Sept. 22, 1925. 1,554,536

E. H. TARTRAIS

PACKING ARRANGEMENT FOR ENGINE OR PUMP PISTONS

Filed April 1, 1924 2 Sheets-Sheet 1

Fig.1

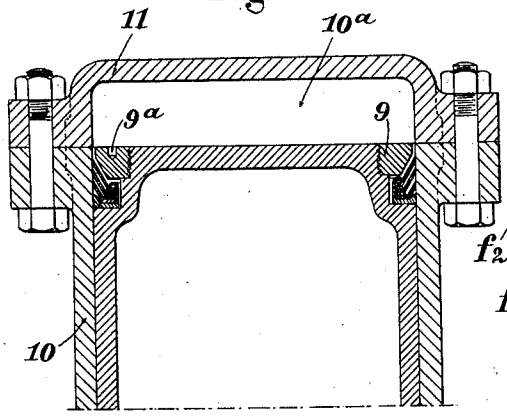


Fig.3

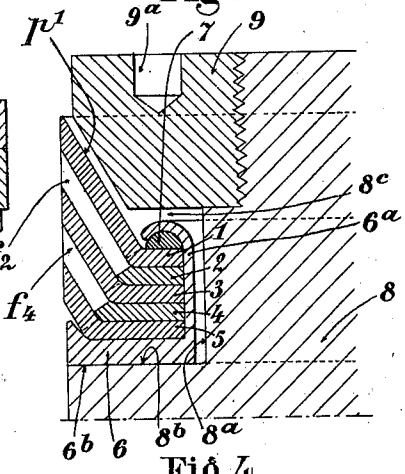


Fig.2

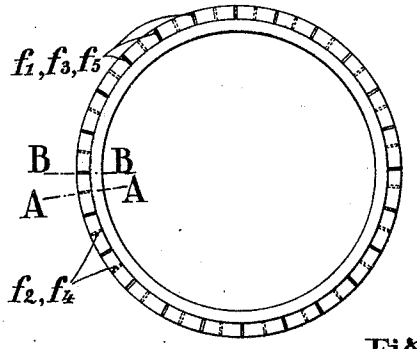


Fig.4

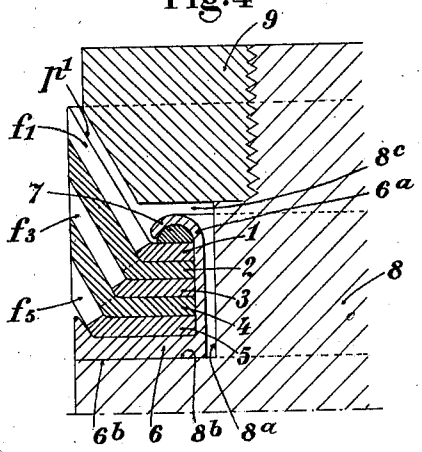
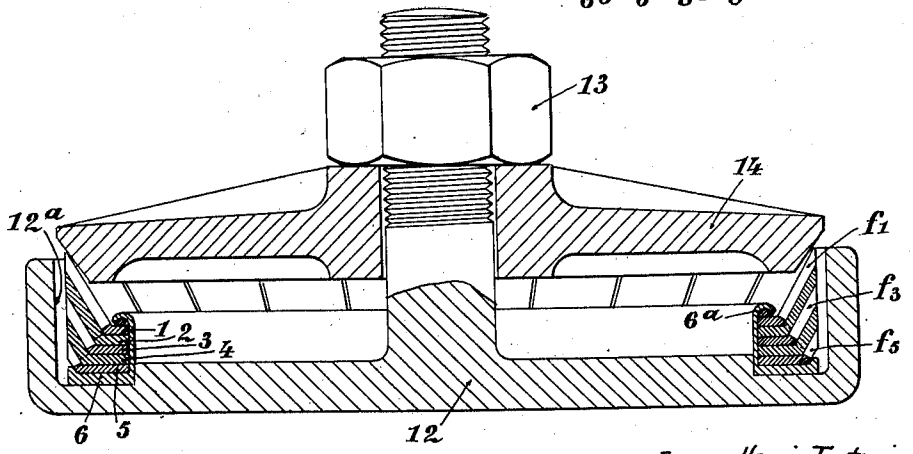


Fig.5



Eugene Henri Tartrais
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Fig.6

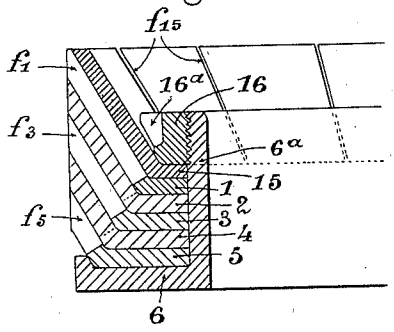


Fig.7

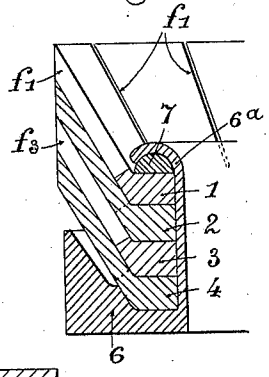


Fig.9

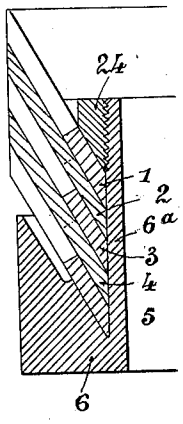


Fig.8

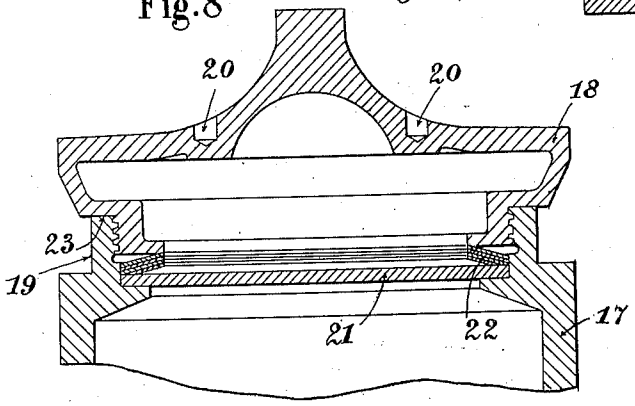


Fig.10

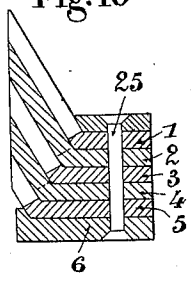


Fig.11

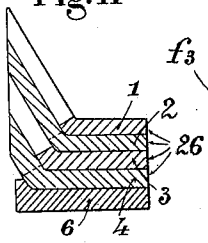


Fig.12

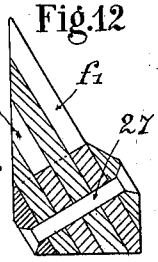


Fig.13

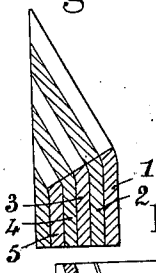


Fig.16

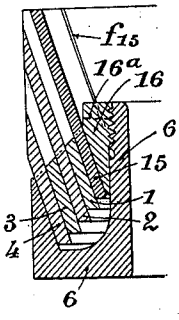


Fig.14

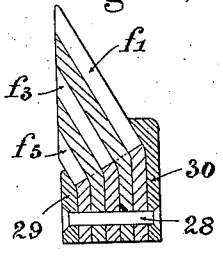
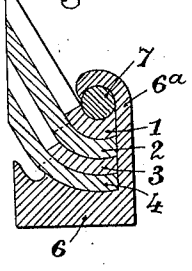


Fig.15



Eugene Henri Tartrais
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by Otto Munk
his
Attorney

Patented Sept. 22, 1925. 1,554,536

UNITED STATES PATENT OFFICE.

EUGÈNE HENRI TARTRAIS, OF MAISONS-LAFFITTE, FRANCE.

PACKING ARRANGEMENT FOR ENGINE OR PUMP PISTONS.

Application filed April 1, 1924. Serial No. 703,484.

To all whom it may concern:

Be it known that I, EUGÈNE HENRI TARTRAIS, a citizen of the French Republic, residing at Maisons-Laffitte, Seine-and-Oise, in the French Republic, have invented new and useful Improvements in Packing Arrangements for Engine of Pump Pistons, of which the following is a specification.

The fluidtight packing arrangement constituting the object of my invention will, although of a metallic nature, operate after the manner of stamped plastic material such as stamped leather, and will hence possess the qualities inherent in stamped plastic devices, i. e. the device is fluidtight and is unaffected by the ovalization of the cylinders, while it has the additional property of withstanding the effects of high temperatures and high speeds.

My said packing arrangement, as applicable to engine or pump pistons, consists of dish-shaped elements—having the shape of stamped leather discs—which are made elastic by means of radial slots provided around the periphery of each element, and in order to prevent all leakage through the said slots the several elements are fitted into each other with the slots in a staggered or baffle disposition.

In the appended drawings which are given by way of example and illustrate my invention:

Fig. 1 shows a complete packing device according to the invention, mounted upon the piston, the Figure being a sectional view on the axis of the piston, the cylinder being of the type with removable cylinder head.

Fig. 2 is a plan view of the said packing device.

Fig. 3 is a view on a larger scale showing a portion of a transverse section of the said packing device mounted on the piston, the section being taken on the line A—A (Fig. 2).

Fig. 4 is a section on the line B—B (Fig. 2).

Fig. 5 is a section of the apparatus used in order to expand the said elements to the proper size after they have become worn down.

Fig. 6 is a sectional view of a modification of the packing device.

Fig. 7 shows another modification of the said packing device.

Fig. 8 shows the arrangement of a piston having a removable piston head disposed in such manner as to receive the packing device according to the invention.

Figs. 9 to 16 are modifications of the assembling arrangement of the several elements composing the said packing device.

In the construction illustrated in Figs. 1 to 4, the packing device comprises five dish-shaped metallic elements or discs 1, 2, 3, 4, 5 which are accurately fitted within each other; the number 5 is of course arbitrary, and a greater or less number of elements may be used; the latter are provided with the respective slots f_1, f_2, f_3, f_4, f_5 (Figs. 2, 3 and 4) in staggered or baffle disposition whereby all leakage in the device is obviated.

The said elements are mounted in a suitable supporting ring 6, and the thin part 6^a of the latter is pressed around a ring 7 of hard metal, so that the aggregate composed of the elements and rings will form a compact device: the latter is mounted in a groove 8^a formed in the piston 8 between the main body of the piston and a screwthreaded ring 9 screwed upon the piston (the said ring can be otherwise secured to the piston); the ring can be screwed or unscrewed by means of the recesses 9^a. In this manner, the packing device as a whole is movoble in the groove 8^a of the piston.

The operation is as follows. The packing device is so disposed that the edges of the disc elements 1, 2, 3, 4, 5 will fit with a certain pressure within the cylinder 10, and on the other hand the several tongues formed by the parts of the discs situated between the slots will be somewhat elastic and will thus fit in a very accurate manner against the internal wall of the cylinder. Should the pressure rise in the cylinder chamber 10^a, the fluid under pressure will act upon the inner wall p_1 of the upper disc and will press it with greater force against the cylinder. At the same time this pressure exercised upon the top of the packing device will apply it in a fluidtight manner upon the lower face 8^b of the groove 8^a. The face 8^b and the corresponding face 6^b of the piece 6 are carefully ground flat, so that all leakage is obviated. On the other hand, no leakage will occur through the slots nor between the discs, since the discs are well adjusted within each other and the slots have the staggered disposition.

The play which is allowed for the said

packing device in the piston groove 8a provides for the expansion of the piston, and the piston wall itself is thus caused to bear upon the cylinder and not through the medium of the packing device. In order to obviate all friction between the tongues of the said discs, which should slide upon each other to a slight degree after the manner of spring plates, when the discs are obliged to assume the shape corresponding exactly to a given surface of the cylinder, it is advisable to interpose between the discs a lubricating substance having graphite as a base.

The packing according to the invention is particularly designed to be used in combination with a removable cylinder head 11, Fig. 1, and the packing can thus be readily removed for repairs or renewal without being obliged to take off the cylinder. Only the cylinder head 11 has to be removed and the ring 9, and the packing device can be readily taken off.

If the packing device has lost its elasticity by reason of wear, it will suffice to spread it out by hand or by means of a special apparatus shown in Fig. 5 comprising a member 12 in which the said packing device is disposed. The nut 13 is employed to screw down the tapered washer 14 whereby the tongues of the said packing device are spread out until the tongues of the upper disc 1 come into contact with the cylindrical portion 12a of the member 12 whereby the spreading of the device is limited to the proper degree. The said device is then replaced within the cylinder. Obviously the packing device according to the invention can be used in a cylinder which is not provided with a removable head.

In the packing device shown in Fig. 3, the discs 1 to 5 are made of a metal which has a sufficient elasticity for the purpose. But in the present state of matallurgy, it is difficult to obtain this quality concurrently with a great resistance to wear and a small coefficient of friction. As concerns friction, it is advisable to use for example the alloy of aluminium and silicon which is known as "Alpax" metal, whose qualities as concerns friction are comparable to the known anti-friction alloys.

But the elasticity of discs made of a metal withstanding wear and having a small friction coefficient may be insufficient for the purpose, and in this event it is advisable to make the upper disc, Fig. 6, of a different metal so that the said disc will serve solely as a spring; steel is preferably employed for this purpose whose temper is unaffected by heat. 1, 2, 3, 4, 5 are the discs made of a metal having a small coefficient of friction, and below the said discs is disposed the elastic metal disc 15 which is slotted like the other discs at *f* 15; since the latter disc has no fluidtight effect, it is given a smaller diameter than the other discs so that it will not come into contact with the walls of the cylinder.

Fig. 6 also shows a modified method of securing the discs to the ring 6. The parts are not assembled by pressing but by screwing by means of the ring 16 provided with recesses 16a for a claw wrench. This allows the disc 15 to be separately removed so that it can be adjusted to the proper tension without pressing upon the whole device. When put in place, the adjusted spring disc 15 will suitably expand the entire device. Obviously, the arrangement comprising the screwed ring can be used for the devices shown in Figs. 1 to 4 in which the spring disc is not employed, the discs 1 to 5 being exactly similar; in this case the ring 7 is dispensed with.

Fig. 7 shows another modification of the packing device in which the discs 1 to 4 are similar, except as concerns the slots which in this, as well as in the other cases, may be provided in different number; for example the disc 4 may have a less number of slots, for instance one-half, in order to prevent the disc from catching in the orifices of the cylinder when the latter is apertured as in the case of a two-stroke engine. On the other hand, in Figs. 1 to 4 a certain play has been left between the upper part 6a of the said packing device and the ring 9. This arrangement is chiefly used for high compression two-stroke engines of the Diesel type or like engines in which the pressure exercised on the packing device and urging it upon its seat 8b is in all cases superior to the force of inertia acting upon the device and tending to lift the same from its seat. In case the compression of the engine should not be sufficient, the play could be reduced to a minimum value, e. g. two or three hundredths of a millimetre, according to the current practice for adjusting the packing members of the known types, whereby the exact lateral movement is allowed while preventing any motion in the axial direction. In the example herein represented, the relatively great play 8c is allowed solely for the purpose of obviating accurate machine work.

In the construction illustrated in Figs. 1 to 4, the said packing device is maintained in position by a ring 9 which is secured to the piston head 8. But the said device may also be maintained by the head or top of the piston itself, in the cases in which the said head is removably secured to the piston for other reasons.

Fig. 8 illustrates this disposition, comprising the piston 17, its head 18 which is screwed thereto, and the groove 19 analogous to the groove 8, (Fig. 3) in which is engaged the said packing device, not shown. As in the high compression two-stroke engines, the gas pressure upon the part 18 will always

urge the latter upon the piston, a very strong screwing is not required, and this operation can be performed by means of a claw wrench engaging the recesses 20 or the like. The double bottom 21 may be held in place for instance by a spring element 22 composed of a plurality of thin spring washers, which have exactly the necessary force to maintain the double bottom 21 without requiring a strong screwing action by means of the wrench. This said spring element, also constitutes a locking device for the nut and thus prevents the head from unscrewing by reason of jarring effects. The screw-thread and the surface of the joint 23 are carefully ground and should be lubricated with graphite in order that the head may be easily removed. To further this latter operation, I preferably make use of non-rusting metals, such as nichrome metal for the head 18 and aluminium for the piston 17.

Figs. 9 to 15 relate to various means for assembling the said discs forming the packing device.

Fig. 9 shows an arrangement in which the said elements are of an exclusively conical shape, thus facilitating the adjustment, since all that is required for an exact fitting is that the angle of the cones shall be exactly the same. The elements are mounted on the ring 6 by means of a screw ring 24.

In Fig. 10, the said elements are assembled by means of the rivets 25, and in Fig. 11 they are soldered upon their inner face 26 the ring 6 having no upwardly extending portion 6^a such as that shown in Fig. 3.

In the device shown in Fig. 12, the said elements are riveted obliquely by means of the rivets 27. In Fig. 13 the elements are constituted by split members of a cylindro-conical shape; said members may be simply fitted by pressure or may be soldered at their lower edge, or they may be held as shown in Fig. 14 between rings 29 and 30 by rivets 28.

Fig. 15 represents an arrangement for assembling the said elements, whereby the latter are secured in an efficient manner. Fig. 16 shows a modification in which the arrangements shown in Figs. 6 and 9 are combined.

Obviously, the invention is not limited to the hereinbefore described forms of construction which are given solely by way of example, and it is evident that in all cases the said forms can be more or less combined with each other.

Having now described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A packing arrangement for pistons comprising a plurality of dish shaped annular discs of a material having a small friction coefficient and fitted into each other, a similarly shaped elastic annular disc fitted into the innermost of said first mentioned discs and adapted to press the latter discs upon one another and to expand the same and means for holding said discs together.

2. A packing arrangement for pistons comprising a plurality of dish shaped annular discs of a material having a small friction coefficient and fitted into each other, a similarly shaped elastic annular disc fitted into the innermost of said first mentioned discs and adapted to press the latter discs upon one another and to expand the same, a ring extending through the central hole of said discs and adapted to clamp inner edges of the same.

3. A packing arrangement for pistons comprising a plurality of dish shaped annular discs of a material having a small friction coefficient provided with radial slots, said slots being in staggered position with respect to those of the adjacent discs, and fitted into each other, a similarly shaped elastic annular disc fitted into the innermost of said first mentioned discs and adapted to press the latter discs upon one another and to expand the same and means for holding said discs together.

4. A packing arrangement for pistons comprising a plurality of dish shaped annular discs of a material having a small friction coefficient having bevelled outer edges forming the contact surface and fitted into each other, a similarly shaped elastic annular disc fitted into the innermost of said first mentioned discs and adapted to press the latter discs upon one another and to expand the same and means for holding said discs together.

5. In combination with a piston for motors, pumps and the like, a circular groove provided near the operative end of the piston, a plurality of dish shaped annular elastic discs fitted into each other and means for clamping the inner edges of said discs and adapted to be mounted within said groove.

6. In combination with a piston for motors, pumps and the like, a circular groove provided near the operative end of the piston, a plurality of dish shaped annular elastic discs fitted into each other and a ring extending through the central hole of said discs and clamping the inner edges of the same, said ring being contained within said groove.

7. In combination with a piston for motors, pumps and the like, a circular groove formed near the operative end of the piston, a ring screwed to the piston head and forming the upper wall of said groove, a plurality of dish shaped annular elastic discs fitted into each other and means for clamping the inner edges of the same, said inner edges being freely contained within said groove.

8. In combination with a piston for motors, pumps and the like and comprising a piston body and a removable head, a circular groove formed between the end of the piston body and the removable head, a plurality of dish shaped annular elastic discs fitted into each other and means for clamping the inner edges of the same, said inner edges being freely contained within said groove.

In testimony whereof I have signed my name to this specification.

EUGÈNE HENRI TARTRAIS.