

(19) **DANMARK**

(10) **DK/EP 3565974 T3**



(12)

## Oversættelse af europæisk patentskrift

Patent- og  
Varemærkestyrelsen

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- (51) Int.Cl.: **F 04 D 29/36 (2006.01)** **F 16 L 27/08 (2006.01)**
- (45) Oversættelsen bekendtgjort den: **2021-07-26**
- (80) Dato for Den Europæiske Patentmyndigheds bekendtgørelse om meddelelse af patentet: **2021-04-28**
- (86) Europæisk ansøgning nr.: **18713123.0**
- (86) Europæisk indleveringsdag: **2018-03-14**
- (87) Den europæiske ansøgnings publiceringsdag: **2019-11-13**
- (86) International ansøgning nr.: **DE2018100227**
- (87) Internationalt publikationsnr.: **WO2018166564**
- (30) Prioritet: **2017-03-17 DE 102017105776** **2017-07-13 DE 202017104188 U**
- (84) Designerede stater: **AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR**
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- (54) Benævnelse: **HYDRAULISK DREJEGENNEMFØRING**
- (56) Fremdragne publikationer:  
**DE-A1- 19 903 565**  
**DE-A1-102013 014 033**  
**US-A- 4 899 641**



## Description

The invention relates to a hydraulic rotary leadthrough having a central rotation axis.

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Hydraulic rotary leadthroughs are inter alia, as also set out in DE 10 2013 014 033 B4, used in fan wheels which are rotatably driven and which have fan blades which protrude radially with respect to the hub thereof. The fan blades, when the fan wheel  
10 is correspondingly supplied by the hydraulic rotary leadthrough which is retained so as to be able to be rotated in a state fixed in position, can not only be adjusted in terms of their setting angle with respect to the rotation plane of the fan wheel in order to change the supply quantity but can also be  
15 adjusted in terms of their conveying direction by pivoting via the rotation plane of the fan wheel while retaining the rotation direction of the fan wheel.

Such fan wheels, depending on the required fan powers, often  
20 reach considerable dimensions and consequently also require a large number of long sealing boundaries with the risk of corresponding leakages which are intended to be overcome using corresponding technical construction measures.

25 DE 199 03 565 A1 discloses a hydraulic rotary leadthrough which with respect to the required functions thereof in each case enables a minimised structural volume and in which, as a result of the path of the pressure line and collection line in the rotary neck of the rotary leadthrough as a virtually common  
30 supply channel of the rotary leadthrough, the number and length of critical sealing boundaries is also reduced.

In spite of the structural volume being minimised and reduced sealing boundaries as a result of the path of the pressure line  
35 and collection line in the rotary neck, good conditions for the composition and assembly of such rotary leadthroughs are intended to be achieved according to the invention by the bearing arrangement and sealing arrangement which encloses the rotary

neck in mounts which are supported axially one on the other, whereby in particular also for small, hydraulic rotary leadthroughs an adjusted guiding of the bearing arrangement and the sealing arrangement in the receiving housing is  
5 advantageously provided and is advantageously also intended to be used together with a V-belt drive whose belt pulleys as working elements are adjusted axially with respect to each other in order to change the translation ratio.

10 The connection of the bearing arrangement and sealing arrangement to form an assembly unit with mutual support and with common guiding in the receiving housing advantageously also makes it possible - almost as a side effect - to use the rotary  
15 neck as a rotation axis for an auxiliary or working device which is intended to be supplied with and/or acted on with a pressure medium via the rotary leadthrough.

The invention can particularly advantageously also be used together with fan wheels in which the fan blades have to be  
20 adjusted in terms of their setting angle counter to the force of wind by applying pressure, that is to say, have to be adjusted hydraulically only in one direction of rotation by applying pressure.

25 In practice, the rotary leadthrough may be connected via the surrounding bearings and/or seals rotatably and directly relative to the receiving housing in a supported manner so that the rotary leadthrough with the receiving housing may also form the counter-piece relative to a piston unit which with respect  
30 to the receiving housing delimits a working space which is intended to be supplied via the rotary leadthrough. However, it is also advantageous in the context of the invention to construct the rotary leadthrough per se as an independent structural unit in the manner of an insert cartridge which is intended to be  
35 inserted into a receiving housing in accordance with the respective inventive purpose.

This embodiment of the invention enables solutions which are

very slim in technical structural terms and in which the diameter of the central rotary neck in the region of the surrounding bearing(s) corresponds to approximately a third of the bearing diameter - with respect to a circular cross section of the rotary leadthrough which is configured as an insert cartridge.

Other details and features of the invention will be appreciated from the claims and the following description of the drawings, in which:

Figure 1 is a highly schematic illustration of a V-belt drive,

Figure 2 is an end-face view of Figure 1 according to the arrow II in Figure 1,

Figure 3 is a section through the V-belt drive according to Figure 1 according to the cutting line III-III in Figure 2, and

Figure 4 is an enlarged, simplified cut-out IV of Figure 3 through the hydraulic rotary leadthrough which is centrally received in the driven disc of the V-belt drive,

Figure 5 shows the use of a rotary leadthrough according to the invention in a fan wheel with fan blades which are arranged radially relative to the hub thereof and which can be adjusted in terms of their setting angle by means of a hydraulic adjustment device, wherein the adjustment device in a state supplied by the rotary leadthrough is arranged in the hub of the fan wheel.

For better understanding of the function and potential structure of hydraulic rotary leadthroughs, such a rotary leadthrough 1 will first be explained below in an embodiment according to the invention as a component of a V-belt drive 6 (belt pulley drive) which can be adjusted fluidically, in particular hydraulically.

The V-belt drive 6 shown as a working unit has a driving disc 2 which is located in a rotationally secure and coaxial manner

(rotation axis 5) with respect to a drive shaft 4, for example, a motor shaft, and opposite which there is a driven disc 3 in a rotationally secure but axially displaceable, coaxial manner so as to delimit a wedge-like gap. The driving disc 2 and the driven disc 3 form a V-pulley pair 13, in the wedge-like gap 7 of which there runs a V-belt which is not shown in this instance and via which the drive connection between the shown V-pulley pair 13 which is depicted by the discs 2 and 3 and a corresponding V-pulley pair is produced and can be changed in terms of translation ratio by means of opposing axial adjustment of the discs of the V-belt pairs and correspondingly related changes of the support radii of the V-belt with respect to the plate-like discs with the tension of the V-belt being maintained.

As shown in Figure 3, the driving disc 2 and driven disc 3 are connected in a rotationally secure and coaxial manner by means of a central guiding sleeve 8 which carries the driven disc 3 and on which it is guided in a rotationally secure and axially displaceable manner. The guiding sleeve 8 itself is received so as to extend into the driving disc 2 so as to be centring relative thereto and fixed by means of axial clamping elements 9, in particular clamping screws. The clamping elements 9 extend through the guide sleeve 8 coaxially with respect to the rotation axis 5 and are fixed in the driving disc 2 with respect to the drive shaft 4. In a state surrounding the guide sleeve 8 and rotationally secure relative thereto is the axially adjustable driven disc 3 which delimits an annular space 10 with respect to the guide sleeve 8. The annular space 10 is connected to the rotary leadthrough 1 by means of line connections 11, as can be seen in Figure 4, and is acted on hydraulically in accordance with the desired translation ratio in each case in order to adjust the axial position of the driven disc relative to the driving disc 2.

The rotary leadthrough 1 is arranged centrally, that is to say, coaxially with respect to the guide sleeve 8, wherein the guide sleeve 8 also forms a housing 12 for the rotary leadthrough 1 and delimits the receiving space 34 for it. In this receiving

space 34 which is delimited by the guide sleeve 8, the rotary leadthrough 1 is axially pretensioned as a structural unit in the form of a cartridge and inserted at the peripheral side in a sealing manner (seals 31). The axially tensioned fixing may, for example, be carried out by means of a spring assembly 14 which is arranged at the base side with respect to the receiving space 34. This is axially opposite a disc-like cover 15 of the receiving space 34 which to facilitate the assembly is preferably constructed as a split disc and which is supported by means of a clamping ring 16 against the housing 12 which is formed by a portion of the guide sleeve 8.

The rotary leadthrough 1 which is received in the receiving space 34 of the housing 12 has a rotary neck 17 which is rotatably retained so as to be fixed in position with respect to the housing 12 and in which a pressure line 18 and a collection and/or leakage line 19 axially extend. Both are located to be radially offset with respect to the rotation axis 5 but extend parallel therewith. The pressure line 18 is supplied by means of a pressure connection 20 which is constructed as a rotary connection and which is connected via a transverse hole 21 to the pressure line 18. This pressure line 18 is connected to the annular space 10 axially opposite the connection 20 by means of the line connection 11.

In the receiving space 34, the rotary leadthrough 1 is supported and retained with the rotary neck 17 thereof axially adjacent to the clamping plane of the clamping elements 9 with respect to the upper side of the guide sleeve 8 by means of a bearing arrangement 22 which has two bearings 23 which are supported axially on each other and which are received in a mount 24. The mount 24 of the bearing arrangement 22 is retained in an axially clamped manner relative to a mount 25 of a sealing arrangement 26 which surrounds the rotary neck 17. In this sealing arrangement 26, there is formed a leakage collection space 27 which is located in the direction towards the rotary neck 17 in the covering region to form an overflow cross section 28 on the collection/leakage line 19 in the rotary neck 17. The

collection/leakage line 19 extends from the overflow cross section 28 to a connection 29 which further enables a return of any leakages or, as a preferred solution, also the arrangement of a sensor system which detects any leakages, where applicable also an optical display in the form of an inspection glass.

This last embodiment is particularly user-friendly, non-sensitive and practice-orientated and enables in particular the connection to the inspection glass by means of a trunk-like, flexible and preferably also transparent line in order to be able to identify leakage deviations from normal operation without difficulty and almost incidentally. Such an in particular trunk-like line, thus briefly such a leakage trunk, enables particularly varied positions of the inspection glass. Particularly in conjunction with relatively long line paths, it may also be advantageous to associate with the inspection glass a ventilation which has light suction and which does not impair the seal in practical terms.

The mounts 24 and 25 which together delimit an annular space 35 for receiving the sealing arrangement 26 against the rotary neck 17 also form, in the overlapping region thereof in which they are axially engaged with each other, boundaries for at least one collection pocket 30 which is radially open with respect to the wall 36 of the receiving space 34 and which has at least one joining connection 33 to the leakage collection space 27 so that leakages which occur via seals 31 which are arranged at the peripheral side with respect to the mounts 24 and 25 are also detected and supplied to the collection/leakage line 19.

In addition, in the embodiment and use of the rotary leadthrough 1 according to the invention it is possible for sealing gaps between components which are moved with respect to each other to be reduced to such an extent, that is to say, to be kept so small that any gaps relevant to leaks in the region of the rotary leadthrough 1 with respect to the guide sleeve 8 remain practically insignificant, in particular without perceptible and visible effects.

The sealing arrangement 26 preferably further comprises an annular seal 32 which is located in the radial annular gap between the rotary neck 17 and the mount 35 which receives the seal 26 and which forms a safeguard against short-circuit connections between the outlet of the pressure line 18 and the overflow cross section 28 which is axially offset relative thereto on the collection/leakage line 19.

10 The use of a rotary leadthrough 48 according to the invention in an operating unit with operating elements which are intended to be adjusted relative to each other is explained below in connection with Figure 5 with reference to construction types of fan wheels which are commercially available under the name  
15 CLEANFIX<sup>R</sup> and which are also mentioned in the introduction. The characterising features of these construction types are a central hub 42, fan blades which are radial with respect to the hub 42 which can be adjusted in terms of their setting angle and which are not shown in Figure 5 as operating elements, and a  
20 hydraulic adjustment device 40 which is received in the hub 42 for the fan blades. This adjustment device 40 requires a hydraulic rotary leadthrough 48 which can itself be rotated relative to the rotatable hub 42.

25 The adjustment device 40 comprises a setting piston 44 which is axially displaceable in a central receiving space 41 of the hub 42 and which can be adjusted counter to resilient force (springs 43) by means of hydraulic action and which in a cup-like configuration is located with the cup wall 45 thereof axially  
30 engaging relative to a dome 46 and which, at the base side with respect to the dome 46, delimits the working space 47 which is intended to be acted on hydraulically for the adjustment of the fan blades which are radial with respect to the hub 42.

35 The rotary leadthrough 48 has, in a similar manner to the embodiment according to Figure 4 to which reference is expressly made as a result of additional details which are illustrated and described therein, a rotary neck 49 which is retained in a

rotationally secure manner and supply lines 50 which extend through the rotary neck 49 in the form of a pressure line 59 and a collection/leakage line 58 so that various sealing boundaries are produced, on the one hand, axially between the dome 46 and the cup wall 45 of the setting piston 44 and, on the other hand, between the rotary neck 49 which is arranged in a rotationally secure manner and the housing 51 which can be rotated relative to the rotary neck 49 and through which the rotary neck 49 extends and which surrounds the rotary neck 49.

These sealing boundaries are, in accordance with the explanations relating to Figure 4, on the one hand formed by axially spaced apart seals 52, 53 between the peripheral wall of the dome 46 and the annular cup wall 45 of the setting piston 44, and, on the other hand, by the seal 54 between the dome 46 and the rotary neck 49 of the rotary leadthrough 48, which is rotatably supported with respect to the dome 46. The seal 54 which surrounds the rotary neck 49 delimits with respect to the rotary neck 49, in a similar manner to Figure 4, a leakage collection space 55 and this leakage collection space 55 is connected via at least one connection channel 56 to a transition space 57 between the seals 52 and 53 so that leakages which are intercepted by the seals 52, 53 and leakages which occur along the annular seal 54 with respect to the fixed rotary neck 49 are supplied to the leakage collection line 58 and can be discharged thereby. The structural configuration of the dome 46 with a separation plane which is located between the seals 52 and 53 relative to axially sequential portions of the dome 46 is advantageous with respect to the sealing arrangements and the configuration of the connection paths relative to the leakage collection space 55.

Figure 5 generally illustrates an advantageous development of the CLEANFIX<sup>®</sup> fan wheels known per se with regard to an extremely substantially leakage-free configuration of working units, which also include by way of example, in addition to the fan wheels and V-belt drives mentioned, inter alia machine tools in which spindle-side clamping devices are intended to be supplied or

supply lines for coolant and/or lubricant are provided.

## Patentkrav

1.    Hydraulisk drejegennemføring med central drejeaksel (5), med centreret over en lejeanordning (22) i et optagende hus (12, 51) drejeligt ført drejehals (17, 59), med i drejehalsen (17, 49) forløbende trykledning (18, 59), som udgående fra en tryktilslutning (20) munder ud på en frontside af huset (12, 51) på en over for liggende trykside af drejegennemføringen (1, 48) og med aksialt mellem tryksiden på drejegennemføringen (1, 48) og lejeanordningen (22) liggende tætningsanordning (26, 54), som omslutter drejehalsen (17, 49), og som afgrænser et lækagesamlerum (27, 55) mod drejehalsen, som er tilsluttet til en samleledning (19, 58), som i drejehalsen (17, 49), udgående fra samlerummet (27, 55), forløber hen mod frontsidens på huset (12, 51), som ligger over for tryksiden, idet trykledningen (18, 59) og samleledningen (19, 58) i drejehalsen (17, 49) er dannet parallelt forløbende gennem boringer i drejehalsen (17, 49), kendetegnet ved, at lejeanordningen (22) og tætningsanordningen (26) er optaget i aksialt på hinanden støttende fatninger (24, 25).

2.    Hydraulisk drejegennemføring ifølge krav 1, kendetegnet ved, at fatningerne (24, 25) er forbundet aksialt dækkende til en enhed.

3.    Hydraulisk drejegennemføring ifølge krav 1 eller 2, kendetegnet ved, at fatningerne (24, 25) via tætninger (31) langs med omkredsen er placeret i det optagende hus (12) på drejegennemføringen (1).

4.    Hydraulisk drejegennemføring ifølge et af de foregående krav, kendetegnet ved, at drejegennemføringen (1) er udformet som indsatspatron.

5.    Hydraulisk drejegennemføring ifølge krav 3 eller 4, kendetegnet ved,

at tætningsanordningen (26) er spændt op mod lejeanordningen (22) via en på tryksiden placeret fjederpakke.

6. Hydraulisk drejegennemføring ifølge et af de foregående krav,

kendetegnet ved,

at drejegennemføringen (1) er bestanddel af en arbejdsenhed med indbyrdes justerbare arbejdsselementer.

7. Hydraulisk drejegennemføring ifølge krav 6, kendetegnet ved,

at der som arbejdsenhed er tilvejebragt et remskivedrev (6), hvis indbyrdes justerbare arbejdsselementer er dannet af remskiver (2, 3), og hvor den ene af de hydraulisk aksialt indbyrdes justerbare remskiver (2, 3) danner det optagende hus (12) til drejegennemføringen (1).

8. Hydraulisk drejegennemføring ifølge krav 6, kendetegnet ved,

at arbejdsenheden er dannet af et ventilationshjul med centralt nav (42), af centralt i navet optaget drejegennemføring (48) og af i forhold til navet (42) radiale, i deres indfaldsvinkel justerbare ventilationsvinger, hvor navhuset (51) og justeringsstempet, som står i aktiv forbindelse med ventilationsvingerne, som indbyrdes justerbare arbejdsselementer er tilvejebragt som optag for et hydraulisk aksialt påvirket justeringsstempel (44).

9. Hydraulisk drejegennemføring ifølge krav 8, kendetegnet ved,

at navhuset (51) er udformet som kopformet optag til justeringsstempet (44), der har tætningsanordninger (52) til drejhalsen (49) og til kopvæggen (45).

10. Hydraulisk drejegennemføring ifølge krav 6, kendetegnet ved,

at drejegennemføringen (1) er tilvejebragt i tilslutning til et drejeligt drevet arbejdsselement, navnlig et drejeligt

arbejdsværktøj.

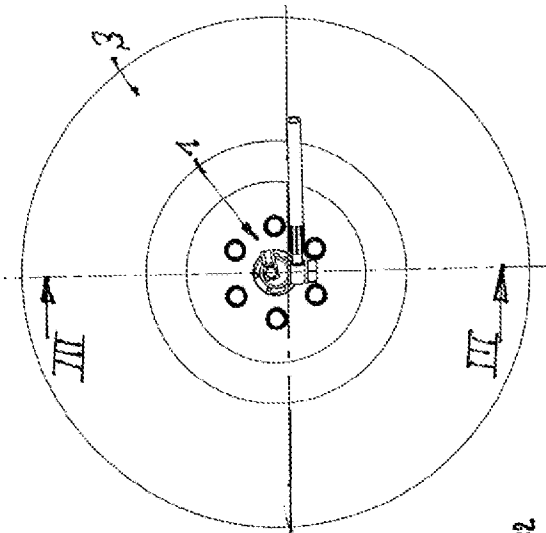


Fig. 2

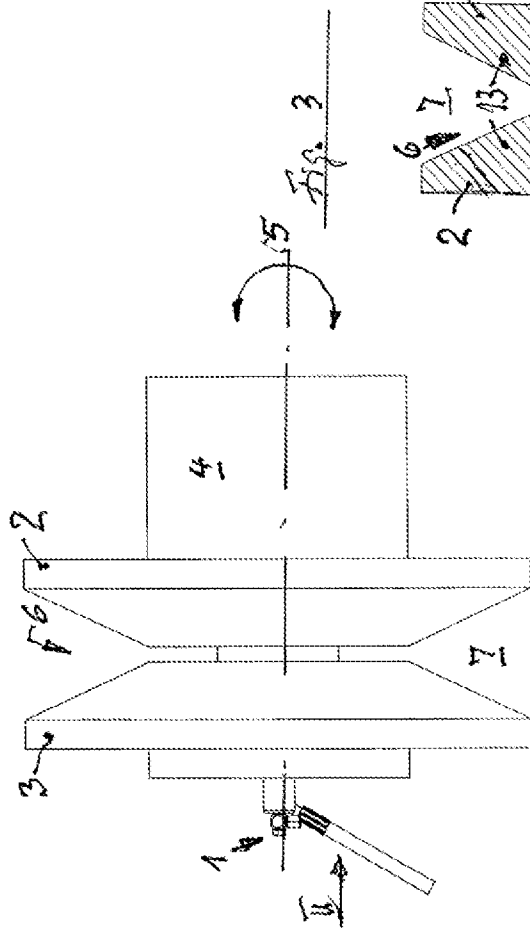


Fig. 3

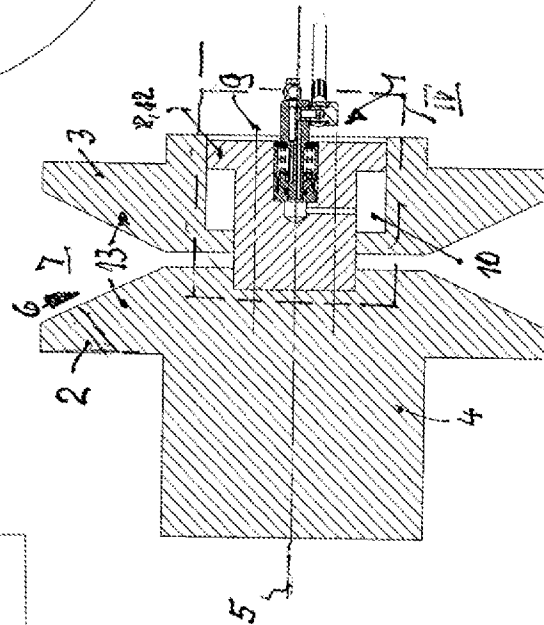


Fig. 1

