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1 Attorney Docket No. 79528

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3 UMBILICAL CABLE BONDING TOOL

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5 STATEMENT OF GOVERNMENT INTEREST

6 The invention described herein may be manufactured and
7 used by or for the Government of the United States of America
8 for governmental purposes without the payment of any royalties
9 thereon or therefor.

10

11 BACKGROUND OF THE INVENTION

12 (1) Field of the Invention

13 This invention generally relates to a cable bonding tool.
14 More particularly, the invention relates to a cable bonding
15 tool having an aluminum alloy portion and an elastomeric
16 sponge portion, the sponge portion in contact with the cable,
17 and thereby preventing damage thereto.

18 (2) Description of the Prior Art

19 The current art for cable bonding tools is limited.
20 Prior to the present invention, there was no device
21 specifically intended for the bonding of the Capsule Launching
22 System (CLS) umbilical cable to a capsule. Typically a length
23 of wood such as a 2x4 was utilized to bond the umbilical
24 cable. This resulted in an inferior adhesive bond line

1 thickness as the 2x4 dimensions and the contact surface shape
2 did not match the contour of the CLS capsule outer diameter.

3 Thus, a problem exists in the art whereby a device for
4 specifically bonding an umbilical cable to a capsule is not
5 known.

6 The following patents, for example, disclose various
7 types of bonding cables, but do not disclose a tool for the
8 adhesive bonding of an umbilical cable to a capsule.

9 U.S. Patent No. 2,786,393 to Grimes;

10 U.S. Patent No. 3,518,613 to Alpert;

11 U.S. Patent No. 3,883,209 to Kongelbeck;

12 U.S. Patent No. 4,047,464 to Rederiksson et al.;

13 U.S. Patent No. 4,099,038 to Purdy;

14 U.S. Patent No. 4,184,731 to Betzmeir;

15 U.S. Patent No. 5,652,404 to Girard; and

16 U.S. Patent No. 5,710,388 to Hutchinson et al.

17 Specifically, the patent to Grimes discloses a monitoring
18 cable release mechanism for a missile having an umbilical plug
19 or connector adjacent one end thereof, a support line attached
20 to the cable, a member to which the support line is attached,
21 a pair of latches pivotally carried by the member for
22 releaseably attaching the member to the missile shell, and
23 means for releasing the latches. The means include a sector
24 shaped release arm pivotally mounted on the member, the

1 release arm having pins received by the latches when the
2 latter are in latching position, a second line having one end
3 attached to the release arm and the other end attached to the
4 plug, whereby when the plug is released, it acts to unlatch
5 the latches thereby permitting the cable to fall clear of the
6 missile.

7 Alpert discloses a missile umbilical cable adapted to
8 interconnect a missile and a launcher prior to launch and
9 having a mechanical linkage interconnecting the missile and
10 launcher to cause automatic disengagement of the umbilical
11 from the missile upon launch in the absence of shearing forces
12 and consequent destruction of the interconnecting pins or
13 electrical components.

14 Kongelbeck is directed to a missile connector for
15 providing electrical connections to an aerial missile from a
16 missile launcher of the box type. A novel feature resides in
17 the provision of structure which allows limited shifting
18 movement of the missile in the launcher without disturbing
19 these electrical connections.

20 Rederiksson et al. disclose a device for breaking the
21 connection between an electric control system and a missile by
22 separating a control cable or umbilical cord joining the
23 missile to its launcher housing during launch. A plurality of
24 continuous, flexible conductors are passed through openings in

1 a non-conductive insert in the surface of the missile.
2 Because the conductors are secured to both the missile and the
3 housing on opposite sides of the insert, they are tensioned
4 against and bent over the outer edge of the opening during
5 launch and broken due to the concentration of tensile and
6 bending stress at the point of contact.

7 Purdy discloses a peel-away flat cable for providing
8 electrical connection to a missile. First and second flat
9 cables, each having a plurality of spaced conductors, are
10 electrically connected together and are bonded to one another.
11 A breakaway joint is provided in the cable to provide ready
12 separation after the cable has performed its desired function.

13 Betzmeir relates to an electrical connector designed for
14 use inside a tube such as an ejector tube for the expulsion of
15 bodies from the tube, whereby the electrical connector is
16 ejected from the tube together with the respective body, such
17 as a mine. As soon as the body leaves the tube, the connector
18 automatically separates itself from the ejected body and falls
19 apart. For this purpose the components of the electrical
20 connector are so shaped that they cooperate for making
21 electrical contact only inside the tube.

22 Girard discloses a device for disconnecting a releasable
23 connector for connecting a flexible connecting element of an
24 umbilical tower to a launcher of the type comprising a base

1 fixed on the launcher and adapted to receive a plug connected
2 to the flexible connecting element and comprising pull-away
3 means for releasing the plug upon firing the launcher
4 connected to an end of a pulling element. The device
5 comprises an element capable of breaking upon firing the
6 launcher for fastening the flexible connecting element to the
7 launcher.

8 Hutchinson et al. discloses an umbilical cord for
9 connecting the control systems within a control center to the
10 operating systems of a projectile that is located within a
11 launch tube and is to be launched therefrom, the umbilical
12 cord comprising a cable having a plurality of conductors
13 therein and having a control center end and a projectile end,
14 a first connector terminated to the conductors at the control
15 center and at a second connector terminated to the conductors
16 at the projectile end, the second connector having insulation
17 displacement contacts therein where the conductors are
18 terminated and the second connector is captivatively pluggable
19 into a recess in the side of the projectile through a port in
20 the launch tube and upon the launching of the projectile, the
21 connector remains with the projectile and the conductors
22 remain with the launch tube, whereby the conductors are pulled
23 free from the insulation displacement contacts.

1 It should be understood that the present invention would
2 in fact enhance the functionality of the above patents by
3 providing a simple tool for the adhesive bonding of an
4 umbilical cable to a capsule or the like.

5
6 SUMMARY OF THE INVENTION

7 Therefore it is an object of this invention to provide a
8 bonding tool.

9 Another object of this invention is to provide a bonding
10 tool for adhesively securing a cable to a capsule.

11 Still another object of this invention is to provide a
12 bonding tool having at least a bar portion and a resilient
13 portion coextensively bonded together.

14 A still further object of the invention is to provide a
15 bonding tool having a metal alloy bar portion and a resilient
16 sponge portion bonded to the metal alloy.

17 Yet another object of this invention is to provide a
18 bonding tool which is simple to manufacture and easy to use.

19 In accordance with one aspect of this invention, there is
20 provided a bonding tool including an aluminum metal alloy bar
21 member of a predetermined width, the bar having an upper
22 surface, a lower surface, and opposing longitudinal edges. A
23 resilient material is adhesively joined with the bar, the
24 resilient material having an upper surface, a lower surface

1 and opposing longitudinal edges. The joining of the resilient
2 sponge material to the bar is such that an entire upper
3 surface of the sponge material is coextensive with an entire
4 lower surface of the bar member. The bonding tool is made in
5 several, for example five, sections and is laid on a cable for
6 bonding the cable to a capsule or the like in a separate
7 process.

8

9 BRIEF DESCRIPTION OF THE DRAWINGS

10 The appended claims particularly point out and distinctly
11 claim the subject matter of this invention. The various
12 objects, advantages and novel features of this invention will
13 be more fully apparent from a reading of the following
14 detailed description in conjunction with the accompanying
15 drawings in which like reference numerals refer to like parts,
16 and in which:

17 FIG. 1 is a sectional side view of a partly expanded
18 cable bonding assembly according to a first preferred
19 embodiment of the present invention;

20 FIG. 2 is an exploded side view of the cable bonding
21 assembly of the present invention without a cable;

22 FIG. 3 is a sectional side view of the bonding tool alone
23 of FIG. 1;

1 FIG. 4 is a sectional view of the aluminum alloy
2 structure of the bonding tool shown in FIG. 2;

3 FIG. 5 is a plan view of the bonding tool shown in FIG.
4 2; and

5 FIG. 6 is a top plan view of separate sections of the
6 bonding tool as they would be assembled.

7
8 DESCRIPTION OF THE PREFERRED EMBODIMENT

9 In general, the present invention is directed to a
10 bonding tool. More specifically, the present invention is
11 directed to a bonding tool which provides a reliable mechanism
12 for bonding an umbilical cable to a Tomahawk CLS capsule.
13 As indicated, there has previously been no device specifically
14 intended for the bonding of a CLS umbilical cable. Typically,
15 a 2x4 was utilized to bond the umbilical cable. This resulted
16 in an inferior adhesive bond line thickness as the 2x4 did not
17 match the contour of the CLS capsule outer diameter.

18 Referring first to FIG. 1, the cable bonding assembly 10
19 is shown therein. The cable bonding assembly 10 in whole is
20 shown to illustrate a preferred application of a bonding tool
21 26 to a device in the industry, and is not intended to be
22 limiting to this application.

23 Continuing, and referring to both FIGS. 1 and 2, the
24 cable bonding assembly 10 is further shown to include a

1 capsule 12. This capsule 12 represents the Tomahawk CLS
2 capsule and is generally cylindrical in shape. Plates 14 are
3 secured to capsule 12 in a spaced apart relationship so as to
4 form recessed site 14a throughout an entire longitudinal
5 surface thereof. Within the recessed site 14a, there is an
6 exposed surface 16 upon which is seated an umbilical cable 18.

7 The umbilical cable 18 is intended to be secured to the
8 exposed surface 16 of the capsule 12 by an adhesive 24. Once
9 the umbilical cable 18 is set on the adhesive 24, the bonding
10 tool 26 is laid thereon and secured by straps 46. The bond
11 pressure is applied by placing and tightening the ratchet
12 straps 46 (or equivalent) over the bonding tool 26 and around
13 the outer diameter of capsule 12 and plates 14. In use, there
14 are preferably five (5) tool 26 segments which are laid upon
15 the entire length of the cable 18. FIG. 5 illustrates one
16 such segment 26a.

17 Each segment 26a has a key 26b protruding from an end
18 thereof and a key slot 26c formed in the opposite end and
19 shaped to receive a key 26b from another segment 26a. Thus
20 the segments 26a are made to interlock with one another as
21 shown in FIG. 6. The use of the multiple tool segments 26a to
22 form an entire length of tool 26 enables easy transport of the
23 tool 26 and application to varying length devices.

1 Referring now more specifically to FIG. 3 and FIG. 4 of
2 the drawings, the tool 26 detail is better shown and further
3 explained. The bonding tool 26 includes a rigid bar portion
4 28 and a resilient material portion 36. The bar portion 28 is
5 formed to include an upper surface 30, a lower surface 32
6 opposite the upper surface, and opposing longitudinal edges
7 34. The bar portion, as mentioned above, is formed as a keyed
8 segment 26a, it being understood that a plurality of linearly
9 placed segments 26a will be used in an actual application of
10 the tool 26, each segment 26a keyed and interlocked with its
11 adjacent segments. The bar portions 28 are fabricated from,
12 for example, an aluminum alloy. The lower side 32 of the bar
13 portion 28 which interfaces with the umbilical cable 18 is
14 contoured to match the outer diameter of the capsule 12. The
15 width of the bonding tool 26 matches that of the umbilical
16 cable 18, thus ensuring that the bonding pressure is
17 distributed over the entire cable width yet allowing for
18 inspection of the bond line along the entire length of the
19 umbilical cable 18.

20 The resilient material 36 also includes a material upper
21 surface 38, a material lower surface 40, and opposing
22 longitudinal edges 42. The resilient material 36 is, for
23 example, a sponge elastomer bonded to one side (in this
24 instance, the lower side 32) of the bar portion 28 so as to

1 prevent damage to the umbilical cable 18 when the tool 26 is
2 pressed thereagainst and to provide an even distribution of
3 the bonding pressure. In order to bond the bar portion to the
4 elastomeric material 36, an adhesive 44 is applied
5 therebetween and dried prior to use of the tool 26.

6 The advantages of this device over the previously used
7 device are numerous, including a much more even adhesive bond
8 line thickness, which is desirable during adhesive bonding
9 applications. In addition, the tool is formed in
10 predetermined keyed segments and is therefore easier to use
11 and transport. Further, the sponge elastomer provides better
12 protection against umbilical cable damage during the bonding
13 operation.

14 There are currently no alternative constructions of the
15 invention. However the materials selected are not critical to
16 the function of the device. The length of the tool segments
17 could also be varied with little or no impact to the device
18 operation. Additionally, the segments need not be keyed if
19 such a relationship is not warranted for a particular
20 application. Further, the ratchet straps could be replaced by
21 any means that can apply a suitable force to hold the bonding
22 tool against the cable and thus the cable against the capsule.

1 Accordingly, it is anticipated that the invention herein
2 will have far reaching applications other than those of
3 securing an umbilical cable member to a capsule.

4 This invention has been disclosed in terms of certain
5 embodiments. It will be apparent that many modifications can
6 be made to the disclosed apparatus without departing from the
7 invention. Therefore, it is the intent of the appended claims
8 to cover all such variations and modifications.

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1 Attorney Docket No. 79528

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UMBILICAL CABLE BONDING TOOL

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ABSTRACT OF THE DISCLOSURE

6 A bonding tool includes an aluminum metal alloy bar
7 member of a predetermined width, the bar having an upper
8 surface, a lower surface, and opposing longitudinal edges. A
9 resilient material is adhesively joined with the bar, the
10 resilient material having an upper surface, a lower surface
11 and opposing longitudinal edges. The joining of the resilient
12 sponge material to the bar is such that an entire upper
13 surface of the sponge material is coextensive with an entire
14 lower surface of the bar member. The bonding tool is made in
15 several, for example five, sections and is laid on a cable for
16 bonding the cable to a capsule or the like in a separate
17 process. The sections are keyed so as to interlock one to
18 another.

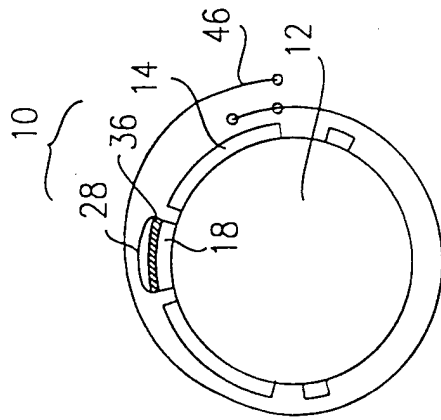


FIG. 1

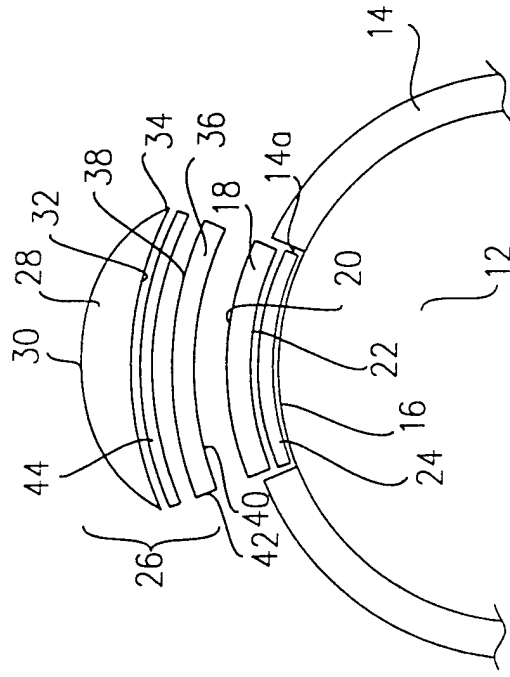


FIG. 2

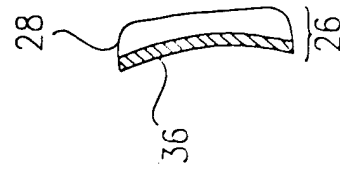


FIG. 3

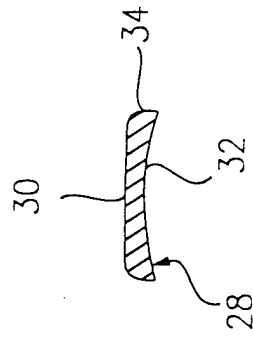


FIG. 4

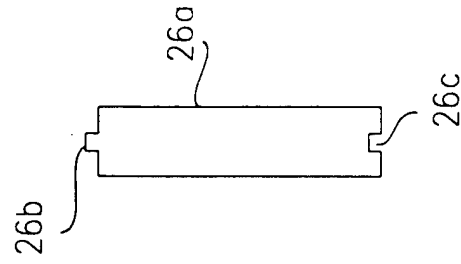


FIG. 5

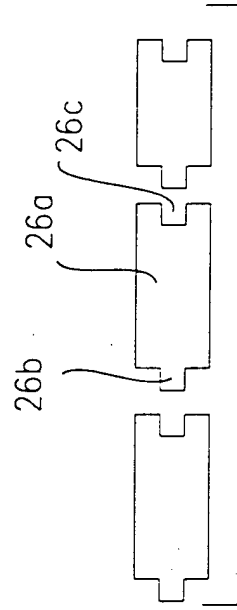


FIG. 6