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CLUSTER ASSEMBLY AND CLIP THEREFOR

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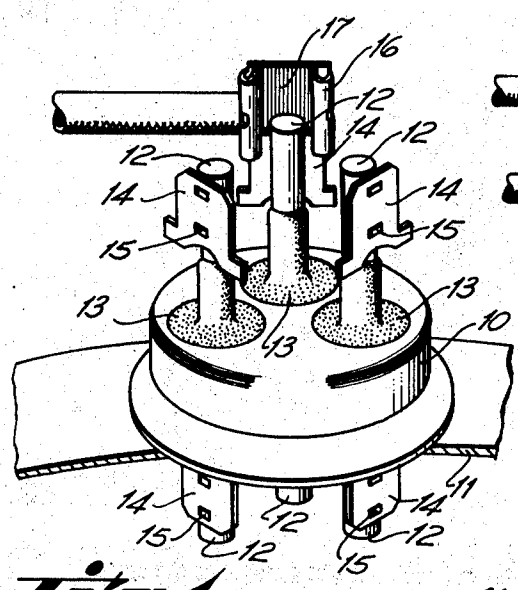

Fig. 1

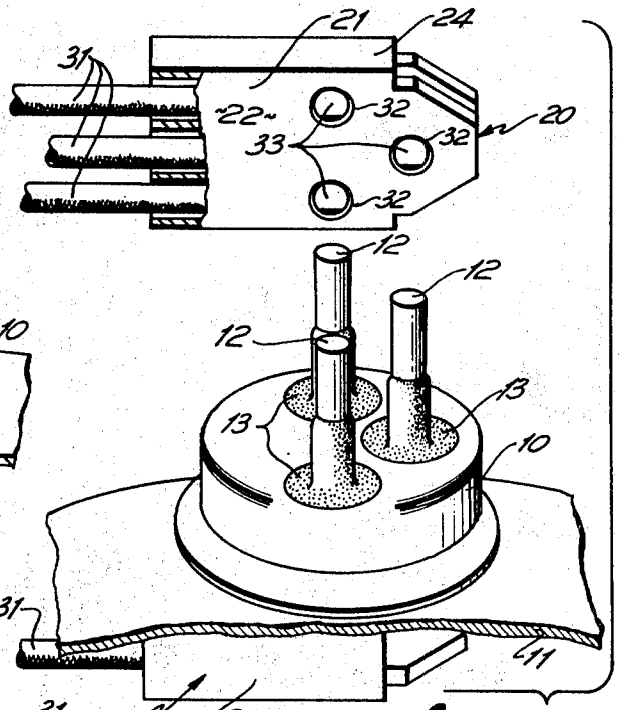

Fig. 2

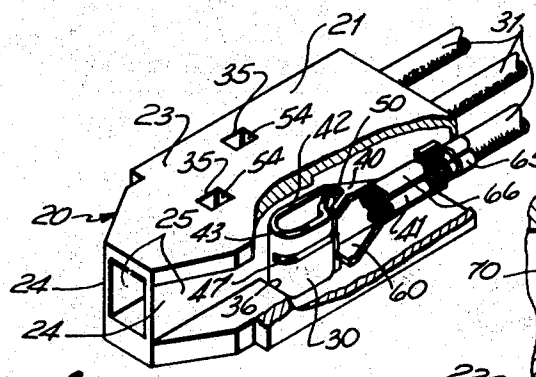

Fig. 5

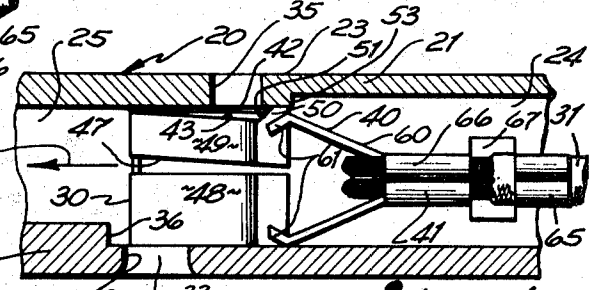

Fig. 4

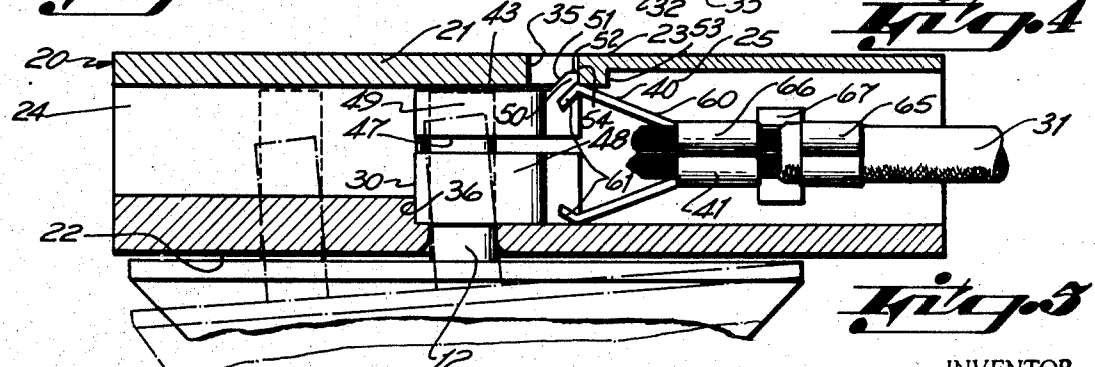

Fig. 3

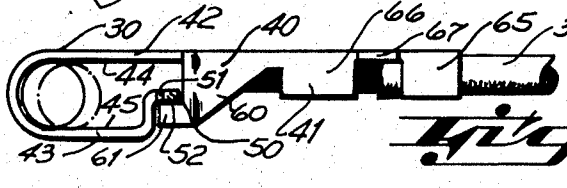

Fig. 6

INVENTOR.
Sigmund J. Skony
BY Wood, Herron & Evans
ATTORNEYS

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CLUSTER ASSEMBLY AND CLIP THEREFOR

Sigmund J. Skony, Cincinnati, Ohio, assignor to
Van Products, Incorporated, a corporation

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ABSTRACT OF THE DISCLOSURE

An assembly of three connector clips, each adapted to be applied to one of a cluster of three pins to form an electrical connection, the assembly being particularly adapted for use with refrigeration compressors having a horsepower requirement of one-half or more horsepower.

This invention relates to an assembly of connector clips each adapted to be applied to circular pin to form an electrical connection. The invention is applied particularly to provide an electrical connection to a motor disposed inside a hermetically sealed compressor. In making hermetically sealed compressors, it has been the practice to provide a metallic housing containing the compressor and motor therefor, the housing having three electrical terminal pins projecting from the inside of the housing to the outside, the pins being electrically insulated from the housing by a glass-to-metal seal. Electrical power is brought to the motor by applying connector clips to the outwardly projecting pins. The motor within the housing is connected by similar clips to the pins within the housing.

A number of considerations are involved in making the connection to the pins. Of principal consideration is the surety of the connection, particularly at the inside of the compressor, for a failure of the connection after the housing is sealed is tantamount to a failure of the complete compressor unit without any possibility of repair. On the other hand, since millions of these connections are made every year in this industry the economy of making the connections must be considered. If an inexpensive connection will reliably perform the same function as an expensive connection, then obviously the inexpensive connection should be selected. An objective of the present invention has been to provide a connection which is at least as satisfactory as that which has been heretofore used in the industry but which can be made at considerably lower cost.

Among the functional requirements which must be met is the requirement that the clips are subject to several applications before final assembly. For example, the clips will be applied to the leads connected to a motor and these clips will be placed upon pins at several testing stations before the motor is deemed suitable for use in the compressor housing. To facilitate the testing steps as well as the final application of the clips it is desirable to mount the clips in a cluster assembly which includes an insulative block that holds the pins in that equiangular orientation determined by the orientation of the pins to which they are to be applied. Not only does the mounting of the clips in a cluster block facilitate testing and assembly but additionally the cluster block tends to provide assurance that the clips will be properly aligned with their pins during application thereby minimizing the possibility of distortion of the clip through mis-alignment with the pins. As a consequence, the cluster assembly of the type which is the subject of Pats. Nos. 2,875,426, 3,101,985 and 3,206,715 have been especially well received in the industry. These cluster assemblies however have been used only in low power applications of up to three-fourths horsepower. For larger horsepower applications the connections have been made along the lines indicated in Pat. No. 3,222,633, that being a spade and flag type connection which is not particularly well suited for a cluster assembly.

The spade and flag connection has employed a spade welded at two spots to each pin. This of itself is an expensive operation costing up to several cents for each assembly. As indicated, the clip has been a flag type clip which has not been mounted in a cluster block and hence the testing and assembly steps have been more costly due to the requirement of manipulating individual clips. Further, the flag receptacle tends to deform due to the force of application and remains loose on its spade. Such a loose connection causes high electrical resistance and hence excessive heat of operation tending to result in early failure.

It has been an objective of the present invention to provide a connector clip which is applicable to a round pin of sufficient diameter for large horsepower requirements, the clip also being mountable in a cluster block whereby all of the attributes of cluster assembly connection can be attained without sacrificing the quality of the electrical connection.

The objective of the present invention is attained in part by providing a connector clip which includes a shank having usual ferrule for attaching to a lead wire at one end and a metallic strip projecting from the shank at the other end. The strip is folded upon itself to provide a receptacle for receiving a pin, the receptacle being constituted by an outwardly projecting leg of the strip and the return leg of the strip.

The return leg of the strip has a longitudinally extending slot which performs two functions. First, the slotting of the leg provides two leg sections each one making an electrical contact with the pin instead of a single point of contact which would be made if the leg were not slotted. Second, a locking detent is mounted on one of the legs, the slot permitting the detent and leg section to flex thereby permitting the detent to ride over a locking abutment in a cluster block.

The invention further contemplates the provision of two locking ears integral with the shank, the locking ears overlying the free ends of the two return leg sections to hold the leg sections against undesirable spreading upon application of the clip to its terminal pin. This manner of latching or locking the return leg in position assures the integrity of the terminal connection which is independent of the walls of the cluster block.

Further in accordance with the invention, the cluster block has a front wall having holes through which the pins project to make an engagement with the clips, and holes in the opposite back wall to provide abutments into which the detents drop when the clips are assembled in the cluster block. The design of the clip coupled with the described orientation in the cluster block prevents permanently distorting the detent carrying section and this prevents the clip from inadvertently sliding out of the cluster block once it has been assembled.

Still further, the receptacle has been formed with flat inside walls whose length is greater than the diameter of the pins over which they are applied and permits a rocking application of the clips to the pin. In other words, the receptacle does not have a barrel which must be precisely aligned with the pin in order to prevent that distortion of the barrel which would occur during a misaligned application.

Several features of the invention will become more readily apparent from the following detailed description taken in conjunction with the accompanying drawings in which:

FIG. 1 is a perspective view of the prior practice,

FIG. 2 is a disassembled perspective view of the present invention,

FIG. 3 is a perspective view of the invention with portions broken away,

FIG. 4 is a side elevational view partly in section showing the connector clip in the process of being inserted in a cluster block,

FIG. 5 is a view similar to that of FIG. 4 showing connector clip in position and being applied to terminal pins,

FIG. 6 is a top plan view of the connector clip.

FIG. 1 illustrates one form of practice in the industry prior to the present invention. As shown there, a header or glass-to-metal seal **10** is secured to a compressor wall **11**. Three conductive pins **12** are mounted in the header **10** through a glass seal **13**. The glass seal physically secures the pins in the header as well as insulating the pins from the metallic header as well as the metallic casing of the compressor.

The device of FIG. 1 is for a high horsepower application and may employ pins of .125 inch in diameter. A spade **14** is secured to each end of each of the pins at the two spot welds **15**. Electrical connection to the pins and spades is made by a flag type connector clip **16** having receptacle portion **17** which receives the spade. The flag type connector clip does not readily admit of cluster assembly application, that is to say, it would not be practical to mount three connector clips in a cluster block for application to their respective spades.

In accordance with the objectives of the invention a structure is provided through which a cluster of clips can be applied to the large diameter pins of a higher horsepower header. The cluster assembly of the present invention is shown generally in FIG. 2 and is indicated at **20**, FIG. 2 showing an inside and outside application of the cluster assembly. As indicated in FIGS. 2 and 3, the cluster assembly includes a cluster block **21** having a front wall **22**, back wall **23**, the front and back walls being joined by four integral transverse walls. As shown in FIG. 5, the dimensions of the front wall **22** should be great enough to overhang the flange of the header **10** at each end. This will prevent an extreme cocking of the block after application and prevent driving the block so far that the pins **12** break through the back wall **23**.

The walls together form three longitudinal passageways **25** which receive connector clips **30** to which lead wires **31** are attached. The front wall has three equiangularly spaced holes **32** each of which is in communication with a respective passageway **25** and each of which is in alignment with a receptacle **33** of each respective connector clip. The three clips are simultaneously applied to three spadeless pins **12** of a header **10** simply by aligning the holes **32** with the pins and applying sufficient force on the cluster block to force the pins **12** to enter the receptacle **33**.

The back wall **23** of the block has three equiangularly spaced holes **35** which provide clip locking abutments as will be explained below. Internally of the cluster block, each passageway presents a shoulder **36** which is engageable by a respective connector clip. The hole **35** and shoulder **36** cooperate with respective surfaces on the clip to locate the clip against fore and aft movement within the longitudinally extending passageway **25** and maintains the receptacle **33** in alignment with the pin receiving hole **32**.

Each clip includes a shank **40** having a lead wire gripping ferrule **41** at one end of the shank, the receptacle **33** being located at the other end of the shank. Receptacle **33** includes a longitudinally extending leg **42** which projects integrally from the shank and a return leg **43** folded up on the projecting leg **42**. The legs **42** and **43** are spaced apart a distance slightly less than the diameter of the pin to which they are to be applied so as to create the receptacle **33**. For example, in a typical application, the diameter of pin **12** is .125 inch. The receptacle **33** includes flat surfaces **44** and **45** which are spaced apart approximately .120 inch. During application, these walls are forced apart by introduction of the pin into the receptacle, the resilience of the metal phosphor bronze or beryllium copper providing the good electrical contact between pin and clip. It can be observed from FIG. 6 that the length of the receptacle, that is its longitudinal dimension, is substantially greater (for example, two times) than the transverse dimension of the receptacle. This permits an angulated or rocking introduction of the pin into the receptacle as explained in connection with FIG. 5 without permanently deforming the walls of the receptacle and thereby causing them to lose their original force of application.

The return leg **43** has a slot **47** which divides the return leg into two sections **48** and **49**. One of the sections **49** which normally lies adjacent to the back wall **23** of the cluster block is somewhat thinner than section **48**. A detent **50** projects laterally from the section **43** and has an inclined edge **51** and an edge of **52** which is perpendicular to the plane of the back wall **23** or the longitudinal axis of the clip and lead wire. The inclined edge of the detent facilitates insertion of the clip into its respective passageway by permitting the detent to ride past a slight shoulder **53** formed in the passageway adjacent the hole **35**. The perpendicular edge **52** is engageable with a surface **54** formed by the hole **35** the edge and surface **52** and **54** respectively forming a cooperating detent and abutment which blocks withdrawal of the clip from the passageway once it has been introduced. Movement of the clip in the passageway **25** in the opposite direction is blocked by the engagement of the clip with the shoulder **36** described above.

A flange **60** projects perpendicularly from each side of the shank **40**. Ears **61** are integral with each flange and overlie the end of the return leg **43**. The flanges **60** terminate adjacent the outer edges of the return leg **43**, which permits as wide as possible a shank **40** which in turn maximizes its current carrying capacity. The ears **61** are angled inwardly from the extreme outer edges of the flanges so as to terminate a substantial distance inwardly of the edges of the return leg. Thus the ear **61** provides a stable lock to hold the position of the respective return leg sections **48** and **49** against distortion when they are applied to a pin.

The ferrule which is attached to the lead wire has an insulation gripping portion **65** and a bare wire gripping portion **66** as is common in connectors of this type. Between the two wire gripping portions **65** and **66** are tabs **67** by which the connector clips are connected together as they form a ribbon emanating from a punch press.

In operation the clips with the lead wires secured are introduced into the respective passageways **25** of the cluster block as shown in FIG. 4. There it can be seen that the inclined leading edge **51** of the detent has ridden past the shoulder **53**. Slight further longitudinal movement in the direction of arrow **70** causes the detent to drop into the hole **35** so that the clip assumes the position shown in FIG. 5.

The cluster assembly of three clips in a cluster block is applied to the three pins **12** simply by placing the cluster assembly onto the pins with the pins in alignment with holes **32**. A slight misalignment is permitted without undue distortion of the clip receptacle as illustrated in FIG. 5 for the receptacle has a sufficiently great longitudinal dimension to enable the pin to be inserted at an angle.

If, for some reason, a distortion occurs to the extent that the slot **47** of the return leg is closed, thus releasing the detent, the slot can be reopened simply by inserting a screwdriver in the slot and twisting.

I claim:

1. A connector clip comprising a shank,

a longitudinally extending ferrule at one end of said shank for application to a lead wire,

a receptacle at the other end of said shank, said receptacle including a longitudinally extending leg projecting integrally from said shank, and a longitudinally extending return leg folded upon said project-

ing leg but spaced therefrom to provide a receptacle to receive a pin,

means on said shank to hold the free end of said return leg from spreading away from said projecting leg,

a detent projecting laterally from one edge of said return leg and adapted to cooperate with an abutment in a cluster block to hold said clip in said cluster block, and

said return leg having a longitudinally extending slot dividing it into two leg sections, said slot imparting resiliency to the leg section carrying said detent to facilitate introduction of said clip into a cluster block and to provide a positive lock of said clip in said cluster block.

2. A connector clip according to claim 1 in which the leg section containing said detent is thinner than the remaining section.

3. A connector clip comprising a shank,

a longitudinally extending ferrule at one end of said shank for application to a lead wire,

a receptacle at the other end of said shank, said receptacle including a longitudinally extending leg projecting integrally from said shank, and a longitudinally extending return leg folded upon said projecting leg but spaced therefrom to provide a receptacle to receive a pin,

said return leg having a longitudinally extending slot dividing it into two leg sections,

a flange integral with and projecting from each side of said shank toward said return leg,

an ear integral with each flange and overlying said return leg sections to hold a respective leg section from spreading away from said projecting leg, and

said flanges being located at the free ends of said leg sections and said ears being angled from their flanges inwardly and terminating inwardly of the lateral edges of said leg sections.

4. A cluster assembling comprising:

an integrally molded block having parallel front and back walls, and four spaced transverse walls between said front and back walls defining three longitudinal passageways,

said front wall having three pin receiving holes, each communicating with a respective passageway.

said back wall having three abutment forming holes, each communicating with a respective passageway,

a connector clip in each passageway, each connector clip having a receptacle including a longitudinally extending first leg and a longitudinally extending return leg folded upon said first leg to provide a pin receiving opening aligned with a pin receiving hole,

a longitudinally extending slot in said return leg to divide it into two leg sections,

a detent projecting laterally from the edge of one of said leg sections and projecting into said abutment forming hole.

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MARVIN A. CHAMPION, Primary Examiner

L. J. STAAB, Assistant Examiner

U.S. Cl. X.R.

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