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Description

The present invention relates to a scraping device for cooperating with a peripheral surface of a structural member, such as a shaft, a spindle, or a cylinder, and having at least one scraping edge part, which is substantially parallel with or defines an acute angle (α) with the axial direction of the peripheral surface and is adapted to engage with such peripheral surface so as to scrape foreign matter therefrom when the structural member is rotated and/or moved axially relative to the scraping device.

In various kinds of machines, apparatuses or devices comprising a shaft, a spindle, or a similar structural element extending through a housing or chamber wall from one chamber to another and being rotated and/or moved axially in relation thereto, it may be necessary or desirable to remove foreign matter from the peripheral surface of the structural member prior to moving such surface through the wall part into or out of such chamber. Conventionally, such scraping function is obtained by means of an annular scraping device having an inner peripheral surface, which is complementary to and tightly engaging with the outer peripheral surface of the shaft or spindle to be scraped. One or both of the inner peripheral edges of the annular scraping device then serve as a scraping edge or edges extending in a plane substantially perpendicular to the axis of the annular scraping device. When the outer peripheral surface of the structural member to be scraped comprises surface parts defining an acute angle with the axis of the structural member, such as the opposite side surfaces of a thread formed at the outer peripheral surface of a threaded shaft or spindle, the conventional scraping device has proven inefficient and dissatisfactory, because foreign matter present on the outer peripheral surface of the shaft or spindle tends to become jammed between the annular scraping device and such surface parts of the shaft or spindle which are non-parallel with the axis thereof.

In a scraper assembly disclosed in EP-B1-0 071 332, which defines the closest prior art, the scraping edges are formed by an elastomeric material and pressed into engagement with the outer peripheral surface of a threaded spindle due to a radial compression of the elastomeric material. This means that the material forming the scraping edges is compressed and deformed, whereby the scraping edges perform a wiping rather than a scraping action. Consequently, they may be suited for removing oil and other liquid material, but not for scraping solid foreign material from the outer surface of the spindle or shaft.

US Patent no. 4,079,477 discloses a scraping device for removing soot and other foreign matter from annular channels formed in pistons. This known scraping device is formed as a ring in which rollers for engaging with the outer peripheral surface of the pis-

ton are mounted. The scraping device also comprises swingably mounted, spring biased scraping members extending into the annular channels. These scraping members have scraping edges extending substantially parallel with the axis of the ring-shaped scraping device.

The present invention provides an annular scraping device for encircling and cooperating with a outer peripheral surface of a structural member, such as a shaft or spindle, and having at least one scraping edge part, which is substantially parallel with or defines an acute angle with the axial direction of the peripheral surface and is adapted to engage with such peripheral surface so as to scrape foreign matter therefrom when the structural member is rotated and/or moved axially relative to the scraping device, which device is characterized in that the scraping edge part or each of the scraping edge parts is formed along one side of a projection extending axially from at least one end of the scraping device, and that the scraping device further comprises an elastic annular member for biasing the scraping edge part or parts into engagement with the outer peripheral surface of the structural member.

In contrast to the prior art, the scraping device of the invention comprises an elastic, separate, annular member for biasing the scraping edge part or parts into engagement with the outer peripheral surface part of the structural member, such as a shaft or spindle. This means that the scraping edges may be formed by a relatively hard material, such as PTFE or a similar plastic material. This, in combination with the fact that each of the scraping edge parts is formed along one side of a projection extending axially from an end surface of the scraping device, provides a scraping device capable of scraping not only oil and other liquids, but also ice, sand and other solid foreign materials from the outer surface of a shaft or spindle or a similar structural part.

The peripheral surface to be scraped and cleaned may be an inner peripheral surface, such as the peripheral wall of a plain or threaded bore, or an outer peripheral surface, such as the peripheral surface of a rod, a shaft or a spindle with a plain or threaded outer peripheral surface. The scraping device may comprise one or more scraping edge parts, and each of these edge parts may be assigned to and adapted to scrape specific parts of the peripheral surface to be scraped, for example the bottom and the top, respectively, of one or more threads. However, preferably the scraping edge parts will scrape in combination substantially the full profile of the thread.

Because the scraping edge part or parts extend(s) axially from at least one end of the scraping device, the peripheral surface of the structural member will pass the scraping edge part or parts and be scraped thereby before it comes into contact with the body member of the scraping device. This means that

jamming of foreign matter between the peripheral surface of the structural member and the adjacent surface of the scraping device can be avoided even when such surfaces are complementary and in tight engagement with each other. Because the axial projections on which the scraping edges are formed may be integral with the scraping device itself, the scraping device according to the invention may be relatively simple to manufacture.

In principle, the scraping device may have any suitable shape. Thus, when the scraping device is adapted to cooperate with an inner peripheral surface, such as a threaded bore, the scraping device may be formed like a solid or hollow stopper or shaft. In the preferred embodiment, however, the scraping device has an annular shape and is adapted to encircle the structural member, such as a shaft or a spindle, so as to engage with the outer peripheral surface thereof.

In a preferred embodiment, at least one end surface of the scraping device may define at least one substantially helical surface part, and the scraping edge part may then be formed by a step interconnecting adjacent ends of the helical surface part or parts. When a plurality of scraping edge parts are needed or desired, the helical surface parts and the scraping edge parts may define serration-like formations.

The scraping edge part or parts may extend in the axial direction of the peripheral surface to be scraped, and when the structural member is rotating in relation to the scraping device, the scraping edge parts will extend substantially perpendicular to the rotational direction. If, however, the scraping edge part defines an obtuse angle with the adjacent helical surface part, foreign matter scraped will tend to slide towards the free end of the scraping edge part, which means in an axial direction away from the scraping device.

The scraping device according to the invention may have a peripheral inner or outer surface cooperating with the peripheral outer or inner surface to be scraped. The interengaging surfaces of the scraping device and of the structural member may be substantially complementary, and the engagement may be more or less tight. However, it is important that the scraping edge parts are in sufficiently tight engagement with the peripheral surface of the structural member to remove foreign matters therefrom. This is obtained by providing an elastic annular element for biasing the scraping edge part or parts into engagement with an outer peripheral surface part of the structural member, such as an O-ring or a metal spring.

As mentioned above, the structural member is rotated and/or moved axially relative to the scraping device. Normally, the scraping device is fixed, for example in a wall part of a housing, while the structural member is being moved. However, it is also possible that the structural member is fixedly mounted, while

the scraping device is being moved, for example together with a housing or chamber in which the scraping device is mounted.

The scraping device may be made from an elastomeric plastic or a harder plastics material or from metal, and the scraping edge part or parts of the scraping device may be rather blunt. Preferably, however, the scraping edge parts are more or less sharpened.

The invention will now be further described with reference to the drawings, wherein

Fig. 1 is a side view and partially sectional view illustrating a first embodiment of the scraping device according to the invention cooperating with a threaded spindle,

Fig. 2 is a perspective view showing a spindle like that in Fig. 1 provided with a scraping device for the opposite direction of rotation,

Fig. 3 is a perspective view of the scraping device shown in Fig. 2, and

Fig. 4 is a side view showing a second embodiment of the scraping device according to the invention cooperating with a plain shaft.

Fig. 1 shows a shaft or a spindle 10, which has a threaded part 11 extending through an opening defined in housing walls 12 and 25, respectively. An annular scraping device 13 is mounted in the opening of the housing wall 12 by means of a locking ring 14 engaging with an annular channel 15 defined in the outer peripheral surface of the scraping device 13 and with an inner annular channel 16 defined in the housing wall 12. Fig. 2 shows the same as Fig. 1, but the scraping device 13 is adapted for rotation of the shaft or spindle 10 in opposite direction.

As indicated in Fig. 3, the inner peripheral surface of the scraping device 13 may be provided with internal threads 17 mating with the threads on the threaded part 11 of the spindle 10 extending therethrough. At least one end surface of the scraping device is provided with one or more scraping edge parts 18 and 19 extending between the adjacent ends of helical end surface parts 20. Each of the scraping edge parts may extend in a substantially axial direction of the annular scraping device 13 or of the spindle 10 surrounded thereby. Preferably, however, each of the scraping edge parts defines an acute angle α (Figs. 2 and 3) with such axial direction and an obtuse angle with a plane extending at right angles to the axial direction and preferably also with the adjacent helical surface part 20. The scraping edge parts 18 and 19 are the inner edges of connecting surface parts 21 connecting the helical end surface parts 20. While these connecting surface parts 21 may extend substantially along axial planes, they are preferably chamfered or bevelled so as to define relatively sharp scraping edge parts. An O-ring 26 mounted in the opening defined by the housing wall 25 is biasing the scraping edge parts 18 and 19 into engagement with

the outer peripheral surface of the spindle 10. In the embodiments shown in Figs. 1-3 the scraping edge parts 18 and 19 have a profile so as to tightly engage with the tops 22 and the bottoms 23 of the thread formed on the threaded part 11 of the spindle 10. When the spindle 10 is rotating in the directions indicated by arrows in the drawings, the scraping edge parts 18 and 19 will efficiently scrape foreign matter, such as ice, oil, sand, dirt, etc., from the outer peripheral surface of the threaded part 11 of the spindle whereby such foreign matter is prevented from being transferred from one side of the housing wall 12 to another.

In the embodiment shown in Fig. 4, the shaft 10 has a plain outer cylindrical surface, and the annular scraping device 13 has a corresponding plain inner cylindrical surface. This embodiment comprises only one scraping edge part 24 connecting adjacent ends of a single substantially helical end surface part 20. The scraping device 13 shown in Fig. 4 could be mounted in a housing wall in a manner similar to that shown in Fig. 1, and the shaft 10 could be rotated and possibly also moved axially in relation to the scraping device 13. Alternatively, the shaft 10 could be stationary mounted whereas the scraping device 13 could be moved in relation to the shaft 10.

The shaft or spindle 10 is normally made from steel or another metal but could also be made from plastic, such as fiber reinforced plastic. The scraping device 13 is normally made from plastic but could alternatively be made from metal, such as aluminum, copper, brass or bronze. Alternatively, the scraping device may mainly be made from plastic while only the scraping edge parts are made from metal, or vice versa.

As an example, the scraping device according to the invention could be used in connection with spindles, shafts and rods used in force transmitting mechanisms in aircraft, ships and other vehicles, where such shafts or spindles are exposed to temperature and humidity conditions which are likely to cause deposition of ice. However, the scraping device according to the invention could be used for removing any other type of foreign matter from the inner or outer peripheral surface of a structural member of the above mentioned type.

It should be understood that various modifications of the embodiments described above and shown in the drawings could be made within the scope of the claims. As an example, both end surfaces of the annular scraping device could be provided with scraping edge parts. These scraping edge parts could, for example, be defined on serration-like projections or other projections formed on the end surface or end surfaces of the annular scraping device.

Claims

1. An annular scraping device for encircling and cooperating with a outer peripheral surface of a structural member (10), such as a shaft or spindle, and having at least one scraping edge part (18, 19, 24), which is substantially parallel with or defines an acute angle (α) with the axial direction of the peripheral surface and is adapted to engage with such peripheral surface so as to scrape foreign matter therefrom when the structural member is rotated and/or moved axially relative to the scraping device, **characterized** in that the scraping edge part or each of the scraping edge parts (18, 19, 24) is formed along one side of a projection extending axially from at least one end of the scraping device, and that the scraping device further comprises an elastic annular member (26) for biasing the scraping edge part or parts into engagement with the outer peripheral surface of the structural member.
2. A scraping device according to claim 1, wherein at least one end surface of the scraping device defines at least one substantially helical surface part (20), each scraping edge part (18, 19, 24) being formed by a step (21) interconnecting adjacent ends of the helical surface part or parts (20).
3. A scraping device according to claim 2, wherein the scraping edge part (18, 19, 24) defines an obtuse angle with the adjacent helical surface part (20).
4. A scraping device according to any of the claims 1-3 for cooperating with a threaded structural member (10), wherein the scraping edge parts (18, 19, 24) are adapted to engage with the top and bottom surfaces (22 and 23), respectively, of the thread.
5. A scraping device according to any of the claims 1-4, which is adapted to be fixedly mounted in a wall part (12) of a housing.
6. A scraping device according to any of the claims 1-5, which is made from plastics material.
7. A scraping device according to any of the claims 1-6, wherein the elastic annular member is an O-ring.
8. A scraping device according to any of the claims 1-6, wherein the elastic annular member is a metal spring.

Patentansprüche

1. Ringförmige Abstreifvorrichtung zum Umschließen und Zusammenwirken mit einer äußeren Umfangsfläche eines Bauteils (10), wie z.B. einer Welle oder einer Spindel, welche Abstreifvorrichtung mindestens eine Abstreifkante (18, 19, 24) aufweist, die im wesentlichen parallel zur axialen Ausdehnung der Umfangsfläche ist oder einen spitzen Winkel (α) dazu bildet und geeignet ist, bei Berührung mit der Umfangsfläche Fremdstoffe von ihr abzustreifen, während das Bauteil rotiert und/oder sich relativ zur Abstreifvorrichtung axial bewegt, dadurch gekennzeichnet, daß die Abstreifkante oder jede der Abstreifkanten (18, 19, 24) an einer Seite eines Vorsprunges ausgebildet ist, der sich in axialer Richtung an mindestens einer Seite der Abstreifvorrichtung erstreckt, und daß die Abstreifvorrichtung außerdem ein ringförmiges, elastisches Bauteil (26), das die Berührung der Abstreifkante oder Abstreifkanten mit der äußeren Umfangsfläche des Bauteils voreinstellt, enthält. 5
2. Abstreifvorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß mindestens eine Stirnseite der Abstreifvorrichtung im wesentlichen als wendelförmiges Teil (20) ausgebildet ist und daß jede Abstreifkante (18, 19, 24) derart als Stufe (21) ausgebildet ist, daß sie die benachbarten Enden des wendelförmigen Teils oder der Teile (20) miteinander verbindet. 10
3. Abstreifvorrichtung nach Anspruch 2, dadurch gekennzeichnet, daß die Abstreifkante (18, 19, 24) einen stumpfen Winkel mit dem angrenzenden gewendelten Teil (20) bildet. 15
4. Abstreifvorrichtung nach einem der Ansprüche 1 bis 3 für das Zusammenwirken mit einem mit Gewinde versehenen Bauteil (10), dadurch gekennzeichnet, daß die Abstreifkanten (18, 19, 24) so ausgebildet sind, daß sie die oberen bzw. die unteren Flächen (22 und 23) des Gewindes berühren. 20
5. Abstreifvorrichtung nach einem der Ansprüche 1 bis 4, dadurch gekennzeichnet, daß sie für eine Montage in einer Gehäusewand (12) ausgebildet ist. 25
6. Abstreifvorrichtung nach einem der Ansprüche 1 bis 5, dadurch gekennzeichnet, daß sie aus Kunststoff besteht. 30
7. Abstreifvorrichtung nach einem der Ansprüche 1 35

bis 6, dadurch gekennzeichnet, daß das elastische Bauteil ein O-Ring ist.

8. Abstreifvorrichtung nach einem der Ansprüche 1 bis 6, dadurch gekennzeichnet, daß das elastische Bauteil eine Metallfeder ist. 40

Revendications

1. Dispositif de raclage annulaire destiné à encercler et à coopérer avec une surface périphérique extérieure d'un élément de structure (10), tel qu'un arbre ou une broche, et possédant au moins une portion d'arête raclante (18, 19, 24) qui est sensiblement parallèle à la direction axiale de la surface périphérique ou définit un angle aigu (α) avec cette direction et est agencée pour venir en contact avec une telle surface périphérique, de manière à en enlever par grattage la matière étrangère lorsque l'élément de structure est tourné et/ou déplacé axialement par rapport au dispositif de raclage caractérisé en ce que la portion d'arête raclante ou chacune des portions d'arête raclantes (18, 19, 24) est formée le long d'un côté d'une saillie s'étendant axialement à partir d'au moins une extrémité du dispositif de raclage, et que le dispositif de raclage comprend en outre un élément élastique annulaire (26) pour appliquer la portion d'arête raclante ou les portions d'arête raclantes élastiquement contre la surface périphérique extérieure de l'élément de structure. 45
2. Dispositif de raclage selon la revendication 1, dans lequel au moins une surface d'extrémité du dispositif de raclage définit au moins une partie de surface (20) sensiblement en hélice, chaque portion d'arête raclante (18, 19, 24) étant formée par un gradin (21) reliant entre elles des extrémités adjacentes de la partie de surface ou des parties de surface (20) en hélice. 50
3. Dispositif de raclage selon la revendication 2, dans lequel la portion d'arête raclante (18, 19, 24) définit un angle obtus avec la partie de surface en hélice (20) adjacente. 55
4. Dispositif de raclage selon l'une quelconque des revendications 1-3 et destiné à coopérer avec un élément de structure (10) fileté, dans lequel les portions d'arête raclantes (18, 19, 24) sont agencées pour venir en contact respectivement avec les surfaces de sommet et de fond (22 et 23) du filet. 60
5. Dispositif de raclage selon l'une quelconque des revendications 1-4 et agencé pour être monté fixe 65

dans une partie de paroi (12) d'un carter.

6. Dispositif de raclage selon l'une quelconque des revendications 1-5 et réalisé en matière plastique.

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7. Dispositif de raclage selon l'une quelconque des revendications 1-6, dans lequel l'élément élastique annulaire est un joint torique.

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8. Dispositif de raclage selon l'une quelconque des revendications 1-6, dans lequel l'élément élastique annulaire est un ressort métallique.

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