Nov. 13, 1928. 1,691,828

F. W. SHUPERT

STAY BOLT CONSTRUCTION

Filed March 22, 1926

Fig. 1.

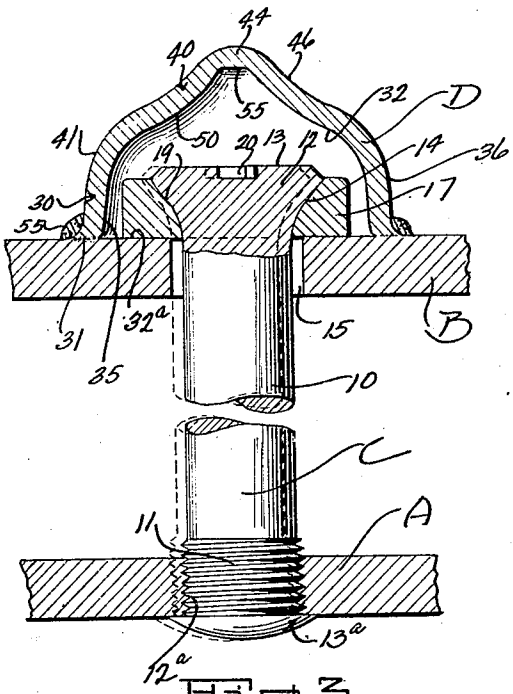


Fig. 2.

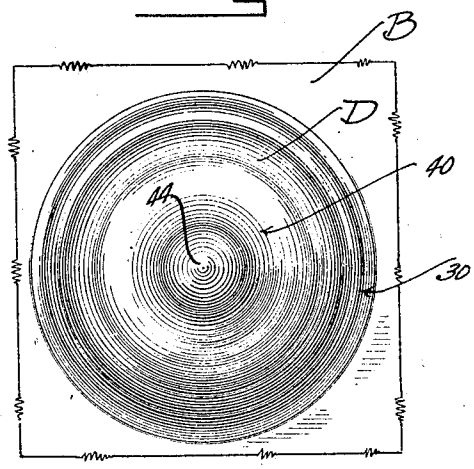


Fig. 3.

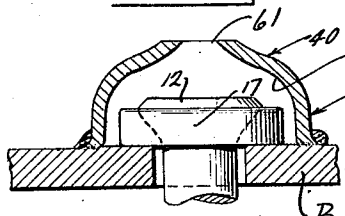


Fig. 4.

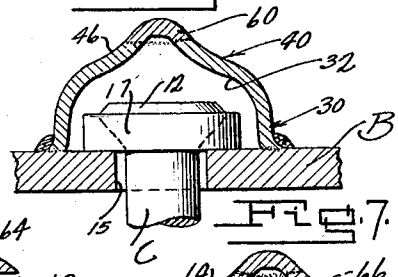


Fig. 6.

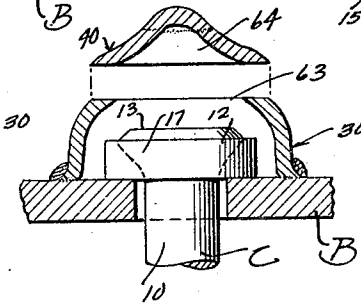


Fig. 7.

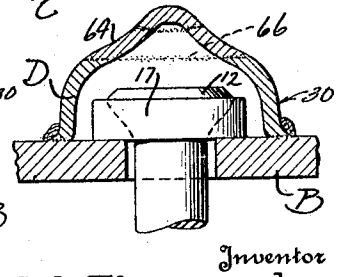
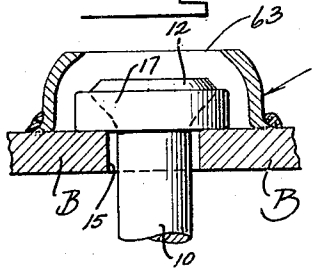


Fig. 5.



Inventor

Frank W. Shupert

By Lancaster and Allwine

Attorneys

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UNITED STATES PATENT OFFICE.

FRANK W. SHUPERT, OF SANFORD, FLORIDA.

STAY-BOLT CONSTRUCTION.

Application filed March 22, 1926. Serial No. 96,647.

This invention relates to improvements in stay bolt constructions, and particularly to the sealing cap applied on the wrapper sheet of a boiler to exteriorly enclose the stay bolt to prevent leakage of the boiler fluids.

The primary object of this invention is the provision of an improved stay bolt construction embodying a novel type of cap or closure of one piece formation, adaptable for welding or other attachment to the wrapper or outer sheet of a boiler to enclose the head of the stay bolt therein in such manner that the stay bolt may shift incident to boiler expansion and contraction; the improved cap being formed in a novel manner to permit its cutting for inspection purposes with but little expense incident to such cutting; and the improved cap being further formed to permit its inexpensive cutting without removing the base of the cap, to facilitate access to the bolt for repair purposes.

Other objects and advantages of this invention will be apparent during the course of the following detailed description.

In the accompanying drawing, forming a part of this specification, and wherein similar reference characters designate corresponding parts throughout the several views,

Figure 1 is a cross sectional view taken through the improved type of stay bolt set forth in my United States application, Serial No. 718,871, filed June 9, 1924, showing the same connected to spaced inner fire box and outer wrapper sheets, with a novel sealing cap exteriorly on the wrapper sheet to enclose the outer head of the stay bolt.

Figure 2 is a plan view of the improved cap of the stay bolt construction.

Figure 3 is a cross sectional view showing the relation in which the improved cap is economically cut to permit inspection.

Figure 4 is a sectional view similar to that illustrated in Figure 3, showing the manner in which the tip end of the cap may be welded back in place after inspection.

Figure 5 is a cross sectional view showing the manner in which the improved cap is cut with a minimum of cutting to permit removal or operation upon the bolt for repair thereof, without removing the base portion of the cap from its welded or secured relation on the wrapper plate.

Figure 6 is a view illustrating the relation of the sheet connected base of the cap and the portion which is cut off to permit adjustment of the stay bolt.

Figure 7 is a sectional view showing the relation of the portions of the cap after the bolt has been adjusted and the portions of the cap welded together to seal the bolt at the outer sheet.

In the drawing, wherein for the purpose of illustration is shown only a preferred embodiment of this invention, the letters A and B may generally designate inner and outer sheets of a boiler, respectively known as the fire box sheet and wrapper sheet, which are connected in spaced relation by means of the stay bolt C set forth in my co-pending application above referred to. The improved sealing cap D of one piece formation is welded upon the exterior surface of the sheet B in order to seal the outer head of the stay bolt C.

The stay bolt C preferably comprises the shank 10 having a screw threaded inner end 11 screw threaded into the internally screw threaded opening 12^a of the fire box sheet A; the shank 10 at the inner side of the fire box sheet A being peened over as at 13^a in accordance with the construction set forth in my co-pending application above referred to. The bolt shank 10 at the outer side of the sheet B is preferably provided with a button head 12 which flares outwardly at an enlarging diameter from the shank 10 to the top surface 13 of the button head 12; the flaring exterior annular surface 14 of the button head 12 of the bolt C being preferably concaved and providing a shoulder facing downwardly towards the enlarged opening 15 in the outer sheet B through which the body 10 of the bolt loosely extends to permit the transverse movement of the bolt incident to relative movement of the sheets A and B, due to expansion and contraction incident to boiler heat, as is well known. A flat slidable washer 17 is disposed beneath the concave 14 of the button head 12, in sliding abutment upon the exterior surface of the wrapper sheet B; this washer 17 having a tapered opening 19 therethrough with a convex surface facing upwardly; the opening 19 diminishing in diameter from the top surface thereof towards the opening 15 of the sheet B, and upon which convex surface of the opening 19 the concave shoulder 14 of the bolt head 12 slidably rests in snug abutment to substantially seal the medium in the boiler from exit through the

opening 15. It is thus to be noted that the bolt head 12 may oscillate upon the washer 17 and that the washer 17 has a sealing sliding abutment on the sheet B. The exterior surface 13 of the bolt head 12 is of course provided with a suitable wrench or tool engaging socket 20 therein, of approved formation.

The cap D is of one piece formation, with all parts originally formed integral, and it may be pressed or stamped out of steel or cast if desired. It is of a nature capable of withstanding conventional boiler pressure limits, and the function of the same is to enclose the head and washer of the stay bolt construction to permit of the sliding of the latter in the compartment of the cap D.

The improved sealing cap or closure D preferably comprises the base portion 30 which is of substantially cylindrical ring-shaped formation, the same being of uniform thickness, at any cross section thereof. The base 30 while substantially cylindrical in formation is yet preferably in the form of the frustrum of a cone, being preferably annularly outwardly flanged at its inner marginal edge 31, about the entrance to the compartment 32 provided in the cap D. The height of the base portion 30 may vary, but it is preferably slightly greater than the distance from the outer surface 32ª of the sheet B, to the top surface 13 of the head 12 of the bolt C, so that the head of the bolt construction is received entirely within that part of the compartment 32 formed by the base 30. The internal and external peripheries 35 and 36 respectively of the base portion 30 conform to each other and taper at a diminishing diameter from the flanged end 31 of the base towards the outer end of the base 30 which is integrally connected with the substantially conical shaped portion 40 of the cap. The conical shaped portion 40 of the cap C may be true conical shaped, or may be slightly dished inwardly. At the juncture 41 of the base 30 with the conical portion 40 the cap D is externally convexed, and the slope of the walls of the conical portion 40 from the juncture thereof with the base 30 is such as to incline the conical portion at a more acute angular degree with respect to the axis of the cap D than the degree to which the substantially frusto-conical base 30 of the cap D is inclined, as is readily apparent from the various figures of the drawings.

The substantially conical shaped portion 40 extends from the base 30 in an outwardly converging relation to a blunt peak 44; the external surface of the conical portion 40 between the juncture of the conical portion with the base 30 and the peak 44 being externally concaved at 46, for a purpose which will be more specifically referred to hereinafter. Of course, due to the conical form of the portion 40 the compartment 32 will gradually diminish in diameter from the juncture of the conical portion with the base 30, so that the diameter of the compartment 32 gradually decreases to the peak 44, where the diameter of said compartment 32 is smallest. Of course, due to the concavity of the external surface of the conical portion, the inner surface of the conical portion opposite the concave surface 46 is convex as at 50 as is illustrated in Figure 1 of the drawing. Within the peak 44 of the conical portion 40 a small shallow depression 55 is provided, as part of the compartment 32.

Referring to the application of the improved cap D, the flange portion 31 of the base 30 thereof is placed on the external surface of the sheet B with the cap axially aligning with the opening 15, and the base flange 31 of the cap D is arc welded at 55′ to the sheet B. In the relation of parts, the washer 17 and head of the bolt lie within the compartment 32 in spaced relation with the internal periphery of the base 30 at the lower part of the compartment 32, to permit the transverse shifting of the washer 17. The diameter of the compartment 32 throughout the height of the base portion 30 is greater than the external or greatest diameter of the washer 17, and the diameter of the compartment 32 at the inner end of the conical portion 40, or immediately outwardly of the top surface 13 of the stay bolt C is of greater diameter than either the washer 17 or head of the stay bolt, for the purpose of permitting removal of the stay bolt construction when the sealing cap D is severed in a plane above the juncture of the conical portions 30 and 40 respectively.

It is frequently necessary to make inspections of the stay bolt C, and in making such an inspection it is simply necessary to cut the tip portion of the conical part of the sealing cap D, as by means of an oxyacetylene torch; the portion which is thus cut being severed in a plane at right angles to the axis of the cap D through the shallow depression 55, immediately at the tip inner surface of the compartment 32; the tip portion which is thus removed being illustrated at 60 in Figure 4 of the drawing, and when severed from the conical portion 40 an opening 61, as illustrated in Figure 3 is provided, through which inspection is made by the use of small punch or rod which is inserted through the opening 61, and by striking the same with a hammer it is at once possible to tell whether the bolt is broken, loose, or if the same is not in efficient operating position. If the bolt is in good operating condition the tip portion 60 is then welded back into place as part of the conical portion 40, and the compartment 32 is again enclosed to seal the head and washer of the bolt construction C therein.

If inspection of the bolt in the above described manner discloses that the bolt is

in an inefficient operating condition, it will be necessary to cut the sealing cap D in a plane inwardly of the plane from which the tip 60 was severed, in order to provide an opening sufficiently large to permit removal of the bolt, or to permit access thereto. Due to the conical formation of the part 40 of the cap D, the plane of separation may be selected, and the upper portion of the conical part 40 is then cut by an oxyacetylene torch somewhere adjacent the juncture of the portions 30 and 40 of the cap D, sufficiently to provide an opening 63 illustrated in Figure 5 of the drawing, thru which suitable tools may be inserted to have access to the bolt construction C. The opening 63 in practically all instances will be large enough to permit the passage of the head of the bolt therethrough, and the plane of separation may be sufficiently low enough to permit removal of the washer 17. It is an important feature of the invention that at the juncture of the base 30 and conical portion 40, at a location outwardly of the outer surface of the head of the bolt, the compartment 32 is of a diameter greater than the external diameter of the washer 17, so that by cutting or severing the cap D outwardly of the top surface of the head, the entire stay bolt and washer construction may be removed if desired.

After the bolt has been fixed the portion 64 which has been removed to provide the opening 63 is welded into place on the severing plane 66 as illustrated in Figure 7 of the drawing.

Taking into consideration the function which the stay bolt is to perform in having free sliding movement within the compartment 32, the advantage of providing the base and conical portions 30 and 40 will be apparent. By providing the conical or tapered portion 40 very little cutting is necessary in order to sever the tip 60, so that an economical inspection may result; at a low cost, necessary to cut the tip 60 from the remaining portions of the cap D over a small cutting area, the cost also entailing the inexpensive welding of the said tip back into place. Again, the conical or tapered portion 40 is important since thereby less cutting is necessary to sever the portion 64 than would be the case where a polygonal, cylindrical, or spherical form is provided. Concaving or dishing the conical portion 40 between the juncture 41 and peak 44 also insures an inexpensive cutting of the parts due to a decreased cross section.

The flange 31 aids materially since thereby the welding at 55′ may more efficiently maintain the base in a permanent secured relation on the sheet B, and this arc welding need never be disturbed, either during inspection of the stay bolt construction C, or operative removal thereof, in the manner above described.

Various changes in the shape, size, and arrangement of parts may be made to the form of invention herein shown and described, without departing from the spirit of the invention or the scope of the claim.

I claim:

A stay bolt sealing cap comprising a hollow ring-like base portion in the form of the frustum of a cone, and an integral hollow approximately conical outer portion the external surface of which is inclined to a greater degree with respect to the axis of the cap than the external surface of the base portion, said base and conical portions having internal surfaces substantially conforming in angularity to the external surfaces of said portions to provide a compartment in the cap which is largest at the base portion and therefrom restricted to the top of the conical portion.

FRANK W. SHUPERT.