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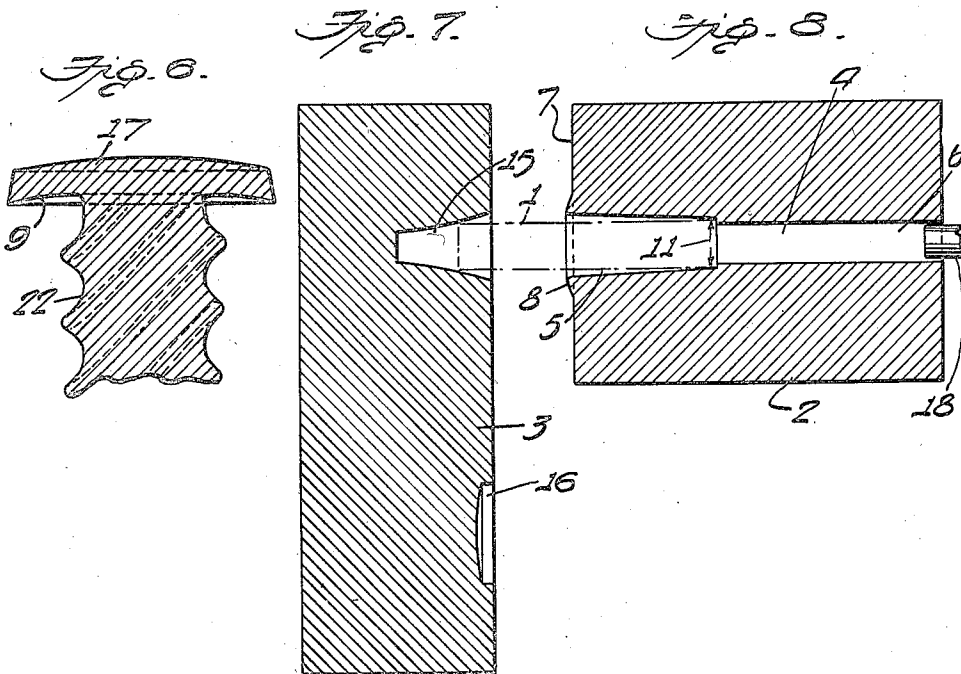
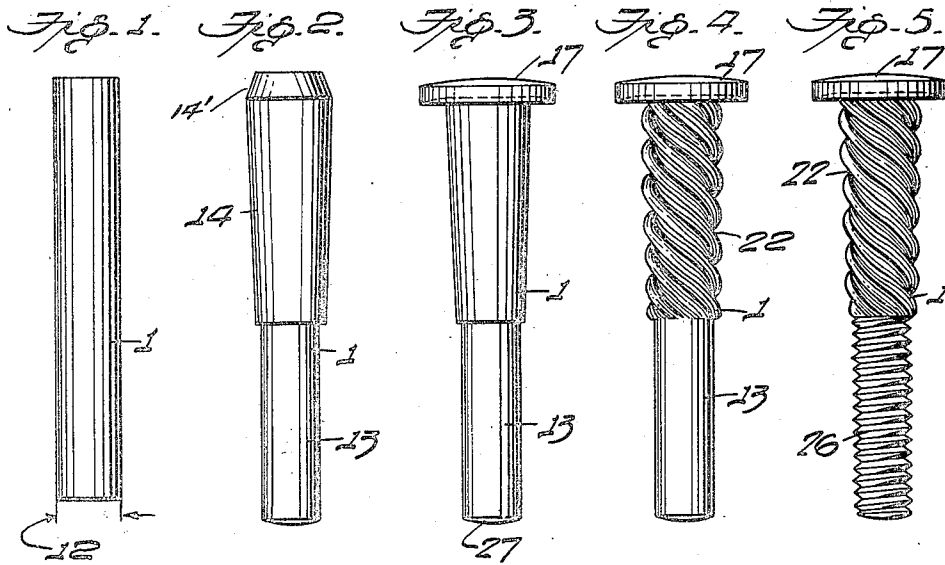
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2,024,070

METHOD OF MAKING BOLTS

Filed June 23, 1932

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

Fig. 9.

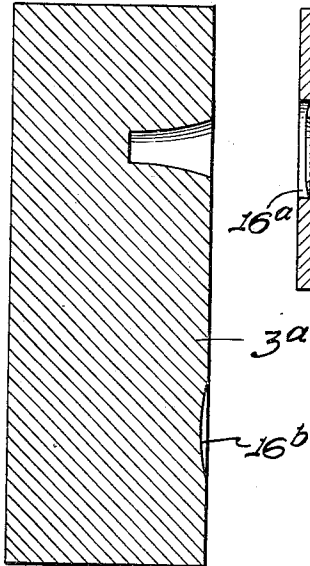


Fig. 10.

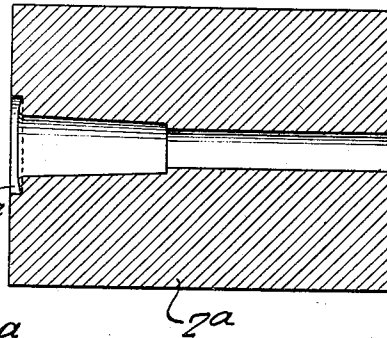


Fig. 11.

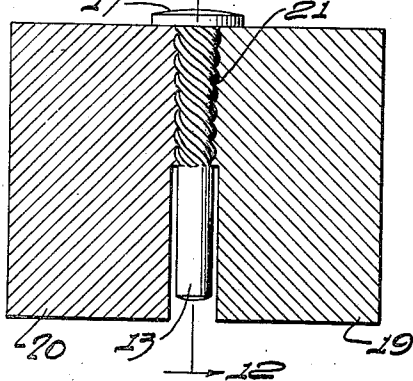


Fig. 12.

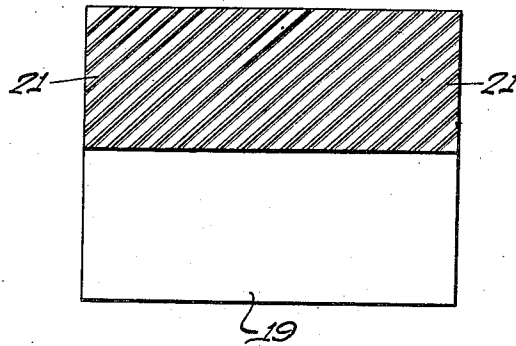
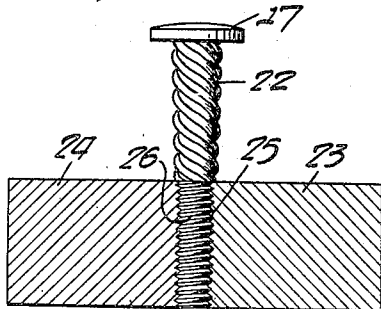


Fig. 13.



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2,024,070

METHOD OF MAKING BOLTS

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Application June 23, 1932, Serial No. 618,971

15 Claims. (Cl. 10—27)

This invention relates to bolts and, more particularly, to such for fastening wood and metal parts together, and the method of making the same.

5 The principal object of my invention, generally considered, is the manufacture 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 to the wood to thereby prevent the entry of moisture into the bolt hole along the shank of the bolt, and the method of making such bolts.

15 Another object of my invention is the formation of bolts from cylindrical wire or stock by cutting the stock to length, upsetting and tapering one end of each length, and reducing the other, forming a head on the tapered end of the stock, rolling spiral flutes into the shank or tapered portion of the blank, and rolling threads on the cylindrical portion thereof.

20 A further object of my invention is the manufacture of bolts in accordance with the above-described method, including finishing of the cylindrical end of the blank to insure full threads before thread rolling, trimming the heads to eliminate flash and tapering them so that the sides will not drag down the wood fibers, and heat-treating to anneal and eliminate cold shots prior to rolling the flutes and threads.

25 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.

30 Referring to the drawings illustrating my invention:—

Figure 1 shows a piece of wire or stock cut to length and ready for the forming process.

40 Figure 2 shows the blank after the stock of Figure 1 has been partially formed in accordance with my improved method.

Figure 3 shows the blank after being headed.

45 Figure 4 illustrates the blank after rolling spiral or substantially helical flutes into the shank or portion thereof adjacent the head.

Figure 5 shows the completely formed bolt with standard U. S. threads rolled on the end for receiving a nut.

50 Figure 6 is an enlarged longitudinal sectional view through the head of the bolt shown in Figure 5.

Figure 7 is a sectional view of the combined extruding and bolt heading movable or hammer die.

55 Figure 8 is a sectional view of the extruding and bolt heading stationary or anvil die.

Figures 9 and 10 are sectional views corresponding, respectively, to Figures 7 and 8, but showing a modification.

Figure 11 is a sectional view of the flute rolling dies with a bolt therebetween in the process of formation.

Figure 12 is a view of one of the flute rolling dies, taken on the line 12—12 of Fig. 11.

Figure 13 is a sectional view of the thread rolling dies with a bolt therebetween in the process of formation.

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 plain, 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 surfaces of the wood, either said heads project beyond the surface, 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 the 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 and method of manufacturing the same, such a bolt being provided with a tapered or frusto-conical spiral fluted, or substantially helical fluted, shank adjacent the head, said 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 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 and provide an air- and water-tight

joint. One form of my "leak-proof" bolt above referred to has been described and claimed in my application Serial No. 534,962, filed May 4, 1931.

Referring now to the drawings in detail, like parts being designated by like reference characters, the manufacture of my improved form of bolt is preferably effected by cutting a blank or length 1 from a bar or roll of wire or stock of suitable metal, preferably steel, as illustrated in Figure 1. The length of wire or stock 1 is then preferably positioned in a stationary extruding and heading die 2, said die being either split or solid, as desired. The die may be placed in a heading machine or press with a movable extruding or bolt-heading hammer die 3 positioned so as to cooperate therewith.

The stationary or anvil die 2 has an aperture 4 therethrough, a portion 5 of which is preferably frusto-conical or tapered, as shown most clearly in Figure 8, and a portion 6 of which is cylindrical. The outer surface 7 of the die 2 adjacent the large end of the frusto-conical portion, as shown in Figure 8, is preferably bulged, as indicated at 8, to provide for forming a concave inner surface 9 on the head 17 of the blank 1. The small diameter 11 of the frusto-conical portion 5 preferably corresponds with the diameter 12 of the stock or wire 1, so that when the length of stock is fed into the stationary die 2, upset, and extruded by the moving or hammer die 3, the cylindrical portion 13 on the blank, as shown in Figure 2, is extruded or decreased in diameter by being forced into the cylindrical apertured portion 6 of the die 2, while the frusto-conical portion 14 is expanded or upset in the larger frusto-conical pocket 5 of the die 2, with the provision of a shoulder at the junction between the frusto-conical and cylindrical portions. If desired, the larger or offset portion of the blank may be made straight or cylindrical by the use of a correspondingly modified die.

That portion of the hammer die 3 which first engages the blank 1 for upsetting and extruding it to the desired form preferably has an outwardly tapering pocket 15 which receives the outer end of the piece of stock 1, when placed between the dies, as indicated diagrammatically in Figures 7 and 8, and avoids undesired distortion of the metal by allowing the outer end thereof to expand slightly uniformly in the pocket portion 15 prior to the head forming process, normally producing a blank with a tapered end portion 14', corresponding with the engaged surface of the pocket 15 in the die 3, substantially as shown in Fig. 2.

With the partially formed bolt blank still in the die 2, the hammer or moving die 3 is shifted laterally until the head cavity or pocket 16 is aligned with the aperture 4 for the second stroke of the press. On said second stroke the metal extending beyond the face 8 of the die 2, and left in that position on account of the pocket 15, is preferably formed as a substantially flat head 17, the formed blank being as shown in Figure 3.

After this formation of the head on the stock, the blank is removed from the die in any desired manner, as by means of an ejector 18 operating in the aperture 4, and positioned between stationary and movable flute rolling dies 19 and 20, respectively. These dies have parallel flutes or grooves 21 on portions of the surface thereof inclined at an angle corresponding with that of the frusto-conical portion 14 of the blank 1, said flutes extending at a relatively great angle to the die, as indicated particularly in Figure 12, so that

when the moving die 20, which travels in a straight line, and may be used in any standard bolt thread-rolling machine, rolls the blank 1 between it and the stationary die 19, the spiral or substantially helical ribs or threads 22, separated by corresponding flutes or valleys, are rolled thereon, developing the blank 1 to the form shown in Figure 4.

The blank is then removed from the flute rolling dies and transferred to a stationary thread rolling die 23 and a movable thread rolling die 24, said dies being desirably used in a standard bolt-thread rolling machine and preferably provided with parallel substantially V-shaped grooves 25, so shaped and disposed at the proper angle to the direction of rolling that when the moving die 24 is rolled in a straight line, with the cylindrical portion 13 of the blank between it and the stationary die 23, said portion 13 has applied thereto threads 26 of the desired character, preferably standard U. S. threads.

Instead of forming the bolt between dies, such as shown in Figures 7 and 8, the same may be formed between dies, such as shown in Figures 9 and 10, in which the head-forming cavity 16^a is carried on the stationary die 2^a instead of on the moving die 3^a. When the bolt is made in this way, the moving die 3^a has a head-forming hammer surface substantially smooth, except possibly for a slightly concave portion 16^b, if it is desired that the outer surface of the head 17 be convex.

The foregoing description is especially for the production of bolts by the cold process. If desired, however, the bolts may be formed by the hot process in a similar way by feeding heated blanks to the dies, positioned in a bolt-making machine, and otherwise completed in the manner previously described.

Bolts, when formed either cold or hot, are desirably subjected to subsidiary steps for perfecting them. One of these steps is the pointing or finishing of the thread, small or cylindrical end of the blank to convex form, as indicated at 27, subsequent to formation of the head but prior to cutting or rolling threads thereon, so that full threads will be insured. This pointing or finishing may be done in a pointing machine, the bolt blank being held in a revolving jaw and moved against a suitably shaped pointing tool.

It is also desirable that the head 17 be trued, which may be done by forcing the bolt through a die in a punch press, cutting off the ragged edge, and shearing to size, governed by the die opening, or by a suitably shaped cutting tool held against the bolt head during the pointing above referred to.

In some instances, it may be desirable to undercut the shank adjacent the bolt head in the pointing machine during the pointing or head trimming operation to prevent piling of metal when the flutes are rolled. This, however, is merely optional.

When the bolt is formed by the cold process, it is preferably heat-treated before rolling of the threads or flutes 22 and cutting or rolling of the threads 26, said heat-treating being for the purpose of eliminating cold shots. This heat-treating is desirably done by heating the bolt blanks in an annealing furnace and quenching in hot oil.

From the foregoing disclosure, it will be seen that I have devised a method of manufacturing bolts particularly adapted for connecting wood and metal, although not limited to such use. Each of said bolts preferably comprises a tapered

or frusto-conical shank portion on which are rolled spiral or substantially helical flutes of large pitch and preferably left-handed, for engagement with wood. The end of each bolt, to which the nut is applied, preferably has standard U. S. threads which are right-handed, or if left-handed bolts are desired; the threads may be formed left-handed, and the flutes right-handed. The portion of the head of the bolt which extends beyond the shank is desirably substantially uniform in thickness with an outer spherical or convex surface and a peripheral surface nearly cylindrical, but preferably slightly tapered or frusto-conical so that the portion adjacent the shank which first engages the wood will be slightly larger than the outer portion thereof. In this way a head is formed that will have no tendency to drag or pull in the wood fibers, due to engagement of its side or peripheral surface therewith.

20 The making of a complete bolt preferably comprises the following steps: (1) cutting the stock to length; (2) tapering and extruding or reducing the stock; (3) heading; (4) pointing the thread end to insure full threads; (5) trimming or truing the heads; (6) heat-treating, if made by the cold process; (7) rolling the flutes; and (8) rolling or cutting the threads.

Although a preferred embodiment of my invention has been disclosed, it will be understood that modifications may be made within the spirit and scope of the appended claims.

I claim:—

1. The method of making bolts which comprises upsetting one end portion of a length of stock to frusto-conical form, simultaneously extruding the other end portion to cylindrical form of a diameter reduced as compared with the adjacent end of the frusto-conical part, and forming flutes on said upset part.

2. The method of making bolts which comprises upsetting one end portion of a length of stock to frusto-conical form, extruding the other end portion to cylindrical form of a diameter reduced as compared with the adjacent end of the frusto-conical part, upsetting the outer end of the frusto-conical part to form a head thereon, and forming flutes on said frusto-conical part.

3. The method of making bolts which comprises upsetting one end portion of a length of stock to frusto-conical form with the largest diameter near the end of the bolt, upsetting said end to form a head, and rolling flutes on said frusto-conical portion.

4. The method of making bolts which comprises upsetting one end portion of a length of stock to frusto-conical form, making the other end portion of cylindrical form, forming a head at the end of the frusto-conical portion, rolling left-handed spiral flutes on said frusto-conical portion, and rolling right-handed threads on said cylindrical portion.

5. The method of making bolts which comprises upsetting one end portion of a length of stock to taper it to gradually increasing section from an intermediate portion of said stock, extruding the other end portion to cylindrical form of a diameter smaller than that of the original stock and the adjacent end of the tapered portion, and forming threads or flutes on said tapered portion.

6. The method of making bolts which com-

prises upsetting one end portion of a length of stock to taper and increase the diameter thereof, extruding the other end portion to reduce the diameter thereof, upsetting the outer end of the increased portion to form a head, truing the head by cutting off the ragged edge and finishing to proper size, and forming threads or flutes on the upset portion.

7. The method of making bolts which comprises upsetting one end portion of a length of stock to tapered form, extruding the other end portion to a reduced cylindrical form, upsetting the outer end of the tapered part to form a head, heat-treating, and rolling threads or flutes on the upset portion.

8. The method of making bolts which comprises upsetting one end portion of a length of stock to tapered form, extruding the other end portion to a diameter reduced as compared with that of the stock, upsetting the outer end of the tapered portion to form a head, pointing the end of the reduced portion, and forming threads or flutes on said upset portion.

9. The method of making bolts which comprises upsetting one end portion of a length of stock to cause it to gradually increase in diameter toward said end, and rolling flutes on said upset portion.

10. The method of making bolts which comprises upsetting one end portion of a length of stock to frusto-conical form with the largest diameter near the end, and forming flutes on said frusto-conical portion.

11. The method of making bolts which comprises upsetting one end portion of a length of stock to frusto-conical form, making the other end portion of cylindrical form, forming spiral flutes on said frusto-conical portion, and forming threads on said cylindrical portion.

12. The method of making bolts which comprises forming one end portion of a length of generally cylindrical stock so that it tapers to a greater diameter than the other end portion, and forming generally helical threads or flutes of steep pitch on said end portion of greater diameter.

13. The method of making bolts which comprises forming one end portion of a length of generally cylindrical stock so that it tapers, leaving the other end portion of generally cylindrical form, forming approximately helical threads or flutes of steep pitch on said tapered portion, and forming threads of smaller pitch wound in the opposite direction on said generally cylindrical portion.

14. The method of making bolts which comprises tapering one end portion of a length of generally cylindrical stock, forming a head at the end of said tapered portion, and forming flutes on said tapered portion.

15. The method of making bolts which comprises taking a length of generally cylindrical stock, reducing the diameter of one end portion as compared with the original diameter, increasing the diameter of the portion remaining, forming a head on the extreme end of the portion of increased diameter, finishing said head to proper size, forming threads or flutes from said head approximately the full length of the portion of greater diameter, and forming threads on the portion of reduced diameter.

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