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Hoover

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[54] PLUG FOR PATCH SYSTEMS

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Primary Examiner—Joseph H. McGlynn

[52] U.S. Cl. 339/91 R, 339/184 M, 339/217 S, 339/258 P

[51] Int. Cl. H01r 13/54

[58] Field of Search 339/91, 184, 186, 198, 339/217, 256, 258, 259

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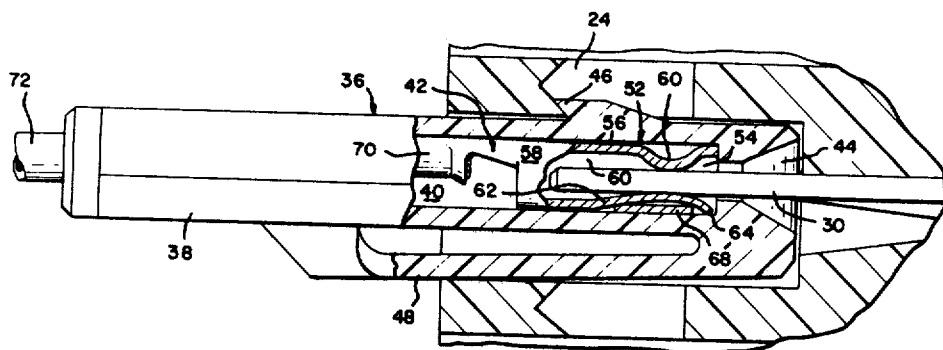
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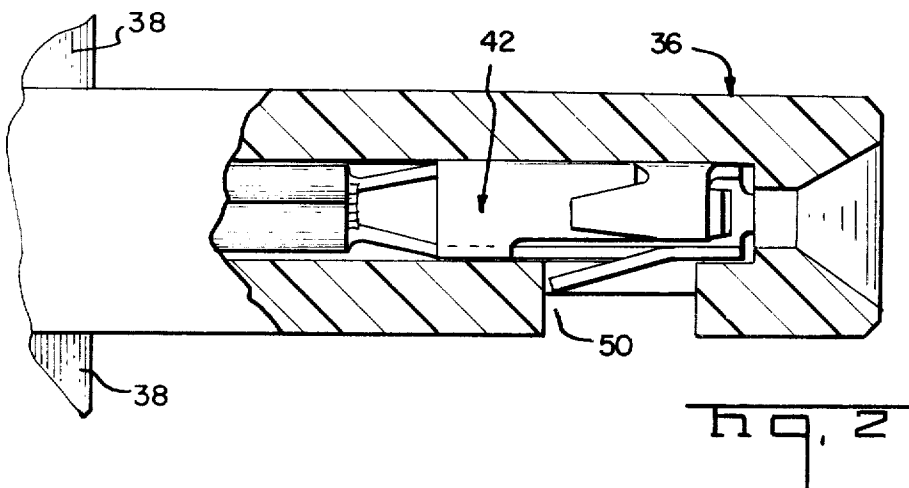
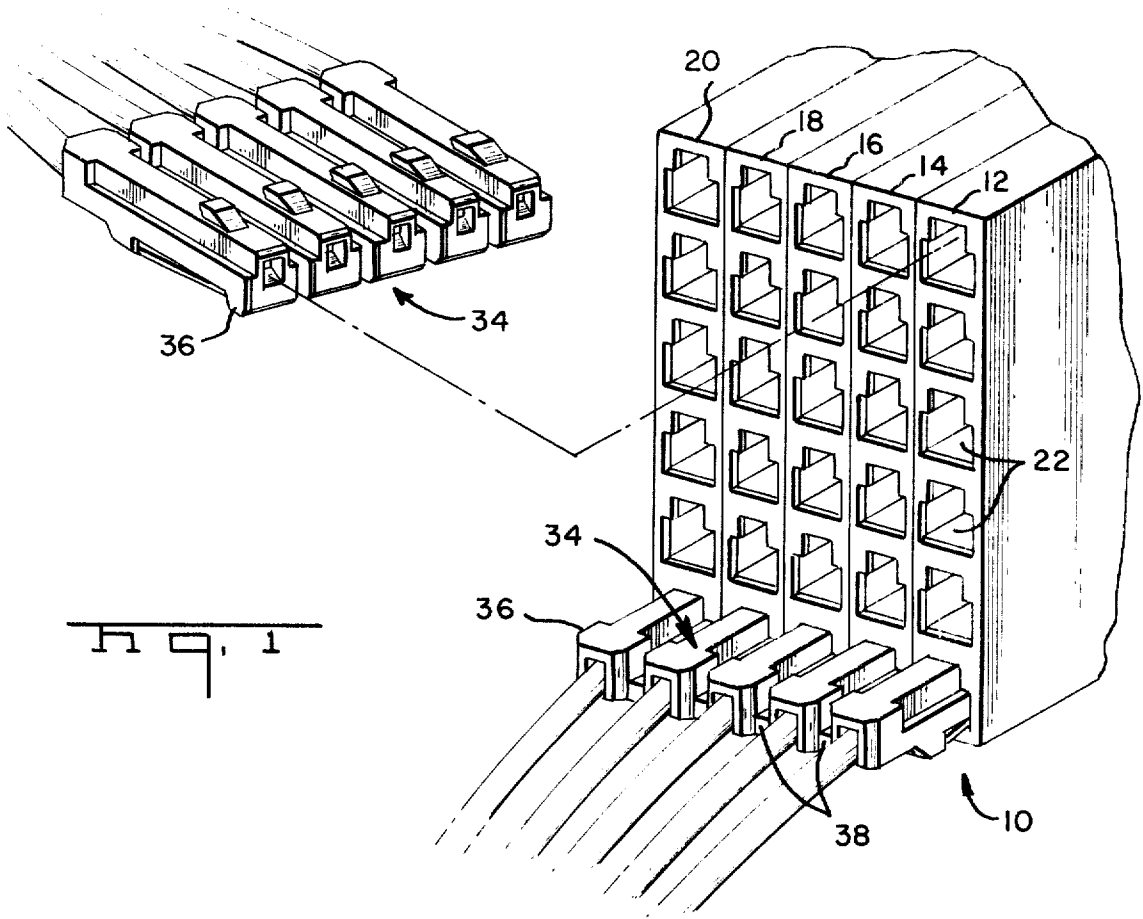
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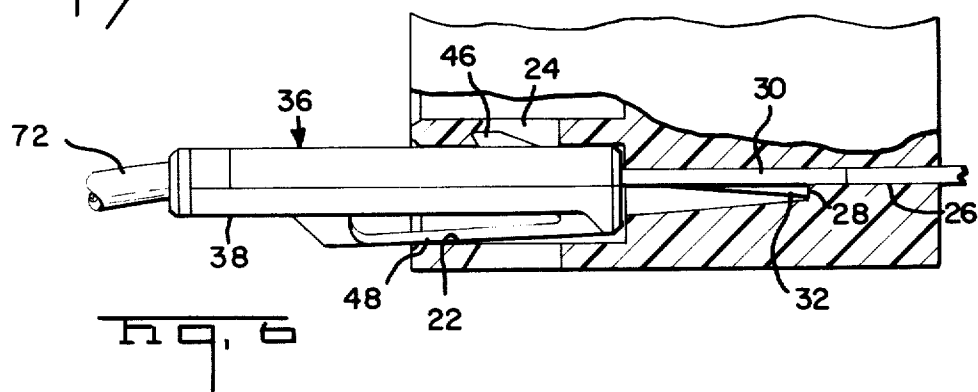
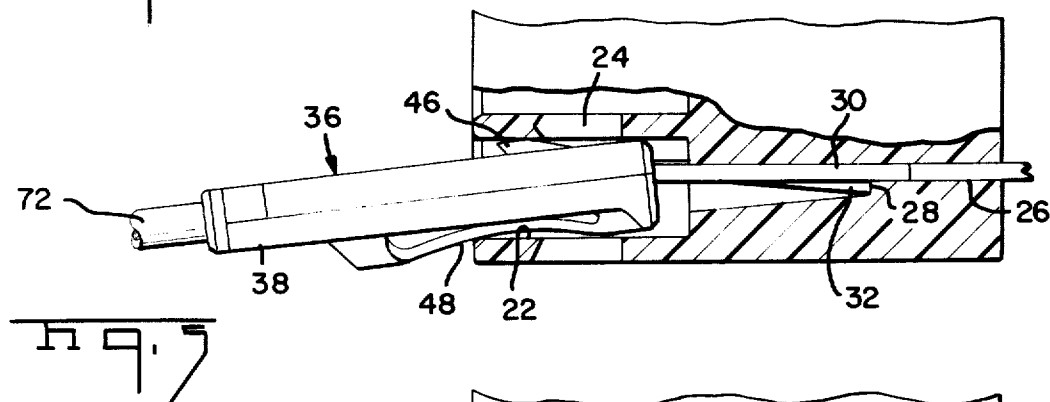
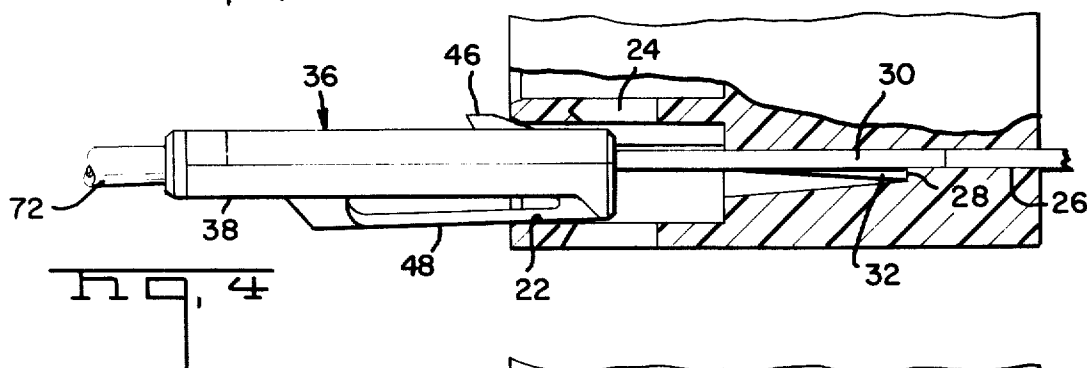
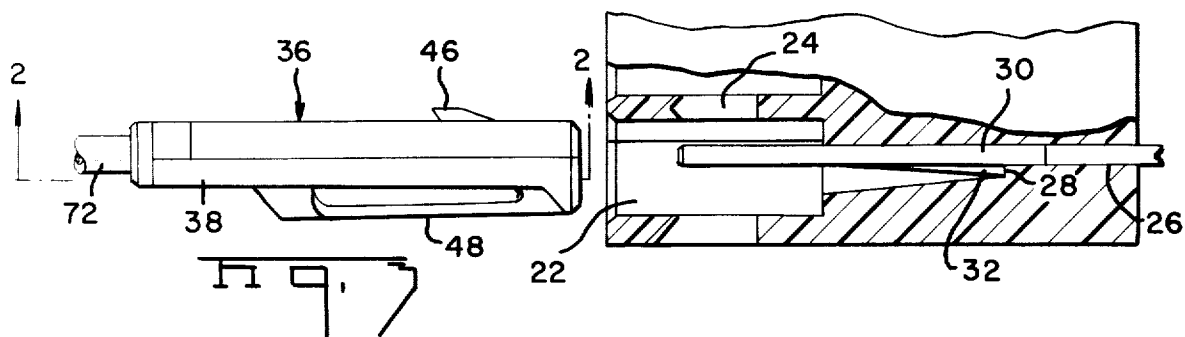
ABSTRACT

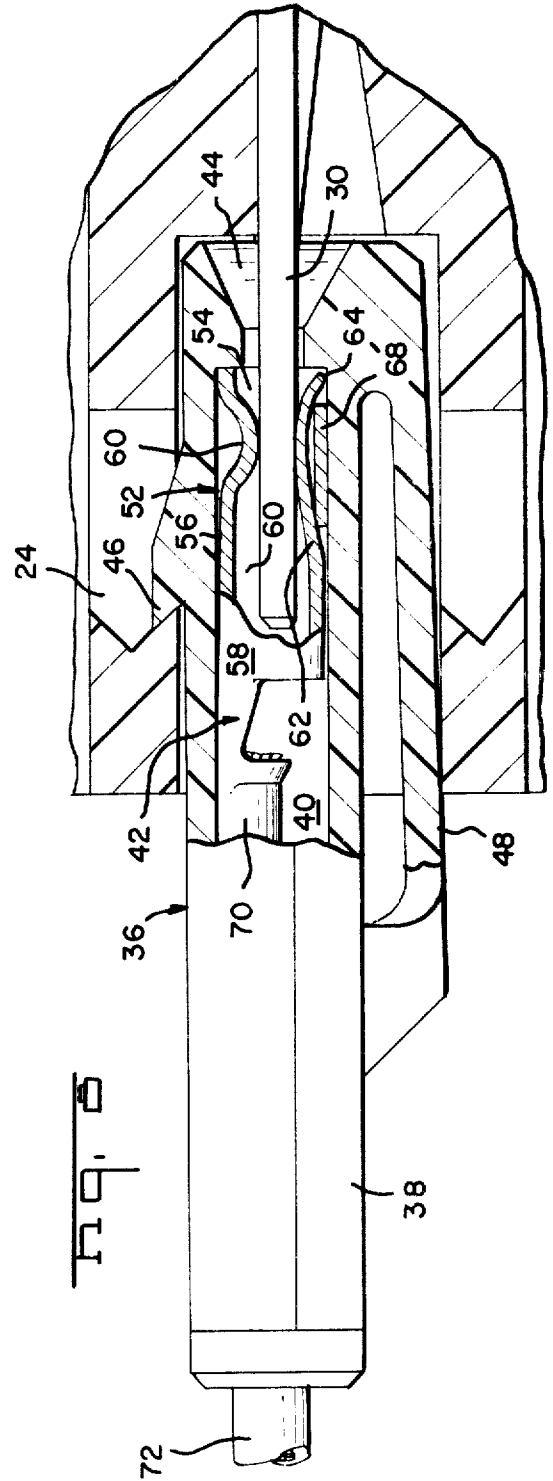
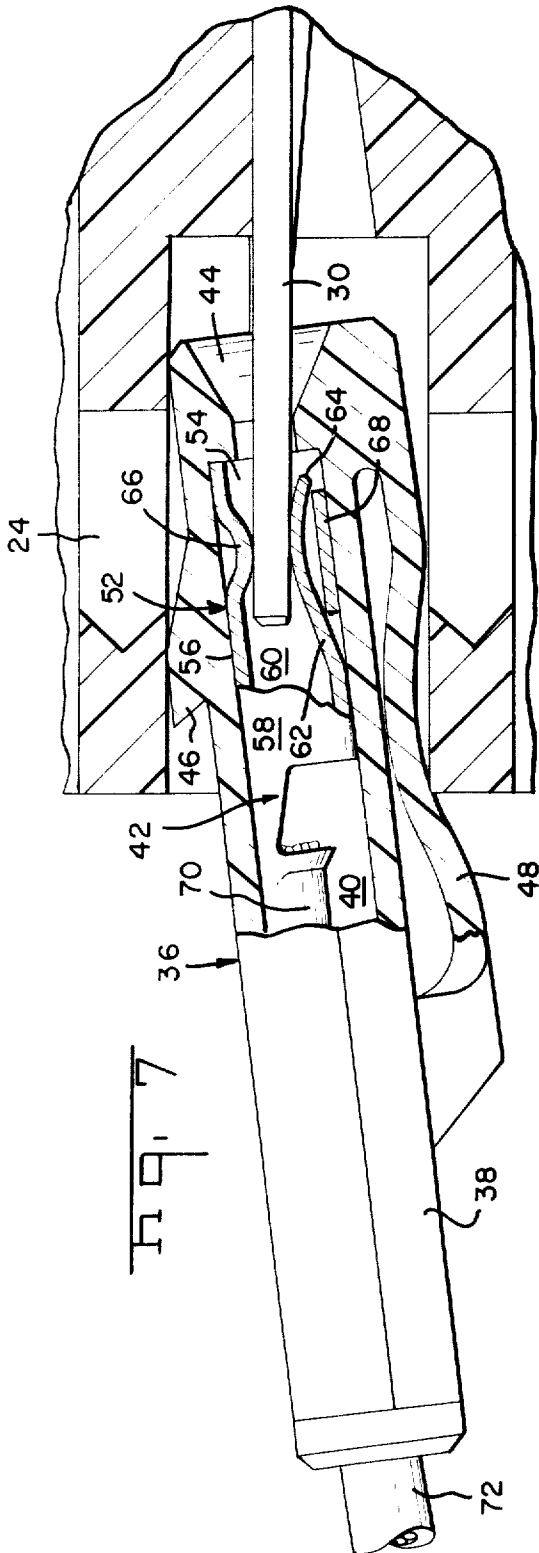
An improved plug is disclosed for use in a patch system in which plugs and receptacles are arranged in a high density fashion. The plugs can be formed individually or in gang fashion and are arranged to be positively latched in the associated receptacles. The plugs are polarized and include integral springs formed of the same plastics material as the plugs.

5 Claims, 8 Drawing Figures









PLUG FOR PATCH SYSTEMS

BACKGROUND OF THE INVENTION

1. The Field Of The Invention

The present invention relates to an improved plug for use in high density patch systems and in particular to a plug of plastics material utilizing the plastics material as a spring biased latching and retention means.

2. The Prior Art

In high density pluggable patch systems there is an inherent problem in providing plugs which will suitably mate with the receptacles and yet can be readily removed for replacement and/or exchange purposes. The high density arrangement limits the amount of material that can be used in the plugs as well as to the number of configurations which can be used. It is clear that plugs for high density applications can not utilize extraneous springs or complicated latching arrangements since they would necessarily require a great amount of space which is not normally available.

Many attempts have been made to solve the above problem, however, most of them have relied upon the formation of the contact itself to give the necessary spring force for latching. While this may be suitable for some applications, it is not always possible since contacts with high spring forces may be subject to an unnecessary and unacceptable level of wear during normal usage.

SUMMARY OF THE INVENTION

The present invention is an improved plug for use in high density patch systems in which each receptacle has a polarized entrance. The plug is formed of a unitary piece of plastics material and has a polarized transverse section, a locking lance on one lateral side and a longitudinally extending resilient spring member on an opposite lateral side.

It is an object of the present invention to produce an improved plug for use in high density patch systems in which the plug can be mated and unmated with closely spaced receptacles with a minimum of effort and wear on the plug.

It is a further object of the present invention to produce a plug for high density pluggable patch systems in which the plug is molded plastics material and includes a locking lance on one side and resilient spring member on the opposite side for biasing the locking lance toward associated apertures in the receptacle.

It is a further object of the present invention to produce a plug for high density patch systems which plug may be readily and economically produced.

The means for accomplishing the foregoing objects and other advantages of the present invention will become apparent from the following detailed description taken with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a high density patch system showing two multiple plugs according to the present invention, one inserted into a row of receptacles and a second positioned for insertion into another row of receptacles;

FIG. 2 is a longitudinal horizontal section taken along line 2-2 of FIG. 3;

FIG. 3 to FIG. 6 are side elevations, partly in section, showing steps during insertion of the subject plug into an associated receptacle;

FIG. 7 is an enlarged longitudinal vertical section similar to FIG. 5, showing the subject plug partially inserted into the associated receptacle; and

FIG. 8 is an enlarged longitudinal vertical section, similar to FIG. 6, showing the subject plug fully inserted into the associated receptacle.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Turning first to FIG. 1, the receptacle portion 10 of a high density patch system is formed by a plurality of individual receptacle units 12, 14, 16, 18, and 20. The individual receptacles are held together in a stacked array by conventional means (not shown) such as inter-mating projections and recesses. In the case shown, each of the receptacle units has six polarized cavities 22. The adjacent cavities 22 are in communication through shaped apertures 24. The cavities further include a passage 26 through the unit and a shoulder 28 formed in the passage. A male terminal contact 30 is mounted in passage 26 with locking lance 32 engaging the shoulder 28. The male terminal contact shown is of an elongated post configuration, generally rectangular in cross-section and provided with a tapered free end. The opposite end of the terminal is provided with a suitable configuration for receiving connecting conductors. The male terminal contact can have any desired configuration suitable for electrically and mechanically engaging a mating contact.

The subject plug is shown in FIG. 1 as two multiple or gang plug units 34, each comprising five individual plug members 36 connected by webs 38. Each plug member 36 includes a profiled unitary body 38 of plastics material having a longitudinal passage 40 for receiving a female receptacle contact 42. The forward end of the passage 40 has a shaped opening 44 which serves to guide the male terminal contact into the receptacle contact. A locking lance 46 projects from one longitudinal side of the plug member and a longitudinally extending spring 48 is formed on the opposite side of the plug. On a third side of the plug there is an aperture 50, shown in FIG. 2.

The illustrated electrically conducting female receptacle contact 42 has a generally box-like receptacle configuration 52 provided with an open end 54 for receiving therein a male electrical terminal 30. The female receptacle contact can be fabricated from a single blank of stamped metal folded to form a generally channel shaped portion including a bottom wall 56 and two spaced parallel sidewalls 58, 60. The box-like receptacle configuration is formed by the channel portion and an elongated electrically conducting leaf spring contact portion 62 having a free end extending towards the open end 54 of the contact. The leaf spring 62 is integral with one sidewall of the channel and is folded about the sidewall to a position generally overlying the channel portion. The leaf spring may be provided with a projecting flange portion (not shown) which engages the opposite sidewall of the channel so that the leaf spring is fully supported by the channel portion. The elongated leaf spring contact 62 is preferably reversibly curved along its length. More specifically, a medial portion of the contact is first curved at an incline to converge generally towards the bottom of the wall 56 and the free end 64 of the contact is reversibly curved, with respect to the medial portion, to provide an outwardly flaring lip immediately adjacent the

open end of the box-like configuration. The outwardly flared end provides a frontal profile at the entry which facilitates insertion of the tapered nose of the male contact. The reversedly curved spring forms an arcuate surface defining a narrow throat portion internally of the channel portion. In a similar fashion the bottom wall 56 may be optionally provided with a dimple 66 opposite the leaf spring contact 62 to further restrict the relatively narrow throat portion.

The contact is further provided with an elongated helper spring portion 68 having a generally tapered configuration terminating at a free end which is pointed away from the open end 54. The helper spring 68 is integral with a sidewall of the channel and is folded about the sidewall such that it is in overlying relationship over the leaf spring contact 62. Accordingly, the helper spring is integral with one sidewall of the channel portion while the leaf spring contact is integral with the opposite sidewall of the channel portion.

The receptacle further includes an integral pair of clamping flanges 70 which are formed into opposed sidewalls portions and formed into a U-shaped before being subsequently curled toward one another to form a crimped barrel connection to a wire conductor 72 as shown. In this manner the receptacle may be securely electrically and mechanically connected to an electrically conducting insulated covered wire in a well known manner as taught by U.S. Patent No. 2,791,755.

FIGS. 3 to 6 show steps during inserting the subject plug into an associated receptacle. FIGS. 7 and 8 show in detail what happens to the plug and the contacts during this insertion. Referring first to FIG. 3, the plug is brought into general alignment with the associated receptacle in a conventional manner. The plug is then inserted into the receptacle, as shown in FIG. 4. As soon as the locking lance 46 contacts the upper edge of the receptacle cavity 22 the plug is forced rotated counterclockwise, as shown in FIGS. 5 and 7. This rotational movement causes the spring 48 of the plug 36 to be compressed. As soon as the locking lance 46 clears the edge of the opening 24, the spring 48 will cause the plug to rotate in the reverse direction (clockwise) to fully seat as shown in FIGS. 6 and 8.

It will be noted, FIG. 7, that as the plug 36 is rotated counterclockwise, the male terminal contact 30 of the receptacle passes through the front opening 44 of the plug and opening 54 of the female receptacle contact 42 and between the leaf spring 62 with relatively low insertion force. The leaf spring 62 is partially compressed at during this stage of insertion to overcome the preloading of the spring by helper spring 68. When the plug is fully inserted, as shown in FIG. 8, the spring 48 will cause the plug to rotate in a clockwise direction, as shown, until the plug is fully seated. The rotational movement will bring the locking lance 46 into engagement with the aperture 50 at the top of the receptacle cavity 22. The leaf spring contact will be resiliently deflected by the rotation of the plug to store additional energy in the spring contact. The resilient energy will bias the spring contact into gripping relationship onto the male terminal. It is generally known that a stiffer spring contact will produce a greater gripping pressure on the male terminal which improves the electrical connection therewith and also impedes the unwarranted separation of the male terminal from the receptacle.

It will be seen from the above discussion and from the drawings that the subject of plug is readily adopted for high density applications in that a relatively small rotational movement of the plug is required to effect insertion and removal of the plug in a patch system. The ganging of the plug is not limited to any number of individual units, except for practical limits in handling.

The present invention may be subject to many modifications and changes without departing from the spirit or essential characteristics thereof. The present embodiment should therefor be considered in all respects as merely illustrative and not restrictive.

What is claimed is:

1. A high density pluggable patch system comprising:
 - a receptacle member having a plurality of closely spaced polarized cavities, aperture means interconnecting adjacent pairs of cavities;
 - a plurality of male terminal contacts each fixedly mounted in a respective one of said cavities;
 - at least one substantially rectangular plug member adapted to be inserted into any cavity of said receptacle member, said plug member having a transverse profile mating with said polarized cavities, locking lance means extending from one side of said plug, spring means extending in parallel spaced relation longitudinally along an opposite side of said plug with both ends of said spring means integrally connected to said plug, a longitudinal passage through said plug and an aperture in said plug leading to said passage; and
 - a female receptacle contact adapted to be mounted in said passage in said plug and to receive said male terminal contact therein, said female contact including locking lance means extending into said aperture to fix said female contact in said passage and means for fixing a conductor to said female contact,
 - said spring means being deformed during insertion of said plug member into said cavity and biasing said locking lance into latching engagement with said cavity aperture when said plug member is fully inserted into said cavity.
2. A high density pluggable patch system according to claim 1 wherein said receptacle member comprises: a plurality of receptacle units, each unit having a plurality of polarized cavities therein and means for joining said units together in an array.
3. A high density pluggable patch system according to claim 1 wherein said male terminal contact comprises a tapered pin adapted to mate with said female receptacle contact, locking lance means for fixedly mounting said terminal in said receptacle cavity, and means for connecting conductors to said terminal.
4. A high density pluggable patch system according to claim 1 wherein said plug member comprises a plurality of plug units and web means interconnecting adjacent pairs of plugs to form a gang plug member.
5. A high density pluggable patch system according to claim 1 wherein said female receptacle contact includes:
 - receptacle means comprising a channel shaped portion having a base and a pair of parallel spaced sidewalls,
 - cantilever leaf spring means attached to one of said sidewalls and overlying said channel shaped portion, said leaf spring converging towards said base and being reversedly curved toward its free end,
 - a hump formed in said base opposite said leaf spring defining a narrow throat therebetween, and
 - a backup spring attached to the other of said sidewalls and overlying said leaf spring.

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