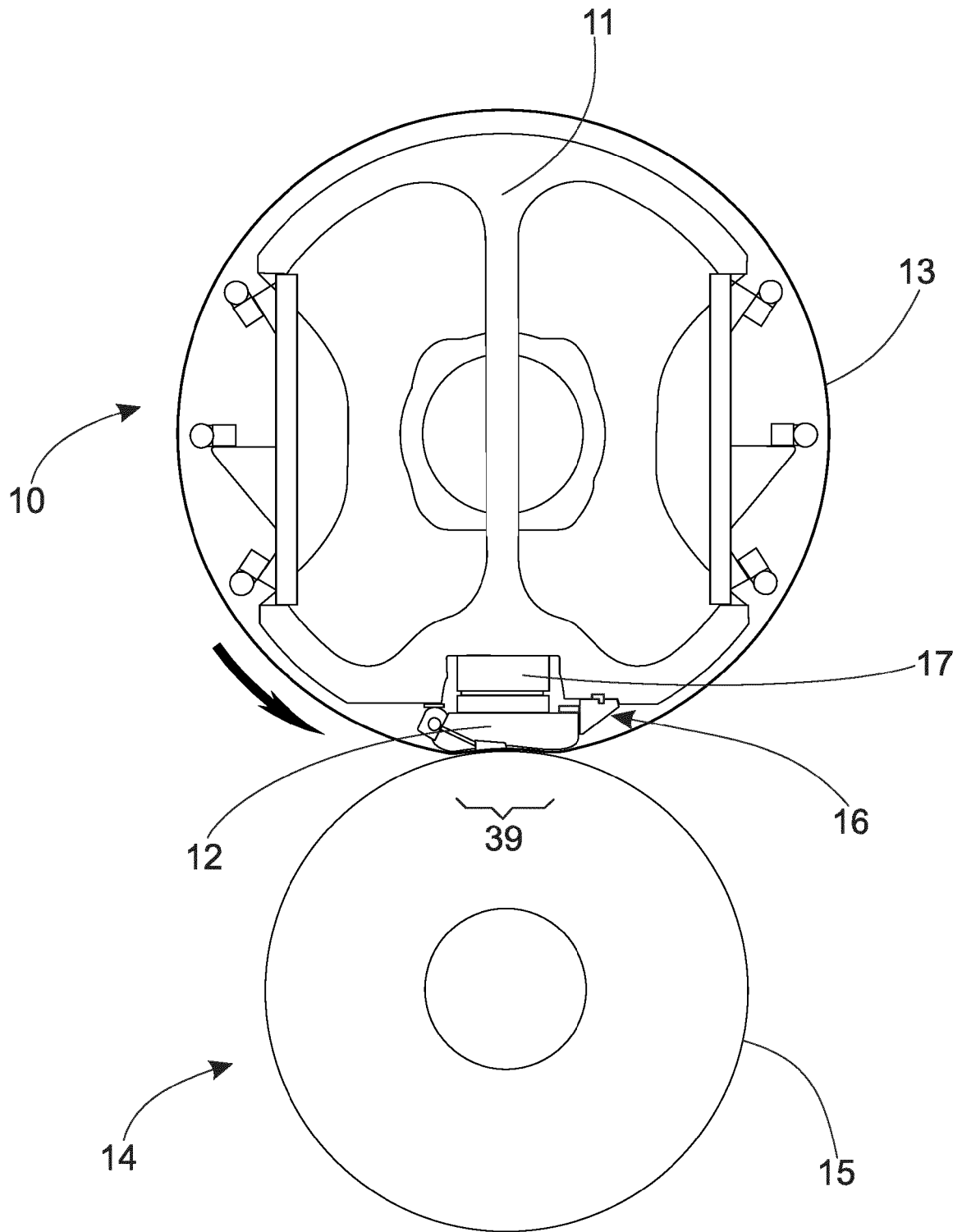


Fig. 2

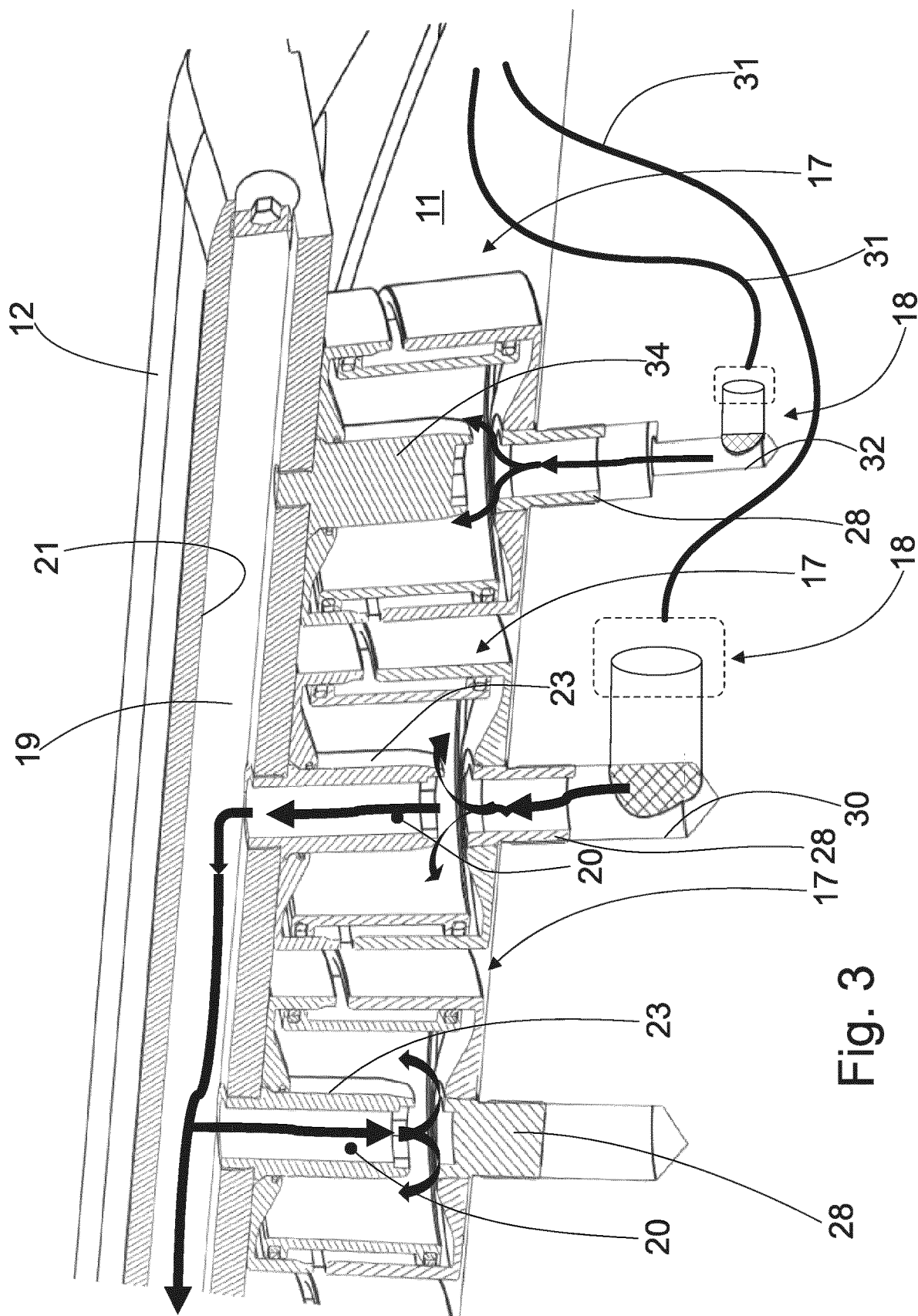


Fig. 3

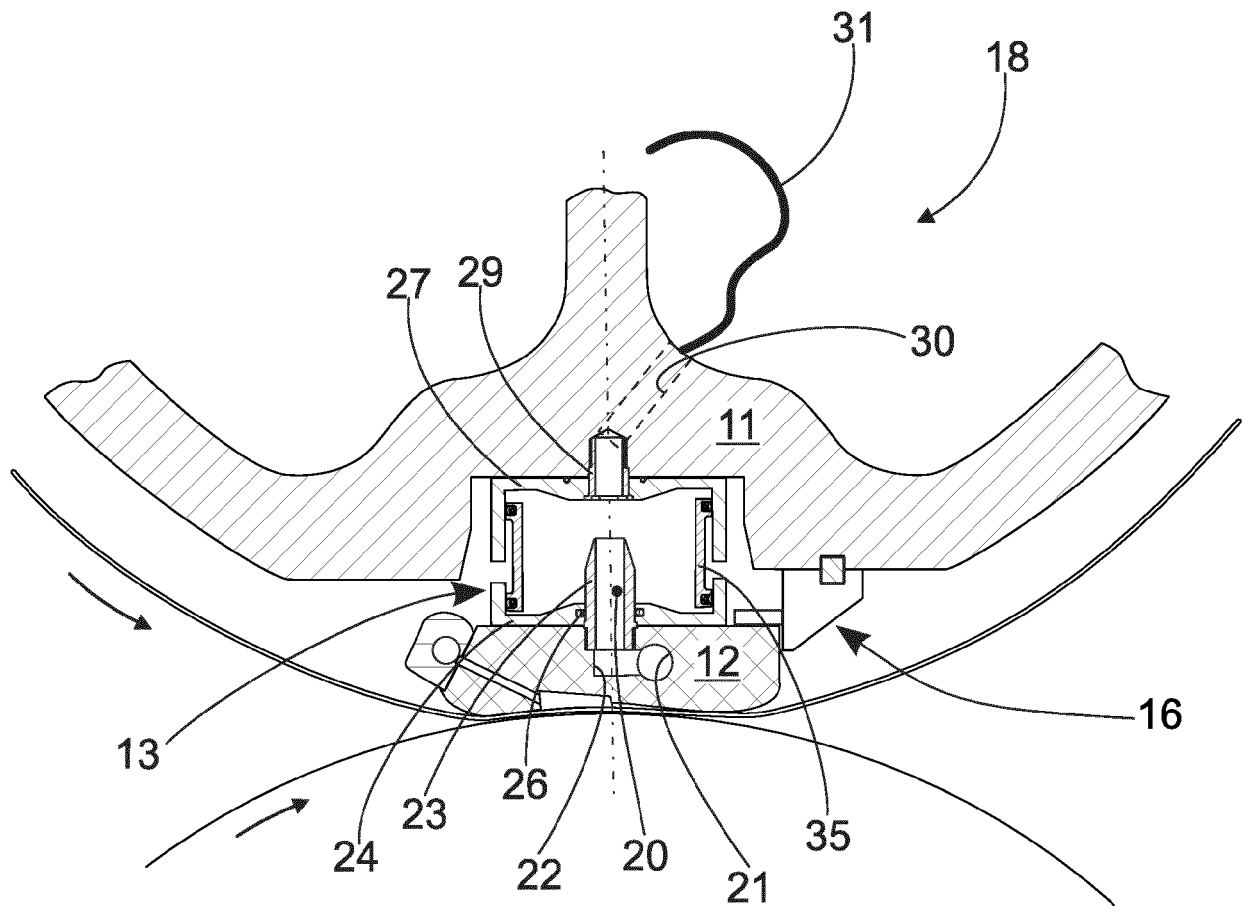
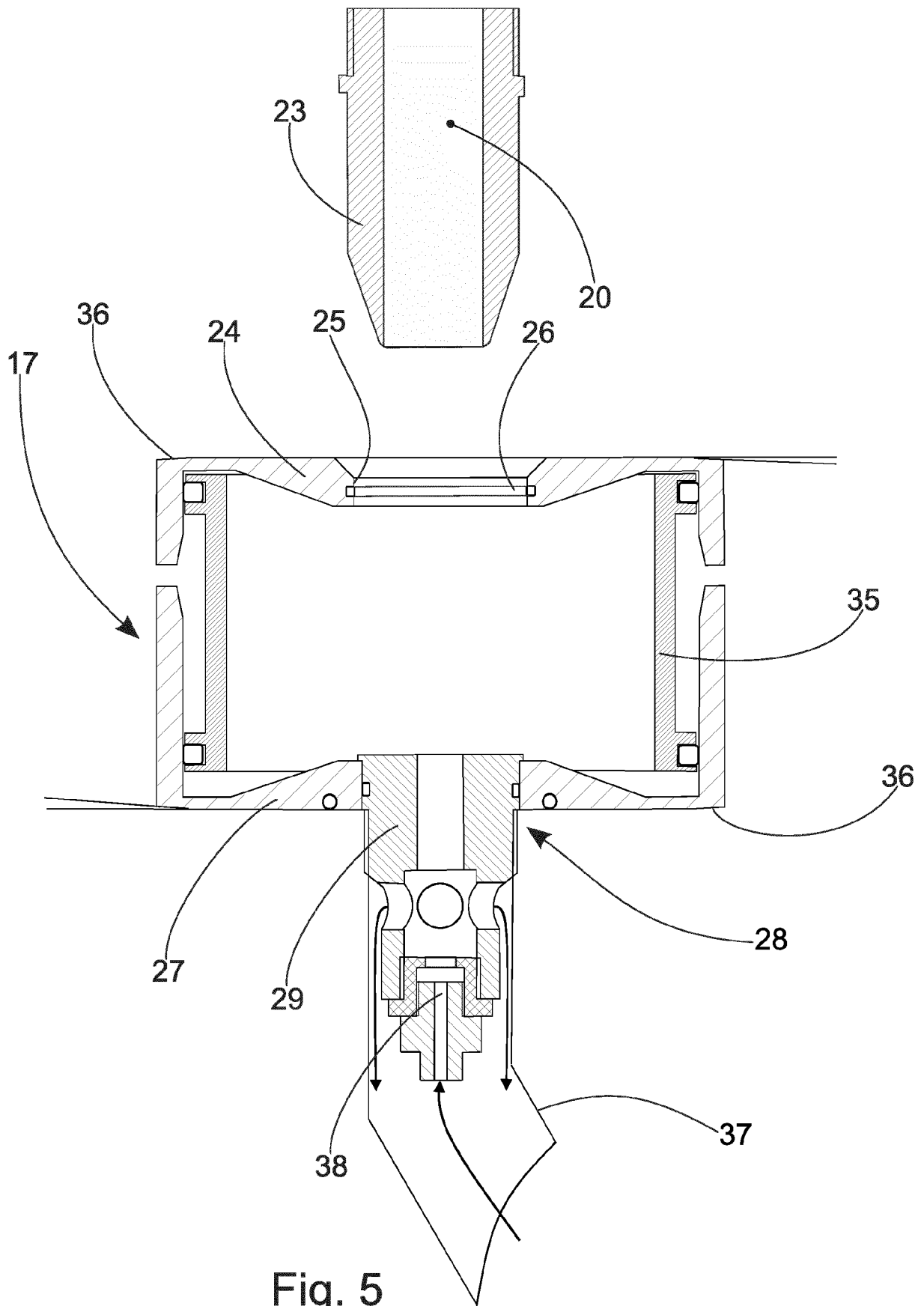


Fig. 4





EUROPEAN SEARCH REPORT

Application Number
EP 19 20 0695

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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Place of search Munich		Date of completion of the search 4 February 2020	Examiner Pregetter, Mario
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