

EUROPEAN PATENT APPLICATION

Application number: **89116847.8**

Int. Cl.⁵: **B08B 1/02**

Date of filing: **12.09.89**

Priority: **14.09.88 DK 5112/88**

Date of publication of application:
21.03.90 Bulletin 90/12

Designated Contracting States:
AT BE CH DE ES FR GB GR IT LI LU NL SE

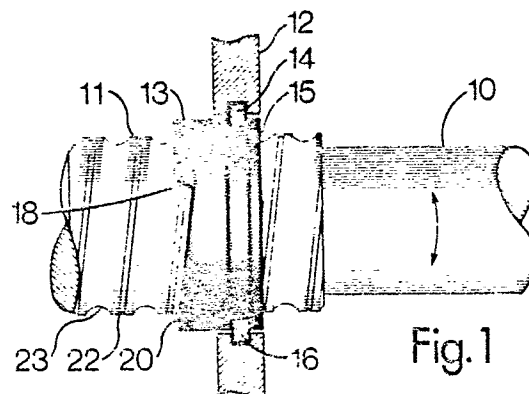
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A scraping device for a spindle or a shaft.

A scraping device (13) having one or more scraping edge parts (18) is adapted to scrape ice, oil, sand and other foreign matter from a peripheral surface of a structural member, such as a shaft or a spindle (10) which may be threaded (11). The scraping device may for example have an annular shape and encircle the shaft or spindle, and the end surfaces of the device may form substantially helical surface parts (20), the adjacent ends thereof being connected by a step on which the scraping edge part (18) is formed. One or more scraping edge parts may be formed on one of the end surfaces or on each end surface. For example, at least one of the end surfaces of the scraping device may have two scraping edge parts, one of which being adapted to engage with the top (22) of the thread, the other one being adapted to engage with the bottom (23) of the thread.



A SCRAPING DEVICE FOR A SPINDLE OR A SHAFT

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.

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 piston 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 parallelly with the axis of the ring-shaped scraping device.

The present invention provides a scraping device of the type described above which may effi-

ciently scrape threaded inner and outer peripheral surfaces of a structural member. The scraping device according to the invention 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.

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 may, for example, be 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 a housing wall 12. 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 there through. 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. 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 stationarily 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 present invention. 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. A scraping device for cooperating with a peripheral surface of a structural member (10) 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.

2. A scraping device according to claim 1, **characterized** in that the scraping device has an annular shape and is adapted to encircle the structural member (10), such as a shaft or spindle, so as to engage with the outer peripheral surface thereof.

3. A scraping device according to claim 1 or 2, **characterized** in that at least one end surface of the scraping device defines at least one substan-

tially helical surface part (20), the scraping edge part (18, 19, 24) being formed by a step (21) interconnecting adjacent ends of the helical surface part or parts (20).

4. A scraping device according to claim 3,

characterized in that the scraping edge part (18, 19, 24) defines an obtuse angle with the adjacent helical surface part (20).

5. A scraping device according to any of the claims 1-4 for cooperating with a threaded structural member (10),

characterized in scraping edge parts (18, 19, 24) adapted to engage with the top and bottom surfaces (22 and 23), respectively of the thread.

6. A scraping device according to any of the claims 2-5,

characterized in comprising an elastic annular member for biasing the scraping edge part or parts into engagement with the outer peripheral surface part of the structural member.

7. A scraping device according to any of the claims 2-6,

characterized in that it is adapted to be fixedly mounted in a wall part (12) of a housing.

8. A scraping device according to any of the claims 1-7,

characterized in that it is made from plastics material.

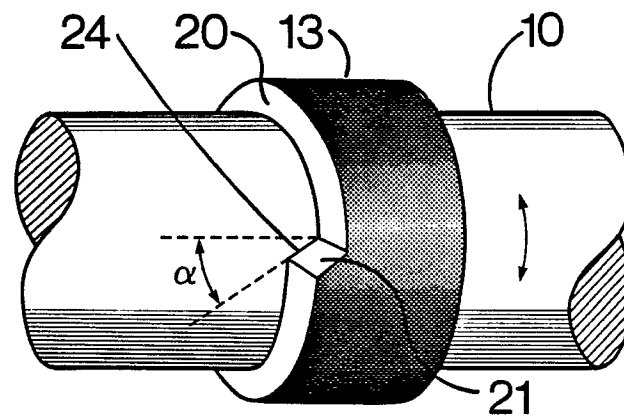
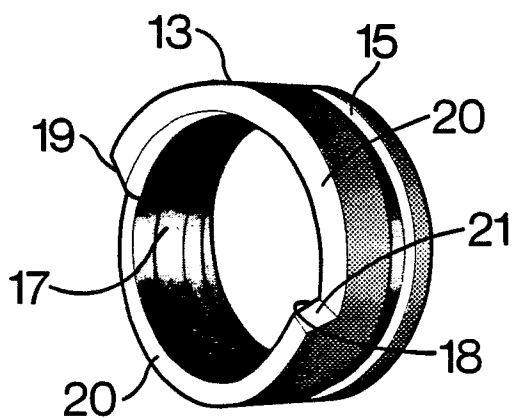
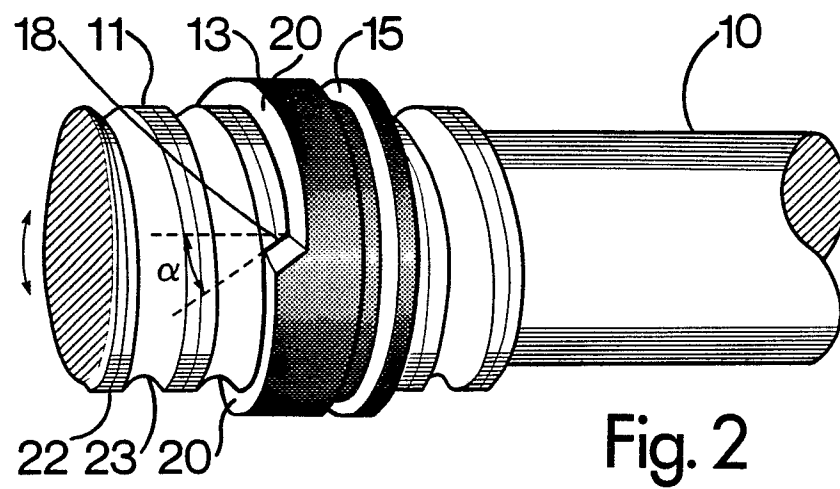
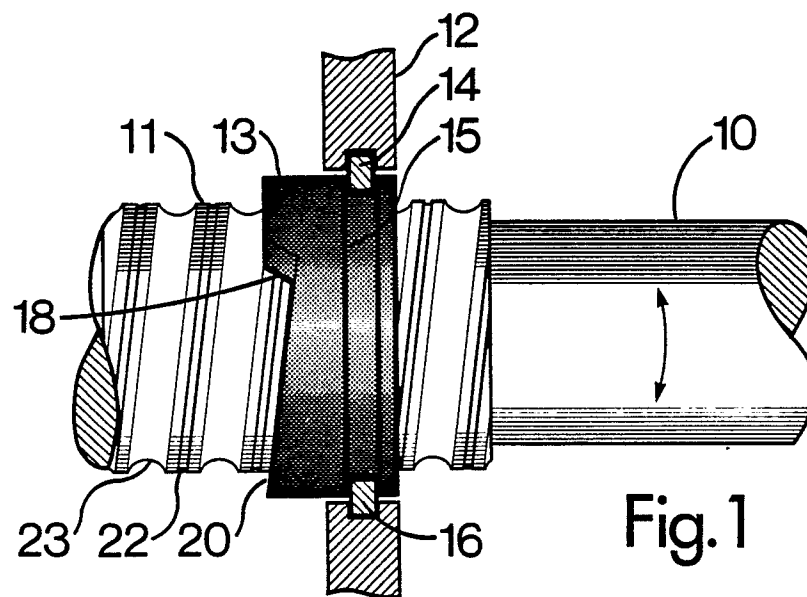
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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. 4)
X	US-A- 4 079 477 (HELT ET AL) *Column 1, line 52 - column 2, line 26* ---	1,2	B 08 B 1/02
X	GB-A- 2 149 459 (J. HOWDEN & CO LTD) *See whole document* ---	1	
X	GB-A- 2 194 614 (FUSION EQUIPMENT LTD) *See whole document* ---	1	
X	SE-B- 441 418 (ELOFSON) *See abstract* ---	1	
A	EP-A1-0 243 197 (MIDLAND DYNAMO) *Column 4, lines 23-28* ---	1-8	
A	EP-A1-0 081 636 (CARL FREUDENBERG) ---	1-8	
A	DE-C- 2 716 608 (VNIISPTNEFT) ---	1-8	TECHNICAL FIELDS SEARCHED (Int. Cl. 4)
A	US-A- 4 621 386 (HIU) -----	1-8	B 08 B F 15 B F 16 N F 16 J
The present search report has been drawn up for all claims			
Place of search STOCKHOLM		Date of completion of the search 29-11-1989	Examiner PETERSON H.
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding			