F. W. HOWARD.

FOUNTAIN PEN.

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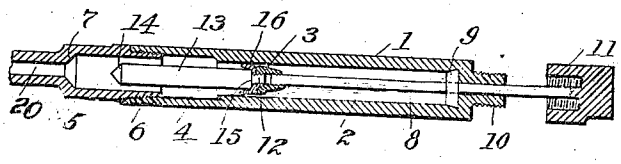
1,068,402.

Patented July 22, 1913.

Fig. 1



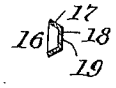


Fig. 2

WITNESSES:

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FOUNTAIN-PEN.

1,068,402. Specification of Letters Patent. Patented July 22, 1913.

Application filed March 2, 1912. Serial No. 681,121.

To all whom it may concern:

Be it known that I, FRANK W. HOWARD, a citizen of the United States, and resident of New York city, in the county of New York and State of New York, have invented certain new and useful Improvements in Fountain-Pens, of which the following is a specification.

This invention relates to fountain pens and is particularly applicable to fountain pens of the self-filling type.

The barrel of the pen is provided with a moving piston or plunger which is advanced in the barrel when the pen is to be filled in order to create a partial vacuum within the barrel into which the ink flows. In order to produce the partial vacuum effectively, it is necessary to provide an efficient packing for the plunger or piston which will prevent the leakage of air past the plunger in the working stroke of the plunger. This packing necessarily comes in contact with the ink and is subject to the destructive action of the acids in the ink. It has been attempted to utilize leather as a material for this packing but the leather is attacked and destroyed by the ink.

The object of this invention is to produce a packing for the plunger which will resist the destructive action of the ink and at the same time which will be soft and pliable and give an efficient air-tight action of the plunger on the working stroke and permitting leakage of air past the plunger on the reverse movement or withdrawal of the plunger.

The invention resides in the packing substance or material with which I pack the plunger.

In the drawing which fully illustrates my invention, Figure 1 is a longitudinal central section through a fountain pen of the type referred to above, and provided with a plunger or piston having a packing of my invention. Fig. 2 is a central section through the packing or packing washer showing the same removed from the plunger.

The fountain pen comprises a barrel or ink reservoir 1, having a longitudinal bore 2 in which the plunger 3 moves longitudinally, and near the forward end the bore 2 communicates with a chamber 4 of enlarged diameter. The forward end of nozzle 5 of the pen has a threaded connection 6 with the barrel 1, and is provided with a conical seat 7. The plunger or piston 3 is moved along in the barrel by means of a stem 8 which passes out through the butt end of the pen, at which point suitable packing 9 is provided. The butt end of the pen is provided with a threaded nipple 10 upon which screws a cap 11 which is rigid with the stem and may be formed integral therewith as shown. The body of the plunger 3 is of slightly tapered conical form as shown, the reduced end of the plunger being disposed toward the butt end of the pen. The forward side of the plunger 3 receives a threaded nipple 12 which is formed on the rear end of a valve or plug 13 having a conical point 14 adapted to come upon the seat 7. The stem 8 has a threaded engagement with the rear or reduced end of the plunger 3.

By reason of the reduced diameter of the nipple 12 an annular shoulder 15 is formed on the plug or valve 13 and on this shoulder is received my packing 16, which is in the form of a cup-shaped washer, as indicated most clearly in Fig. 2. This washer has an annular conical flange 17, and a disk body 18, with an opening 19, through which the threaded nipple 12 passes.

In the operation of the pen, the cap 11 is forced in suddenly so that the piston or plunger 3 advances toward the forward end of the barrel, creating a partial vacuum within the barrel. As the plunger passes into the enlarged chamber 4, the ink flows in through the immersed end of the nozzle 5, through the duct 20, and flows around the piston or plunger into the barrel, being forced up into the barrel by the atmospheric pressure. When the plunger is drawn toward the butt end of the pen, the air leaks past the plunger. After the reservoir is filled the "feeding" of the ink is regulated by screwing the cap 11 onto nipple 10. This adjusts the valve 13 on its seat 7.

As long as the pen reservoir is partially filled, the packing 16 is in contact with the ink and subject to the destructive action of the ink.

In order to produce a packing which will resist the action of the ink, I produce a packing washer of substantially the shape shown in Fig. 2, and form the same out of red vulcanized rubber of a suitable quality. As this material is relatively hard, it can readily be given the desired shape by cutting tools. In order to adapt the washer for use in ink, it is then softened, preferably by subjecting it to the action of an oily substance at a high temperature. For this purpose, it is preferable to use a vegetable oil,

such as linseed oil. The heating should be accomplished by stages. The best results are secured by placing the washers in cold raw linseed oil and raising the temperature gradually to about 365° F. This raising of the temperature should consume about a half hour. The washers should then be left in the oil with the temperature maintained at 365° F. for about three to five hours or longer, depending upon the thickness of the washers, and upon the degree of softness and flexibility desired. The temperature should preferably then be raised quite rapidly to about 400° F. and maintained at 400° for ten or fifteen minutes or longer. Washers of a thickness of 25/1000 to 60/1000 of an inch will require the temperature of 365° to be maintained for about six hours. Washers having greater thickness would require a longer time. If the same bath of oil is used repeatedly, it becomes thicker and requires a longer time to accomplish the results, but is still useful. A considerable expansion of the material takes place in this treatment. Washers of a thickness of wall of .053 of an inch expand to a thickness of about .065 of an inch.

After treating the washers as described above, I immerse them in paraffin wax at a temperature of from 212° to 300° F. for about ten minutes immediately after taking them from the oil. This has the effect of preventing evaporation of the oil at the surface of the washers and also tends to make the washers work smoothly in the barrel of the pen.

A variation may be made in the oil treatment by immersing the washers in oil at 365° F. and maintaining this temperature for two to three hours, and then rapidly raising the temperature to 480° F. for a few moments; and then reducing the temperature to about 400° to 410° F. This has the effect of making the finished washers tougher but seems to reduce their durability in use.

I believe that the resisting effect of the soft rubber washer is due to the impregnation of the pores of the rubber with oily substance. But it may be an inherent property of softened vulcanized hard rubber.

If the washers are placed in oil already at a high temperature, or if the temperature is raised too suddenly, to a high temperature, the washers will often crack or burst, or lose their shape. Sudden raising of the temperature tends to toughen the rubber, but it loses thereby in elastic qualities.

What I claim and desire to secure by Letters Patent is:

1. A fountain pen comprising an ink reservoir, a plunger movable in said reservoir, and a softened vulcanized porous rubber washer carried by said plunger, said washer having its pores impregnated with an oily substance, thereby producing a washer impervious to ink and flexible.

2. A fountain pen comprising an ink reservoir, a plunger movable in said reservoir, and a softened vulcanized porous rubber washer carried by said plunger, said washer having its pores impregnated with an oily substance and having a waxen exterior surface, and thereby producing a washer impervious to ink and flexible.

Signed at New York city in the county of New York and State of New York this 1st day of March A. D. 1912.

FRANK W. HOWARD.

Witnesses:

MERLE I. ST. JOHN,

ELIZABETH A. KLINE.