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J. H. SHARP

2,024,069

BOLT

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Fig - 1 -

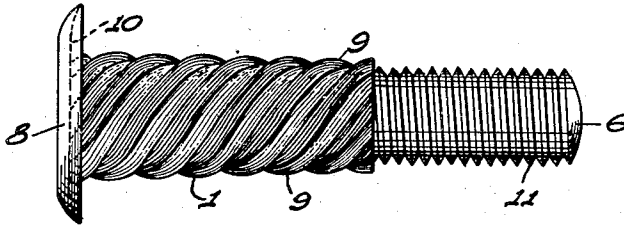


Fig - 2 -

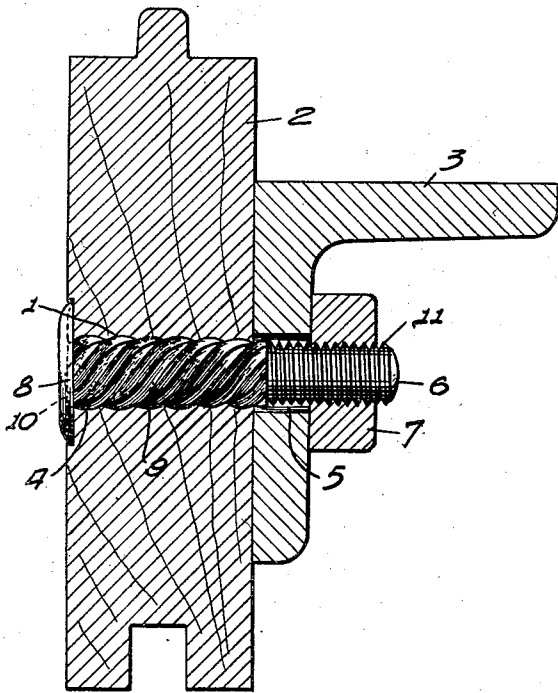
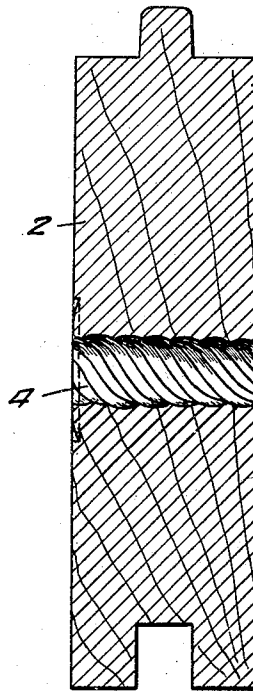


Fig - 3 -



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UNITED STATES PATENT OFFICE

2,024,069

BOLT

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Application May 4, 1931, Serial No. 534,962

18 Claims. (Cl. 85—1)

This application is a continuation in part of my application Serial No. 468,346, filed July 16, 1930 for bolts.

This invention relates to bolts, and more particularly to such for fastening the wood part of a railway freight car to the metal frame.

The principal object of my invention, generally considered, is the provision of bolts, particularly adapted for connecting wood sheathing, lining, roofs, running boards and floors to metal or wood framing, and which, when in place, lie in fluid-tight relation with the wood to thereby prevent the entry of moisture into the bolt hole along the shank of the bolt, so that rotting of the wood and other undesirable results are avoided.

Another object of my invention is the provision of a bolt particularly adapted for connecting wood and like compressible material to metal parts, which bolt may be used with such parts after the same have merely been drilled or apertured for receiving the minimum section of the bolt with the desired slight clearance, said bolt, when in place, having threaded itself into such tight engagement that those portions of the wood surrounding the bolt shank have been put under pressure, forcing them into all voids, to such an extent that the most extreme shrinkage or warpage of the wood will not relieve the holding pressure sufficiently to admit moisture, whereby the bolt opening is sealed against the entrance of water and air, so that not only is rotting of the wood minimized, but the entrance of warm air, for example, into refrigerator cars, is prevented.

Another object of my invention is the provision of a bolt with an intermediate portion of the shank tapered and specially threaded, or formed with spiral flutes and corresponding ribs therebetween, to adjacent the head so that it will form corresponding ribs and flutes on a wood part to be connected thereby when driven into place, as with a hammer, or spiral itself into the wood when the nut is applied, thereby automatically holding the bolt from turning during such nut application.

A still further object of my invention is the provision of a bolt particularly adapted for connecting wood and metal parts, which bolt preferably has a head, the outer surface of which is approximately flat or slightly convex at the periphery, and the inner surface of which is desirably slightly concave, and the shank itself then tapers a material distance toward the other end of the bolt, said tapered portion being formed with spiral flutes adapted to engage wood and disposed on such a steep pitch that axial pressure

on the bolt will cause the same to spiral itself into a piece of wood after it has been applied in an aperture therein, the end of said bolt away from the head being threaded to receive an associated nut, the threads for the nut and the flutes for engaging the wood winding in opposite directions so that when the nut is applied, the spiral flutes in the wood will automatically tighten themselves therein so as to finally prevent turning of the bolt and permit a tight application of the nut.

Other objects and advantages of the invention relating to the particular arrangement and construction of the various parts will become apparent as the description proceeds.

Referring to the drawing illustrating my invention, the scope whereof is defined by the appended claims:—

Figure 1 is a side elevation of a bolt embodying my invention.

Fig. 2 is a fragmentary view, in transverse section, of wooden sheathing and an associated metal frame portion with a preferred form of my bolt, shown in side elevation, used for connecting said wood and metal parts.

Fig. 3 is a view similar to Fig. 2, but showing the sheathing after the bolt has been removed.

In connecting wood and metal structural members such as parts of railway vehicles, it has been customary to use bolts commonly designated as "carriage" bolts with heads, the outer surfaces of which are generally spherical, and the inner surfaces of which are plane, with the shank of the bolt adjacent the head generally square or non-circular in section to minimize turning of the bolt when the nut is applied to the other end. When such bolts are employed with the head engaging the adjacent surface of the wood, either said head projects beyond the surface of the wood, or it is necessary to countersink the wood to receive the head so that the outer surface thereof may lie normally flush with the surface of the wood. In either event, the bolt shank requires a bigger hole in the wood than its outside diameter, so that any moisture, which strikes the exposed end of the bolt travels along its shank and enters the hole in the wood, resulting in premature decay of the wood, as well as permitting the transfer of moisture and possibly air from one side of the wood to the other.

To overcome such an undesirable condition, I have devised a waterproof and air-tight bolt by providing a bolt with a tapered spiral-fluted shank adjacent the head, the flutes being left-handed or formed in a direction opposite to the nut receiving threads on the other end of the

bolt, so as to permit drawing or driving the bolt into the wood, without splitting it, until the head is normally substantially flush with the corresponding surface of the wood, thereby eliminating, without countersinking, the damage and inconvenience frequently caused by protruding bolt heads. The flutes adjacent the bolt head are preferably formed of relatively steep pitch and so constructed that they are adapted to form effective corrugations or ribs in wood, and on account of their being disposed on the tapered portion of the shank, they will thread and wedge themselves into the wood to provide an air- and water-tight joint.

Referring now to the drawing in detail, like parts being designated by like reference characters, there is shown, as one embodiment of my invention, a bolt 1 which, in Fig. 2, is represented as connecting wooden sheathing 2 to a portion of a metal car frame 3, as by extending through registering apertures 4 in the sheathing and 5 in the frame. The end or shank 6 of the bolt protruding beyond the frame 3, through which it desirably extends loosely, has applied thereto a nut 7, which nut, when screwed tight on the threaded end portion 11 of the bolt, desirably forces the head 8, the outer surface of which is convex or substantially flat, into the wood 2 until it is substantially flush with the outer surface of said wood.

In order to make an air- and water-tight joint with the wood 2 and at the same time prevent turning of the bolt when the nut 7 is applied thereto, I preferably make the hole 4 in the wood of a diameter corresponding with that of the end portion of the bolt, which is externally threaded for the nut 7, and form that portion of the shank 6 of the bolt adjacent the head 8 on a slight taper with respect to the bolt axis, from near said head to a diameter slightly greater, for example, .050" greater than the normal diameter of said shank. On the outer surface of said tapering or frusto-conical portion, I apply ribs or threads 9, separated by corresponding flutes or valleys, disposed on a relatively great pitch and of coarse formation or widely spaced, preferably with sharp crests, and roots formed on a relatively easy curvature, so that when the bolt is driven or drawn into the wood, it will form cooperating wood flutes which will be interspaced with the bolt flutes to form a water- and airtight joint between the shank of the bolt and the wood along the aperture therein. As shown in Figs. 1 and 2, the diameter of the small end of the tapered portion at the base of the flutes is desirably slightly greater than the diameter of the threaded end at the crest of the threads.

To further enhance the waterproof construction, I desirably form the inner surface 10 of the bolt head 8 concave, so that when the bolt is drawn tight into the wood, the periphery of the head will compress the fibers of the wood beneath the head, as shown most clearly in Fig. 2. If the thread 11 for receiving the nut 7 is right-handed, the spiral ribs 9 for engaging the wood are formed left-handed, that is the ribs 9 wind around the bolt in a direction opposite to that of the thread 11, so that upon turning the nut tight, and thereby causing the bolt to turn with the nut, said bolt will tend to spiral itself into the wood, and when the head 8 is pressed into said wood so that the outer surface thereof is substantially flush with the corresponding surface of the wood, rotation will be stopped and the nut may be tightened to the desired extent.

In applying such an improved bolt, the aperture 4 in the wood is desirably made to correspond in size with the outer or normal diameter of the end having the threads 11, that is, of a size corresponding with the normal size of the shank 6, desirably with the usual clearance, so that when the tapered portion of the shank having the ribs 9 thereon engages the apertured portion 4 in the wood, the wood is not only fluted without any tearing action, but the aperture is expanded to correspond with the increasing tapered portion of the bolt. In this way, the bolt is not only forced into tight engagement with the wood to prevent turning of the bolt, but the wood is compressed around the bolt with a pressure greater than any relief that can be obtained by drying the wood out, so that whether the wood is wet or dry the bolt is always under pressure to exclude air and moisture from between the wood and the shank of the bolt. At the same time, the head is drawn to a position preferably substantially flush with the adjacent surface of the wood, the pitch of the ribs 9 being such that the bolt may be started, and driven home, if desired, by hammering or otherwise forcing it into position in the wood.

From the foregoing, it will be seen that I have devised a bolt particularly adapted for connecting wood and metal, although it is not limited to such use. Bolts such as have been described are designed more particularly for use on railway freight cars. On such equipment, bolts are used to fasten the wood parts, such as lining or sheathing, to the wood or metal frame of the car. In order to provide a smooth surface which has no projections to interfere with or injure the lading, such bolts are usually applied with the heads inside of the car and the threaded ends carrying the nuts on the outside exposed to the weather.

To permit the bolts to pass through the wood, the bolt hole, with the ordinary cylindrical shank bolt, must necessarily be larger than the bolt shank, and openings or voids generally exist between that shank and the wood. These openings increase in size as the wood dries and seasons in service. This has been found true of every type of straight and tapered shank bolt previously used in such car construction, even where bolts were driven through undersize holes because they had to tear the hole larger than the bolt shank in order to pass through the wood. In the present invention, by providing a bolt shank tapered and equipped with self-threading left-hand spiral flutes, I eliminate the space between the bolt shank and the wooden part, thereby obviating the entrance of air and moisture with ensuing deterioration and rotting of the wood.

When in use, the spiral self-threading left-hand fluted and tapered portion draws itself into the wood with a rotary motion, the increasing diameter of the tapered ribs acting to compress the wood fiber, filling all voids between the sides of the bolt hole and the metal of the bolt shank, thereby forming a seal which prevents the entrance of moisture into the bolt opening, prevents leaking into the car, and rotting of the wood fiber. Inasmuch as the amount of compression is greater than the maximum possible shrinkage, no leaks can develop when the wood shrinks or dries out.

The left-hand flutes on the tapered shank being opposed to the right-hand thread made to receive the nut, pull the bolt more tightly into the wood when the nut is tightened on the bolt,

thereby accentuating the seal. Because of the relatively steep pitch on the flutes, the bolt may be driven in with a hammer or drawn in when applying the nut.

5 The periphery of the cupped head, preferably provided on the bolt of my invention, when turned with the bolt upon tightening the nut, cuts a groove for itself in the wood fiber, and the head is eventually drawn in substantially
10 flush with the wood surface, thereby eliminating the necessity for countersinking. This action does not tear the wood fibers or cause them to stick up with a consequent liability to damage the lading.

15 Although I have shown as an illustration the bolt applied to the side sheathing of a box-car, it will be understood that such bolts can be used to advantage in numerous other relations, such as in the floors and roofs of freight cars, for holding automobile bodies on the frame, and, generally, wherever it is desired to bolt wood to metal. My bolt, which is preferably formed of
20 metal, is adapted for use with self-locking or grip nuts as well as common nuts.

25 Although a preferred embodiment of my invention has been illustrated, it will be understood that modifications may be made without departing from the scope of the appended claims.

30 I claim:

1. A rigid metal bolt adapted for use in wood and provided with a head at one end, a standard exterior screw thread on the other end portion for engaging a nut, and a reversely taper fluted shank between said head and threaded portion,
35 which spirals itself into the wood when the nut is tightened on the standard screw thread.

2. A rigid metal bolt provided with a head, a standard exterior screw thread on one end portion for engaging a nut and a taper threaded shank portion between said head and threaded portion to engage a wooden part held by the bolt as a means of excluding moisture from the bolt hole to eliminate rotting of the wood adjacent to said bolt hole.

3. A headed bolt provided with a standard external screw thread, a shank with tapered spiral flutes between its head and thread so as to screw itself into wood upon the application of axial pressure, forcing the wood into all voids between the solid portion of the said bolt shank and the sides of the bolt hole, thus closing the hole against the passage of moisture and air.

4. A rigid metal bolt comprising a shank and a head on one end thereof, that portion of the shank adjacent the head being tapered and having widely spaced flutes of relatively large pitch adapted to engage wood, and the end of the shank away from the head being externally threaded to engage a nut.

5. A bolt comprising a shank and an approximately flat head on one end thereof, that portion of the shank adjacent the head being tapered to a smaller cross-section away from said head and formed with spiral flutes, the opposite end of said shank being externally threaded in the opposite direction for engaging a nut.

6. In combination, a piece of metal, a piece of wood, a bolt passing loosely through an aperture in said metal and tightly through a registering aperture in said wood for joining them together, that portion of the bolt in the wood involving a tapered shank adjacent an approximately flat head and formed with flutes on such
75 a steep pitch that the bolt may be driven or

drawn into place, the outer surface of said head being normally approximately flush with the adjacent surface of the wood, and the fluted portion of said shank being tightly engaged with said wood and lying in fluid-tight relation therewith, the end of said bolt extending through the metal being threaded for receiving a nut.

7. The combination of wood and metal, and means connecting them in superimposed relation comprising a bolt and a nut, said bolt having a shank headed at one end and gradually tapered to a right-handed threaded portion adjacent the other end for receiving the nut, said tapered portion having left-handed spaced
15 flutes applied thereto and disposed in tight engagement with the wood, said flutes having a relatively steep pitch, and the threaded portion passing loosely through the metal and the nut applied thereto and screwed tight, whereby the bolt will spiral itself into the wood into fluid-tight engagement therewith.

8. A bolt of the kind described consisting of a shank having a head at one end and threaded for a generally cylindrical portion of its length at the opposite end, the shank intermediate the head and threaded portion being of greater diameter than the threaded portion of the shank at the crest of the threads and tapered from the head end toward the threaded end, said tapered portion having flutes thereon extending spirally lengthwise of the shank and in the opposite direction to the threads at the end of the shank.

9. A two-part separable fastener consisting of a nut and a bolt, the shank of which is provided with a head and has an externally threaded end portion on and off which the nut may be screwed, characterized in that a portion of the bolt shank between its head and threaded end portion is tapered and provided with a plurality of bolt-hole-wall engaging ribs stepped therearound and each projecting farther from the shank axis than the shank thread and also lying in a helical path of which the direction of winding is reverse to that of the shank thread.

10. A two-part separable fastener consisting of a nut and a bolt, for connecting pieces provided with bolt holes, the shank of said bolt being provided with a head and an externally screw-threaded end portion on and off which the nut may be screwed, characterized in that a portion of the bolt shank between its head and threaded end portion is tapered and provided with a plurality of bolt-hole-wall gripping ribs stepped therearound, each projecting farther from the shank axis than the threads, and each lying in a helical path of which the direction of winding is reverse to that of the shank threads, said ribs initially having an outside diameter greater than the diameter of a bolt-hole in one of said pieces, so as to be finally positioned, in friction gripping relation with the wall defining said hole, by forcible axial insertion to cause the material of one of the engaged surfaces to accommodate itself to the other, resulting in a tight fit of the bolt in the hole, with a rib gripping action increasing with an increase of the torque applied to the shank by the nut, during subsequent screwing up of said nut upon the bolt to tightly clamp the pieces between the head and the nut.

11. In combination with a plurality of juxtaposed parts provided with bolt holes, a two-part separable fastener consisting of a nut and a bolt, the shank of said bolt being disposed in said holes for connecting said parts and provided with a

head and an externally screw-threaded end portion on and off which the nut may be screwed, characterized in that a portion of the bolt shank between its head and threaded end portion is tapered and provided with a plurality of bolt-hole-wall gripping ribs stepped therearound, each projecting farther from the shank axis than the threads, and extending substantially the entire distance from the head to the threaded end portion, said ribs initially having an outside diameter greater than the diameter of a bolt-hole and being finally positioned, in friction gripping relation with the wall of a part defining said hole, by forcible axial insertion to cause the material of one of the engaged surfaces to accommodate itself to the other, resulting in a tight fit of the bolt in the hole, with a rib gripping action increasing with an increase of the torque applied to the shank by the nut, during subsequent screwing up of said nut upon the bolt to tightly clamp the fastened parts between the head and the nut.

12. In combination with a plurality of juxtaposed parts provided with bolt holes, a two-part separable fastener consisting of a nut and a bolt, the shank of said bolt being disposed in said holes for connecting said parts and provided with a head and an externally screw-threaded end portion on and off which the nut may be screwed, characterized in that a portion of the bolt shank between its head and threaded end portion is tapered and provided with a plurality of bolt-hole-wall gripping ribs stepped therearound, each projecting farther from the shank axis than the threads, and each lying in a helical path of which the direction of winding is reverse to that of the shank threads, said ribs initially having an outside diameter greater than the diameter of a bolt-hole and being finally positioned, in friction gripping relation with the wall of a part defining said hole, by forcible axial insertion to cause the material of one of the engaged surfaces to accommodate itself to the other, resulting in a tight fit of the bolt in the hole, with a rib gripping action increasing with an increase of the torque applied to the shank by the nut, during subsequent screwing up of said nut upon the bolt to tightly clamp the fastened parts between the head and the nut.

13. In combination with a plurality of juxtaposed parts provided with bolt holes, a two-part separable fastener consisting of a nut and a bolt, the shank of said bolt being disposed in said holes for connecting said parts and provided with a head and a screw-threaded end portion on and off which the nut may be screwed, characterized in that a portion of the bolt shank between its head and threaded end portion is provided with a plurality of bolt-hole-wall gripping ribs stepped therearound, each projecting farther from the shank axis than the threads, and each lying in a helical path of which the direction of winding is reverse to that of the shank threads, the pitch of said ribs being steep like that of the threads of a drive screw to facilitate application, said ribs initially having an outside diameter greater than the diameter of a bolt-hole and being finally positioned, in friction gripping relation with the wall of a part defining said hole, by mere axial force applied to the bolt to cause the material of one of the engaged surfaces to be tapered to accommodate itself to the other, resulting in a tight fit of the bolt in the hole, with a rib gripping action increasing with an increase of the torque applied to the shank by the nut, during subsequent screwing up of said nut upon the

bolt to tightly clamp the fastened parts between the head and the nut.

14. A two-part separable fastener consisting of a nut and a bolt, for connecting pieces provided with bolt holes, the shank of said bolt being provided with a head and a screw-threaded end portion on and off which the nut may be screwed, characterized in that a portion of the bolt shank between its head and threaded end portion is provided with a plurality of bolt-hole-wall gripping ribs stepped therearound, each projecting farther from the shank axis than the threads, and each lying in a helical path of which the direction of winding is reverse to that of the shank threads, said ribs having end portions adjacent said threads formed with a smaller overall diameter than the portions adjacent the head to facilitate insertion of the bolt in a bolt-hole and initially having the outside diameter of its main portion greater than the diameter of a bolt-hole in one of said pieces, so as to be finally positioned, in friction gripping relation with the wall defining said hole, by forcible axial insertion to cause the material of one of the engaged surfaces to accommodate itself to the other, resulting in a tight fit of the bolt in the hole, with a rib gripping action increasing with an increase of the torque applied to the shank by the nut, during subsequent screwing up of said nut upon the bolt to tightly clamp the pieces between the head and the nut.

15. A bolt comprising a shank, a head, and an annular flange on the inner face of the head and adapted to sink into an associated member provided with a hole receiving said bolt to form a seal to prevent leakage of liquid beneath the head into said bolt-hole, said shank having the portion remote from said head threaded to receive a nut, and substantially the full length of that portion between said threaded portion and head enlarged to a diameter greater than said threaded portion, and formed with ribs extending substantially the full length of said enlarged portion and adapted to grip the sides of the bolt-hole, to resist turning of said bolt when an associated nut is tightened on said threaded portion.

16. A bolt comprising a shank, and a thin disc-like head, said shank having the portion remote from said head externally threaded to receive a nut, and that portion between said threaded portion and head formed with a fin integral with said shank and head and extending along said shank, on a taper, in a steep generally helical path, toward the peripheral portion of said head, said fin being adapted to grip the sides of the bolt-hole to resist turning of said bolt when an associated nut is tightened on said threaded portion.

17. A bolt comprising a shank, a head, and an annular edge portion extending at an angle to the transverse plane of said head, toward the end of said shank away from said head, and adapted to sink into an associated member provided with a hole receiving said bolt to form a seal to prevent leakage of liquid beneath the head into said bolt-hole, said shank having the portion remote from said head threaded to receive a nut and that portion between said threaded portion and head enlarged to a diameter greater than said threaded portion and formed with spiral ribs adapted to grip the portions of the member defining said hole to resist turning of said bolt when an associated nut is tightened on said threaded portion.

5 18. A bolt comprising a shank, a head, and an annular peripheral portion on the inner face of said head, pointed diagonally toward the end of said shank away from said head and adapted to sink into an associated member provided with a hole receiving said bolt to form a seal for preventing leakage of liquid beneath the head into said bolt-hole, said shank having the portion remote from said head threaded to receive a

nut and that portion between said threaded portion and head tapered to a diameter greater than said threaded portion and formed with spiral flutes adapted to grip the surface of said member defining said hole to resist turning of said bolt when an associated nut is tightened on said threaded portion.

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