

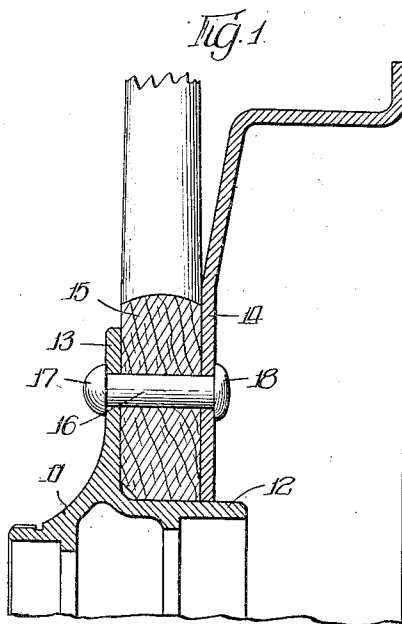
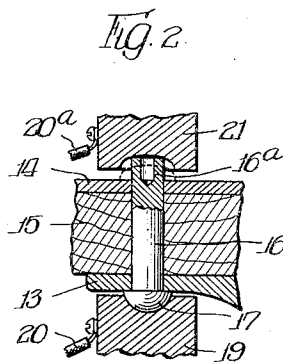
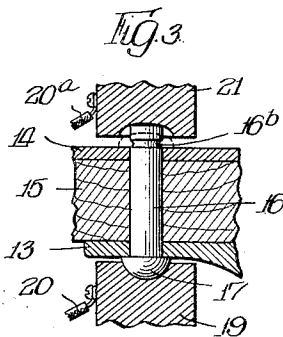
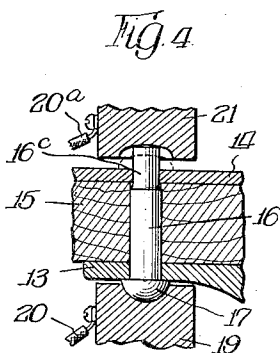
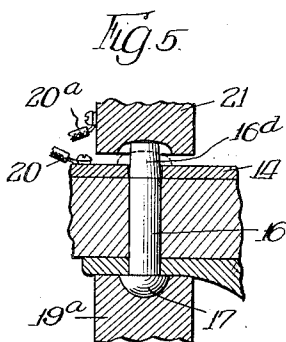
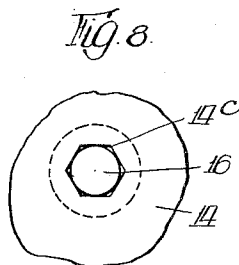
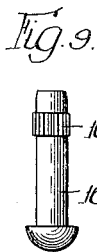
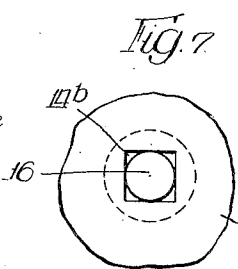
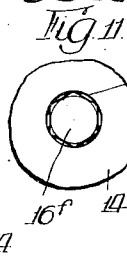
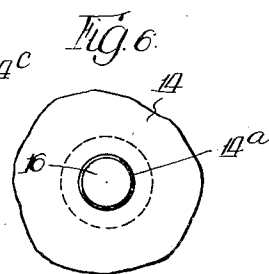
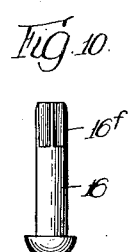
Nov. 14, 1933.

A. S. VAN HALTEREN

1,934,780

METHOD OF RIVETING WOOD AND METAL ELEMENTS

Filed April 14, 1930



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UNITED STATES PATENT OFFICE

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METHOD OF RIVETING WOOD AND METAL
ELEMENTSAndrew S. Van Halteren, East Lansing, Mich., as-
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Mich., a corporation of Michigan

Application April 14, 1930. Serial No. 443,941

2 Claims. (Cl. 219—2)

In permanently assembling articles which com-
prise composite elements such as a wood layer
between layers of metal, as by means of rivets,
difficulties are presented which it is the primary
5 object of my invention to overcome.

If the rivets are headed cold, there is a tendency
of the rivet shank to swell or buckle within the
wood under the heavy end pressure required to
upset the rivet as by blows of a riveting hammer;
10 whereas if the rivets be heated to facilitate up-
setting, there is a burning of the wood and a
consequent loose fit about the rivet shank within
the wood.

I solve these difficulties by heating the end of
the rivet locally to a temperature permitting of
easy upsetting while maintaining the shank of
the rivet in contact with the wood sufficiently
15 cool to avoid any burning effect.

This local heating of the rivet end may be
accomplished in divers ways, of which exempli-
fications may be given as follows:

Forming the rivet end with a reduced section of
metal by coring the same axially, or reducing the
outside diameter, or providing an annular external
25 groove, and then applying one electrode to the
head of the rivet and another upsetting elec-
trode to the end of the rivet, the portion of re-
duced section only will be heated to any substan-
tial extent.

30 Again, a rivet of uniform or non-uniform sec-
tion may be used, and the electrodes applied one
to the metal plate adjacent that end of the rivet
to be upset and the other pressure electrode to
the rivet end.

35 In either case, the swelling of the upset end
of the rivet into intimate contact with the metal
plate at that end will cause a rapid dissipation
of the heat and a quick cooling.

40 Added advantages are presented in my im-
proved method inasmuch as the metal is tem-
pered by rapid cooling of the upset end; there is
no fracturing of the metal particles of the rivet
head as is possible where cold riveting is prac-
ticed; and no great pressure is required to upset
45 the heated rivet as in the case of blows required
in cold riveting.

In order that the invention may be readily
understood by those skilled in the art, a diagram-
matic representation of the conditions employed
50 and steps practiced is presented in the accom-
panying drawing as applied to the permanent
securing of the metal and wood parts in a wood
wheel hub assembly, by way of example.

In the drawing:

55 Fig. 1 is a conventional illustration of a frag-

mentary radial section of a wood wheel hub
assembly;

Figs. 2, 3, 4 and 5 are fragmentary sections
illustrating the rivet in place ready for up-
60 setting;

Figs. 6, 7 and 8 are schematic plan views illus-
trating the relation between the end of the rivet
and a metal plate prior to upsetting; and

Figs. 9, 10 and 11 represent, respectively, two
forms of rivets and their relation to the metal
65 plate.

Referring to the drawing in detail, by way of
example, a wheel hub is indicated at 11 compris-
ing the hub barrel 12 and permanent hub flange
13. Between the flange 13 and the brake drum
70 14 is disposed the wheel spider comprising wood
spokes 15. One of a series of rivets having shanks
16, original heads 17 and an upset head 18 is
shown as permanently binding the spoke 15 be-
tween the hub flange 13 and the brake drum 14.

75 It will be obvious that if the rivets 16 are in-
serted hot, the wood of the spoke 15 will be
charred where it contacts with the heated shank
of the rivet. It will also be evident to those skilled
in the art that if a cold rivet 16 were employed
80 and headed cold, the heavy pressure blows re-
quired to upset the rivet will tend to cause a
swelling or buckling of the shank where it trans-
fixes the wood element.

In order to accomplish the hot upsetting of
85 the rivet without injuriously affecting the wood
element of the assembly, any one of a number
of expedients may be adopted, all of which are
embraced within my invention, several of which
expedients are illustrated in the other figures of
90 the drawing.

According to Fig. 2, an anvil electrode 19 forms
one terminal of an electric circuit indicated at
20 while a pressure electrode 21 forms the other
terminal of the electric circuit as indicated at 20^a.
95 In this case, the rivet is provided with a cored
end portion 16^a of reduced metallic cross section
which fits within an aperture of the brake
drum 14.

The anvil electrode 19 is brought into support-
ing contact with the rivet head and the pressure
electrode is brought into pressure contact with the
reduced end of the rivet. When the elec-
tric circuit is closed, the passage of the elec-
tric current through the rivet will cause a 105
rapid heating of its reduced end, by reason
of the greater resistance, while the shank
of the rivet will remain substantially unheated.
The pressure of the electrode 21 will cause an
upsetting of the reduced rivet end, substantially
110

closing of its central cavity, thus forming a conventional rivet head as indicated at 18 in Fig. 1. The heating and upsetting of the rivet is practically instantaneous, and likewise the dissipation of the heat through the metal plate 14.

In Fig. 3 the method is substantially the same, the only difference being that the reduction of cross section in the rivet end is obtained by providing the same with an external annular groove 16^b.

The same method of procedure applies to Fig. 4, the only difference residing in effecting a reduced cross section of the rivet end by decreasing its over-all diameter as represented at 16^c.

According to Fig. 5, the anvil 19^a does not serve as an electrode but purely as a support for the head 17 of the rivet 16. Herein the metal plate 14 of the brake drum forms one terminal 20 of the electric circuit while the pressure electrode 21 forms the other terminal of the electric circuit as indicated at 20^a. In this instance, the rivet end is shown as having an intimate contact with the plate 14 of the brake drum, such contact, amounting to a driving fit, being obtained, as illustrated in this figure, by slightly tapering the rivet end, as indicated at 16^d. The rivet 16 being supported by the anvil 19^a and the pressure electrode 21 being brought into pressure relationship to the rivet end, the closing of the circuit will cause a flow of electric current through the plate 14, the rivet end 16^d and the pressure electrode 21, the shank of the rivet 16 not being included in the circuit and consequently being unheated to any degree. Here, as in the other examples given, the rivet end will be instantly heated and upset when the circuit is closed and pressure applied and the same rapid cooling will be effected by dissipation of the heat through the plate 14.

It will be appreciated that, under the method last described, it is important that there be an intimate electrical contact between the plate 14 and the rivet adjacent the end to be upset. Where this condition is attained by tapering the rivet end and driving the same into the aperture 14^a provided in the plate 14, there may persist a slight clearance about the rivet at the outer face of the plate as indicated in Fig. 6, into which clearance space the heated metal of the rivet is displaced by the heating operation.

An intimate contact between the plate 14 and the rivet end 16, according to the method illustrated in Fig. 5, may be obtained by providing the plate 14 with a polygonal aperture 14^b into

which the end of the rivet 16 may be driven as indicated in Fig. 7.

A close contact between the plate 14 and the end of a standard rivet 16 is also obtainable in practice by employing a polygonal punch and a round die for producing the rivet-receiving apertures in the plate, the result being an aperture round on the die side and polygonal on the punch side. Such an aperture in relation to the end of the rivet 16 is represented at 14^c in Fig. 8.

Even better results have been found to follow the employment of a rivet having that portion of its shank adjacent its end formed of polygonal cross-section as indicated at 16^e and 16^f in Figs. 9 and 10 and then driven into a round aperture 14^c as indicated in Fig. 11. The spur corners of the polygonal portion of the rivet shank bite into the metal of the plate, thus insuring a good electrical contact between the rivet and plate as indicated in Fig. 11.

I claim:

1. The method of riveting metal members together upon an interposed wood member which comprises providing the members with aligned apertures, forming a rivet with a head and with a generally cylindrical shank of a diameter closely fitting said apertures and that end portion opposite its head with lateral spurs having an over all diameter greater than the cylindrical portion of the shank, transfixing the apertured members with such rivet with the head seated against one of the metal members and the spurred portion engaged within the aperture of the other metal member with its end projecting, applying one terminal of an electric circuit to that metal member adjacent the rivet end and the other terminal to the projecting end of the rivet whereby to heat that end of the rivet locally, and finally exerting pressure by the second terminal to upset the heated end of the rivet.

2. The method of electrically riveting through metal which consists in deforming the rivet shank circumferentially adjacent its end to form thereon radially projecting ridges, driving the rivet into an aperture of the metal to force the ridges into the metal wall of the aperture, applying one electrode to the metal and a second electrode to the rivet end, applying electric current to heat the rivet between the metal and the rivet end, and applying pressure by means of the second electrode whereby to upset the heated rivet end.

ANDREW S. VAN HALTEREN.