L. J. VOORHEES.

SCREW THREADED CONNECTION.

APPLICATION FILED MAY 29, 1920.

1,388,622. Patented Aug. 23, 1921.

Fig. 1.

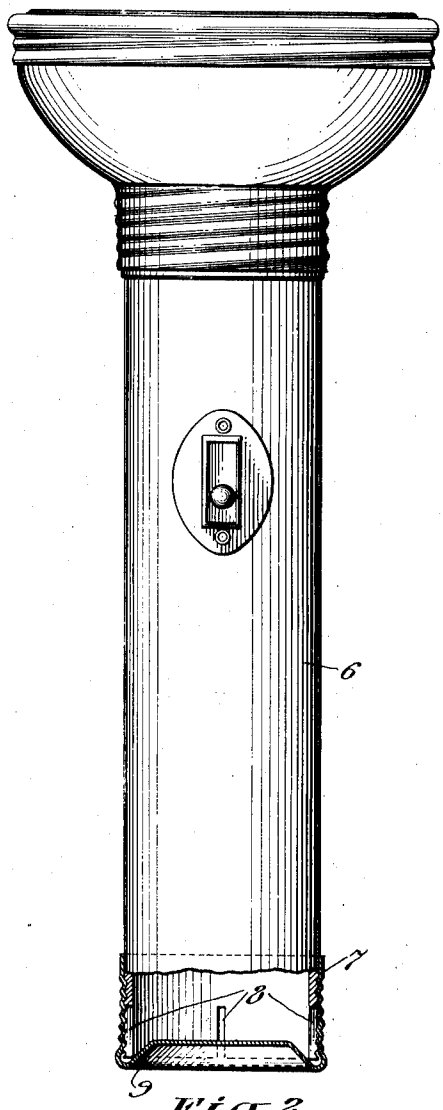


Fig. 2.

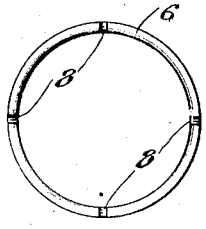


Fig. 5.

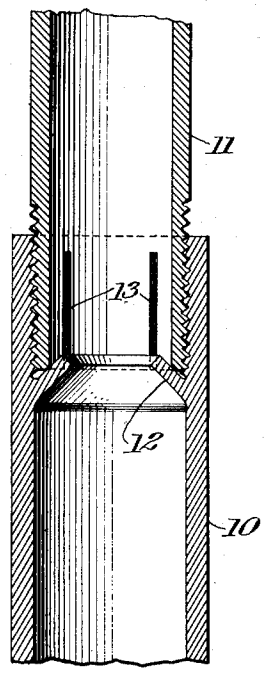


Fig. 3.

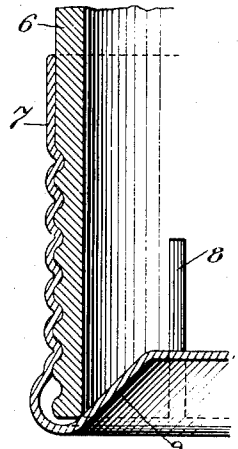
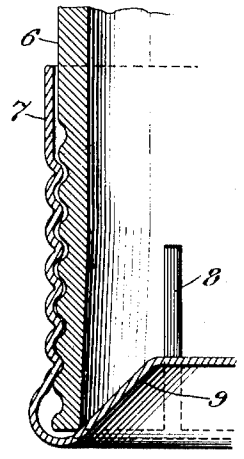


Fig. 4.



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UNITED STATES PATENT OFFICE.

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SCREW-THREADED CONNECTION.

1,388,622. Specification of Letters Patent. Patented Aug. 23, 1921.

Application filed May 29, 1920. Serial No. 385,378.

To all whom it may concern:

Be it known that I, LEE J. VOORHEES, a citizen of the United States, residing at Binghamton, in the county of Broome and State of New York, have invented certain new and useful Improvements in Screw-Threaded Connections, of which the following is a specification.

This invention relates to screw-threaded connections between members formed of materials exhibiting different changes of dimensions under the influence of the same change in conditions. The invention also includes the process of making the connections referred to above.

The object of the invention is to provide a form of connection in which the connected parts will neither seize nor become excessively loose when they undergo unequal expansion or contraction.

It is well known that various materials are unequally affected by changes in the conditions to which they are exposed. For example, if a piece of wood has attained a constant length in an atmosphere containing a large percentage of water vapor and the content of water vapor is then reduced, other conditions remaining the same, the piece of wood will contract or shrink. A piece of metal subjected to the same change would not be altered in length. Likewise an increase in temperature will cause a piece of metal to expand more than a piece of the same size made from many non-metallic materials, and there is a material difference among the various metals with respect to their temperature-dimension relations. Changes in pressure can also affect different solid materials unequally.

When it is necessary to join unlike materials by a screw-threaded joint which is to be subjected to changes of conditions, the dimensions of the parts must be such that the connection will still be preserved when an unfavorable extreme condition is encountered. Furthermore, if the parts are to be joined so that they can be readily separated under all conditions, the parts must be of such sizes that they will not seize under extremes of expansion and contraction. If due allowance is made for extremes which favor seizing of the parts, the connection is apt to be loose and unreliable under all other conditions. Specific instances of this nature are found in cases where male-threaded members of wood or the like are fitted to female-threaded members of metal, or where male-threaded members of metals of low expansion such as iron, are fitted to female-threaded members of metals of high expansion, such as copper or aluminum. The former joints are likely to be too tight in damp weather and too loose in dry, while the latter joints will be too tight when cold and too loose when hot.

As a further specific instance of the effect of changes of atmospheric condition upon a joint connecting parts of dissimilar material, it may be said that it has heretofore been regarded as impractical to attach the usual metal end-cap of a flashlight directly to the casing of the light by means of a screw-thread when the casing is made of fiber or other material which is subject to dimension changes under the influence of changing atmospheric conditions, for example, variation in the moisture content of the atmosphere. When it has been attempted to so directly thread together metal caps and fiber casings, it has been found that in dry weather the fiber becomes so contracted that the joint is loose and unreliable, while in very damp weather, the fiber casing becomes so expanded that the casing and cap will become seized and may be separated only with the greatest difficulty.

To provide between such dissimilar materials a connection which will not seize under the extreme conditions favoring a close fit and which will not become loose under the opposite extreme of conditions, I have designed the form of connection hereinafter described, two specific examples of my invention being shown in the accompanying drawings, in which—

Figure 1 shows a threaded metal cap directly attached to the threaded tubular fiber casing of a flashlight,

Fig. 2 shows an end view of the flashlight with the cap removed,

Fig. 3 shows an enlarged sectional view of the connection under conditions favoring a close fit,

Fig. 4 shows another sectional view of the same parts under unfavorable conditions tending to loosen the connection, and

Fig. 5 shows a connection between threaded tubes of dissimilar metals.

The flashlight shown in Fig. 1 is of a general and well known construction and only those parts which comprise my improvement will be described.

The casing 6 for holding the battery is of fiber as already mentioned. The end-cap 7 for retaining the battery in the casing, is of metal. According to the prior practice, it has been found necessary to attach to the end of the fiber casing, a threaded ring, for example, by riveting it to the casing, and to then apply the threaded end-cap to the ring so attached to the casing. By means of my improved construction, the intermediate ring can be eliminated as will now be described.

To increase the resiliency of the end of the fiber tube, the latter is provided with one or more slots 8 extending longitudinally from the lower end of the tube. The tube 6 and cap 7 are so proportioned that the cap 7 can be readily detached when the tube 6 is swelled to its maximum size, which condition will be reached after continued exposure to air saturated with water vapor. Upon a change to dryer atmosphere, the top 6 will shrink and in the absence of special provisions to prevent its receding from the metal cap 7, it would, under conditions of extreme dryness, become so shrunken that the joint between the tube and cap 7 would be worthless from a practical point of view.

To prevent the casing 6 from receding from the cap 7, when the casing undergoes contraction, I have provided a special form of end-cap comprising inclined surfaces 9 which will engage the end of the tubular casing 6 upon application of the cap, and expand it against the threads of the metal cap provided a shrinkage of the tubing has already taken place. If the tube 6 is already at its full size, the inclined surface will merely engage its end without enlarging its diameter. Whether or not the tube was at its full size when the parts were assembled, when the cap 7 is turned to the limit of its motion on the screw-thread, the inner corner of the lower extremity of the tube will be engaged by the inclined surface 9 in such a way that the top of the tube may shrink without any possibility of the lower end, comprising the greater part of the screw-thread, being able to recede from the metal cap. A slight recession may take place near the top of the metal cap, as best shown in Fig. 4, but since the threads will be in contact throughout a considerable proportion of their length, this will be sufficient to maintain the joint in a tight and satisfactory condition, in spite of the shrinkage of the body of the tube. The slots 8 will permit a reduction of cross-section of the fiber tube in its unrestrained portions while the original cross-section is maintained at its lower end without splitting the tube, because of the increased resiliency provided by said slots. A similar construction may be used at the lamp-end of the casing.

From the foregoing, the operation of the joint shown in Fig. 5 will be readily understood. In this figure the tube 10 is formed from a metal having a low coefficient of expansion and is provided at its end with a female-thread. The tube 11 is formed from a metal having relatively high coefficient of expansion and is provided with a male-thread engaging the thread on tube 10, an inclined surface performing the same function as the surface 9 of Fig. 1, being provided by the internally projecting flange 12 inside the tube 10 at the extremity of the thread with which tube 10 is provided. The slots 13 in tube 11 perform a function exactly similar to the function of slots 8 in Figs. 1 and 2.

Assuming that the joint of Fig. 5 is designed to be tight at a certain high temperature, and that the parts must not be seized at this temperature, the tubes are so proportioned that a perfect fit will be attained when the connected tubes have acquired the dimensions corresponding to this temperature. If the joint is then subjected to lower temperature, the tube 11 will contract more than the tube 10 and there will be a tendency for the threads to become separated, especially near the extremity of tube 10. However, the greater part of the engaging threads will continue to be held in close contact by means of the inclined surface 12, and the loosening of the joint, which will follow the decrease in temperature, will not be greater than is permissible under the circumstances.

While the invention has been illustrated in its application to certain specific cases where a screw-thread joint or connection between parts of dissimilar materials is desirable, it will be apparent that the invention may be applied to a great variety of connections and may be employed wherever one of the materials is in tubular form, elastic enough to undergo slight flexure without breaking, stiff enough substantially to maintain its original form in spite of the deformation of its end by a wedging action, and capable of taking a screw-thread.

I claim:

1. A connection which comprises a tubular member of a material which is stiff but flexible, said tubular member having a screw-thread and being provided with slots to increase its resiliency, a second member of a material differing from the material of the tubular member in the change of dimensions which it exhibits under the influence of the same change in conditions, a screw-thread on said second member engaging the screw-thread on the tubular member, and means to hold portions of the respective screw-

threads in close contact regardless of relative changes in the dimensions of the connected members.

2. A connection which comprises a tubular member of a material which is stiff but flexible, said tubular member having a screw-thread and being provided with slots to increase its resiliency, a second member of a material differing from the material of the tubular member in the change of dimensions which it exhibits under the influence of the same change in conditions, a screw-thread on said second member engaging the screw-thread on the tubular member, and an inclined surface attached to said second member and adapted to hold portions of the respective screw-threads in close contact regardless of relative changes in the dimensions of the connected members.

3. A connection which comprises a tubular member of fiber or the like, said tubular member being provided with slots to increase its resiliency, a metal member, a screw-thread on said metal member engaging the screw-thread on the tubular member, and an inclined surface attached to said metal member adapted to hold portions of the respective screw-threads in close contact, regardless of relative changes in the dimensions of the connected members.

4. A connection which comprises a tubular member of fiber or the like, said tubular member being provided with slots to increase its resiliency, a metal cap, a screw-thread on said metal cap engaging the screw-thread on the tubular member, and an inclined surface forming a part of the metal cap and adapted to hold portions of the screw-thread in close contact regardless of shrinkage of the tubular member.

5. Process of connecting a screw-threaded tubular member to a second member made of material differing from the material of the tubular member in the change of dimensions which it exhibits under the influence of the same change in conditions, which comprises forming on the second member a screw-thread adapted to engage the thread of said tubular member, cutting the end of the tubular member to increase its resiliency, providing an inclined surface attached to said second member and adapted to force and hold the respective threaded portions in closer contact when the members are screwed together, and then screwing the members together.

6. Process of connecting a screw-threaded tubular member to a second member made of a material differing from the material of the tubular member in the change of dimensions which it exhibits under the influence of the same change in conditions, which comprises forming on the second member a screw-thread adapted to engage the thread of said tubular member, slotting the end of the tubular member to increase its resiliency, forming on said second member an inclined surface adapted to force and hold the respective threaded portions in closer contact when the members are screwed together, and then screwing the members together.

In testimony whereof, I affix my signature.

LEE J. VOORHEES.