July 12, 1966 R. R. DEAN ETAL 3,260,988

BINDING POST

Filed June 9, 1964

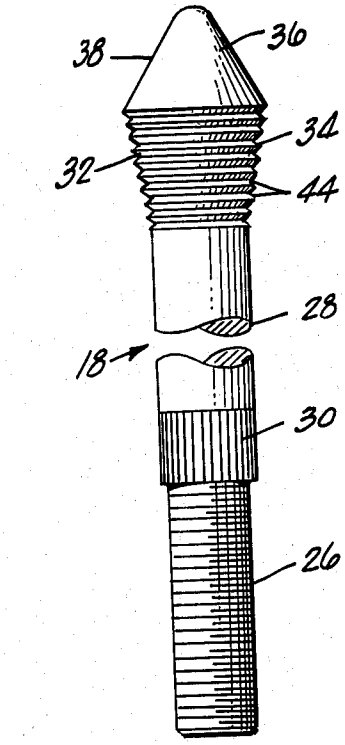

Fig. 2

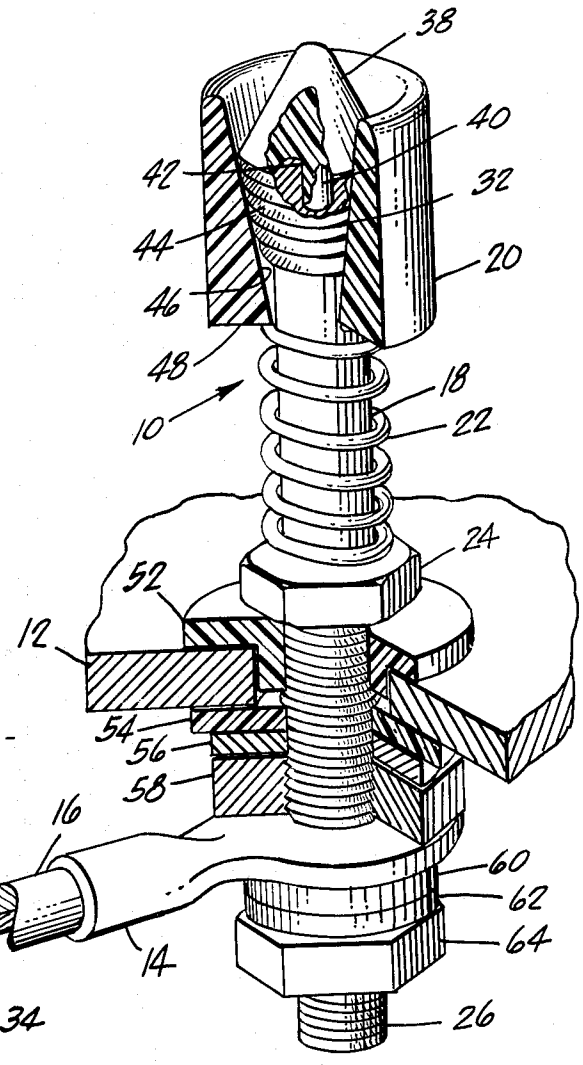

Fig. 1

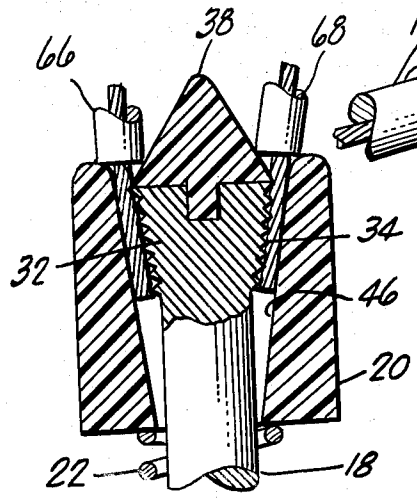

Fig. 3

INVENTORS
ROBERT R. DEAN
MICHAEL L. MARCOUX

BY Hoch N. Jeu
AGENT

United States Patent Office 3,260,988 Patented July 12, 1966

3,260,988

BINDING POST

Robert R. Dean, Lakewood, and Michael L. Marcoux, Huntington Beach, Calif., assignors to Douglas Aircraft Company, Inc., Santa Monica, Calif.

Filed June 9, 1964, Ser. No. 373,750
3 Claims. (Cl. 339—254)

Our present invention relates generally to electrical binding posts and more particularly to an improved binding post to which electrical wires may be easily and firmly attached thereto.

Electrical binding posts are commonly used on various electrical equipment and components to connect electrical wiring to such apparatus. These binding posts are normally mounted to the surface of the apparatus and are electrically connected to the electrical circuitry within the apparatus. The binding posts must, of course, ordinarily be electrically insulated from the surface to which they are mounted if such surface is made of electrically conductive material.

Electrical wires are frequently connected to and then disconnected from test equipment. The trouble encountered with the usual binding posts used on most test equipment is that the wires connecting with the binding posts become loose and make poor and intermittent contact. This is particularly bothersome with small, fine wires. It is desirable that the wires can be readily attached to and detached from the binding posts on such equipment and that good, secure electrical connections are consistently obtained. It should be possible to accomplish this with one or more wires of different sizes which may be attached to a single binding post.

Another desirable feature for binding posts which are often used under severe and harsh operating conditions, is that the posts should be easily installed and securely mounted onto the surface of the electrical equipment. Harsh usage of easily installed binding posts normally results in posts which soon become loose. This is especially true where the binding posts are desirable and readily mountable and dismountable.

Also, where electrically energized connections are being made, it is desirable that the connecting wires can be safely guided and attached to easily operated binding posts. The prior art binding posts including a threaded stud and engaging nut for clamping the end of one or more wires wrapped thereon, and a post and spring-loaded cap slidably positioned thereon for engaging the straight end of a wire passed through a transverse hole in the post normally covered by the spring loaded cap, are well-known binding posts which do not meet these or the foregoing desirable features for binding posts.

It is, therefore, a major object of our invention to provide a novel and useful binding post which fulfills the desirable features enumerated above for electrical binding posts.

More specifically, it is an object of this invention to provide an electrical binding post in which one or more electrical wires can be easily and securely attached to the binding post in positive electrical contact therewith.

Another object of the invention is to provide a binding post which is readily and firmly mountable to or dismountable from the surface of electrical apparatus.

A further object of this invention is to provide a binding post to which electrically energized wiring can be guided and attached to the binding post without undue exposure to electrically conductive parts or structure.

A still further object of the invention is to provide a binding post which is structurally few in parts and can be assembled to remain constantly ready for installation on electrical apparatus.

Briefly, and in general terms, the foregoing and other objects are preferably accomplished by providing a binding post which includes a novel stud, collar, spring and nut that are assembled into a particularly useful arrangement and effective structure.

The stud is made of a hard, strong, electrically conductive material which is preferably non-corrosive and has a normally threaded lower end, a generally smooth cylindrical shank with a circumferentially straight-knurled lower portion, and an enlarged head with a circumferentially grooved or serrated, upwardly diverging conical surface capped by an upwardly smooth and converging conical surface preferably of a molded plastic tip or other similar, non-conducting material. The outer edges or ends of the serrations are sharp in order to obtain good electrical contact with engaged wires.

The collar is also preferably made from molded plastic or other similar non-conducting material which is strong and relatively hard in the form of a cylinder having a central, upwardly smooth and diverging hole therein. The major, longitudinally middle surface portion of this hole fits in direct contact with the serrated and upwardly diverging conical surface of the head of the stud, when the collar is positioned on the stud in its uppermost position.

The spring is preferably a helically wound compression spring coil which fits generally on the shank of the stud and is used to bias the collar towards its uppermost position on the stud.

The nut is preferably of a standard hexagonal shape and size having a central, circular and smooth cylindrical hold therein which is press fitted over the straight-knurled lower portion of the shank of the stud to compress the spring partially between the top surface of the nut and the bottom surface of the collar at its uppermost position on the stud. The coil diameter of the spring is such that the spring is retained on the shank of the stud between the nut and the collar.

The binding post is thus assembled and is thereafter ready for installation on electrical apparatus. Installation is greatly facilitated by having the binding post properly pre-assembled before installation. The pressed on nut essentially retains all of the different parts of the binding post together and also provides a wrench gripping surface for facilitating mounting of the binding post to electrical apparatus.

Our invention will be more fully understood, and other features and advantages thereof will become apparent from the following detailed description of an illustrative example of the invention. The description is to be taken in conjunction with the accompanying drawings, in which:

FIGURE 1 is a perspective view, partially sectionalized, of our binding post installed, on, for example, part of an electrical chassis;

FIGURE 2 is an elevational view of the stud used in the binding post; and

FIGURE 3 is a fragmentary, central and longitudinal sectional view of the upper portion of the binding post showing it engaging the ends of two electrical wires.

A perspective view of our binding post **10** is shown installed and mounted on a metallic chassis **12** in FIGURE 1.

FIGURE 3 is a fragmentary, central and longitudinal sectional view of the upper portion of the binding post showing it engaging the ends of two electrical wires.

A perspective view of our binding post **10** is shown installed and mounted on a metallic chassis **12** in FIGURE 1. The binding post **10** is illustratively connected to terminal lug **14** of a wire **16**. The binding post **10** includes a stud **18**, collar **20**, spring **22** and nut **24**. The stud **18** is made of steel, for example, preferably a non-corrosive type although not necessarily so, and is illustrated in de-

tail in FIGURE 2. The stud 18 may, of course, be made of steel having a non-corrosive cadmium plating, for example, or it could be made of an appropriate alloy such as constantan for use in thermocouple work. It can be seen to have a normally threaded lower end 26, a generally smooth cylindrical shank 28 with a circumferentially straight-knurled lower portion 30, and an enlarged head 32 with a circumferentially grooved or serrated, upwardly diverging conical surface 34 capped by an upwardly smooth and converging conical surface 36 of, for example, a strong and relatively hard molded plastic tip 38. Other non-conducting material having characteristics similar to plastic may, of course, be used for the tip 38. The tip 38 has a stem 40 which is press fitted into a central, mating hole 42 drilled in the top surface of the metallic stud 18.

It is apparent, of course, that stud 18 and tip 38 could be made in one piece, of conductive material. The conical shape would be retained; however, a conductive tip is provided to which the end of a wire may be easily touched when desired. It should also be noted that the stud 18 must be made of a strong and hard material (preferably non-corrosive) so that sharp and durable outer edges or ends of the serrations on surface 34 are obtained. Sharp outer edges or ends on the serrations are necessary in order that good and secure electrical contact will result when engaging wire ends which may be oxide coated and/or be of various sizes.

The serrated conical surface 34 diverges symmetrically at an angle of, for example, sixteen degrees overall or eight degrees with the vertical axis of the stud 18. A number of separate and circular grooves 44 are provided on the surface 34 and produces the serrations thereon. The conical tip 38 is also symmetrical with respect to the axis of the stud 18 and has a rounded apex angle preferably of 60 degrees as is apparent from FIGURE 2. The serrated conical surface 34 diverges upwardly at an angle which is matched by that of the surface of a symmetrical, smooth and diverging hole 46 in the collar 20 (FIGURE 1).

The collar 20 is preferably made of molded plastic material similar to that of the conical tip 38, in the form of a cylinder having a central, upwardly diverging hole 46 therein. The collar 20 is shown in its uppermost position on the stud 18 in FIGURE 1. It can be observed that the middle portion of the upwardly diverging hole 46 of collar 20 is in direct and matching contact with the serrated and upwardly diverging conical surface 34 of the stud's head 32. The collar 20 is normally urged towards its uppermost position on the stud 18 by the biasing action of the helically wound, compression spring 22.

The spring 22 is preferably a steel compression spring coil having several axially spaced helical turns making up the coil. The ends of the coil are squared and ground to abut flatly against the bottom surface 48 of collar 20 and the top surface 50 of the nut 24. The nut 24 is preferably made of steel in a standard hexagonal shape and size but having a central, circular and smooth cylindrical hole therein which can be press fitted tightly onto the straight-knurled lower portion 30 of the shank 28 of stud 18. The spring 22 is, of course, partially compressed in this condition between the top surface 50 of the nut 24 and the bottom surface 48 of the collar 20 at its upper most position on the stud 18.

The assembled binding post 10 is mounted and installed on the chassis 12 with the threaded lower end 26 of the stud 18 passed through an insulating (fiber) shoulder washer 52, chassis 12, then a flat, insulating (fiber) washer 54, lock washer 56 and secured to the chassis 12 by a retaining nut 58. To attach the lug 14 to the stud 18, a flat washer 60, lock washer 62 and retaining nut 64 can be used as indicated in FIGURE 1.

The retaining nuts 58 and 64 can be firmly tightened by using a wrench to hold the nut 24 and thus prevent the stud 18 from being turned when tightening the nuts

58 and 64. If the chassis 12 is thicker than twice the neck height of the shoulder washer 52, another similar shoulder washer may be used in lieu of the flat washer 54. Of course, when the binding post 10 is to be mounted on a non-conducting chassis or board, the insulating washers 52 and 54 can be omitted and the threaded lower end 26 of the stud 18 can be screwed directly into a tapped hole made in the non-conducting chassis or board.

Wires can be attached to the installed binding post 10 by grasping the collar 20 and depressing the same against the force of the spring 22 to produce a space between the collar hole 46 and the serrated surface 34, and inserting the wire ends into such space after which the collar 20 is released. The result is that the wire ends will be firmly and positively gripped by the sharp serrations as shown in FIGURE 3 wherein wires 66 and 68 are illustratively shown connected to the binding post 10.

Good electrical contact is established between the ends of the wires 66 and 68 and the stud 18 because of the wedging action of the spring biased collar 20 which squeezes the wire ends between the relatively hard surface of hold 46 and the sharply serrated surface 34 of the stud 18. When the wires 66 and 68 are pulled or placed under tension, the combined characteristics of the collar 20 and the serrated surface 34 tend to seat the wires more firmly in the serrations to hold the wires and maintain good electrical contact.

The collar 20 used in conjunction with the serrations of surface 34 is naturally self-orienting and will firmly hold up to three properly positioned individual wires. More wires may be easily gripped if they are first hand-twisted into no more than three groups before such groups are inserted into the space which is produced between the serrated surface 34 and the surface of the collar hole 46 when the collar 20 is depressed.

The conical tip 38 greatly aids in guiding the ends of the wires 66 and 68 into the space produced between the collar 20 and the serrated surface 34 of the stud 18. At the same time, the non-conductive material of the collar 20 and the conical tip 38 minimizes the possibility of manual or other contact with an electrically energized surface. Actual wire contact with the conductive stud 18 is also made within a generally shielded and enclosed space.

Variations in details and usage of the illustrative example of our invention are, of course, possible. For example, when the collar 20 is made of metal in order to provide a strong and hard surface for the hole 46, a non-conductive outer shell having a suitable non-slipping outer surface may be integrally affixed to the collar 20 so that an insulated outer surface is obtained therefor. The improved binding post can also be used without the nut 24, if necessary, since the shank 28 of stud 18 has a lower shoulder which can engage the upper surface of the washer 52. In this instance, the lower end of the spring 22 will also engage the upper surface of the washer 52, and the spring 22 will be retained in a partially compressed condition after the nut 58 has been suitably tightened during installation of the binding post.

The exemplary embodiment of the invention described above and shown in the drawings is, therefore, merely illustrative of, and not to be restrictive on our broad invention. It is to be understood that various changes in design, structure and arrangement in the invention may be made without departing from the spirit and scope of the appended claims.

We claim:

1. An improved binding post, comprising:
a stud made of conductive material and including
a normally lower end for attachment with mounting structure,
a shank having a lower securing portion, and
a head having an upwardly diverging conical sur-

face which is circumferentially grooved to provide a serrated conical surface;

a collar positioned on said stud around said head thereof, and including

an upwardly diverging hole having a surface adapted to engage cooperatively with at least a portion of the serrated conical surface of said head when said collar is positioned on said stud in its uppermost position;

a conical tip formed of a non-conductive material having an upwardly converging conical surface and being located on top of said head, said conical tip provides a guiding surface to the space between the serrated conical surface of said head and the cooperative surface of said hole in said collar;

spring means positioned on said stud for urging said collar to its uppermost position on said stud; and

means engaging a lower portion of said stud for retaining said spring means in a partially compressed condition to spring load said collar normally to its uppermost position on said stud whereby said collar can be depressed against the spring force of said spring means to produce a space between the serrated conical surface of said head of said stud and the cooperative surface of said hole in said collar for insertion of a wire end therein, the wire end being firmly gripped between the serrated conical surface of said head and the cooperative surface of said hole when said collar is released.

2. An improved binding post, comprising:

a stud made of conductive material and including

a normally lower end for attachment with mounting structure,

a shank having a lower securing portion, and

a head having an upwardly diverging conical surface which is circumferentially grooved to provide a serrated conical surface with serrations having sharp and hard outer edges;

a collar having at least its radially outer surface made of non-conductive material positioned on said stud around said head thereof, and including

an upwardly diverging hole having a surface adapted to engage cooperatively with the serrated conical surface of said head when said collar is positioned on said stud in its uppermost position;

a conical tip formed of a non-conductive material having an upwardly converging conical surface and located on top of said head for providing a guiding surface to space between the serrated conical surface of said head and the cooperative surface of said hole in said collar;

a helically wound compression spring coil positioned on said shank of said stud and having an upper end adapted to engage said collar to urge it to its uppermost position on said stud; and

means engaging the lower portion of said stud for retaining said spring coil in a partially compressed condition to spring load said collar normally to its uppermost position on said stud whereby said collar can be depressed against the spring force of said spring coil to produce a space between the serrated conical surface of said head and the cooperative surface of said hole in said collar for insertion of a wire end therein, the wire end being firmly gripped between the sharply serrated conical surface of said head and the cooperative surface of said hole when said collar is released.

3. An improved binding post, comprising:

a stud made of conductive material and including

a normally lower end for attachment with mounting structure,

a shank having a lower securing portion, and

a head having an upwardly diverging conical surface which is circumferentially grooved to provide a serrated conical surface with serrations having sharp and hard outer edges;

a collar having at least its radially outer surface made of non-conductive material positioned on said stud around said head thereof, and including

an upwardly diverging hole having a surface adapted to engage cooperatively with at least a portion of the serrated conical surface of said head when said collar is positioned on said stud in its uppermost position;

a conical tip formed of a non-conductive material having an upwardly converging conical surface and located on top of said head for providing a guiding surface to space between the serrated conical surface of said head and the cooperative surface of said hole in said collar;

a helically wound compression spring coil positioned on said shank of said stud and having an upper end adapted to engage said collar to urge it to its uppermost position on said stud; and

a nut affixed to the lower portion of said shank, said nut providing a stud rotation holding means and also partially compressing said spring coil between said nut and said collar in its uppermost position on said stud whereby said collar can be depressed against the spring force of said spring coil to produce a space between the serrated conical surface of said head and the cooperative surface of said hole in said collar for insertion of a wire end therein, the wire end being firmly gripped between the sharply serrated conical surface of said head and the cooperative surface of said hole when said collar is released.

References Cited by the Examiner

UNITED STATES PATENTS

2,714,197	7/1955	Wharton et al.	229—255
2,761,115	8/1956	Visconti	339—255

OTHER REFERENCES

Electronic Design, Jan. 18, 1963, page 157.

PATRICK A. CLIFFORD, *Primary Examiner.*

J. H. McGLYNN, *Assistant Examiner.*