

CONNECTOR RECEPTACLE FOR PRINTED CIRCUIT BOARDS

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1 This invention relates to small connector receptacles
in the form of miniature metal shells which are intend-
ed for insertion in openings of printed circuit boards,
and more particularly to such receptacles wherein there
5 are friction contact means adapted to co-act with con-
tact pins of cooperable male connectors.

Heretofore various types of connector receptacles
of the above kind have been proposed and produced. Com-
monly these have generally comprised tubular metal shells
10 or cups in which spring contactors are disposed for en-
gagement with the contact pins of cooperable connectors.
The tubular shells or cups are inserted in openings of
printed circuit boards with a sliding fit, and their
walls are variously formed or embossed to effect a re-
15 tention of the cup in the board after its insertion. Some
cups are knurled for this purpose, others are formed with
a non-circular cross section, and various diverse con-
figurations have been employed in the past during the
fabrication of the shell or cup, by modification of its
20 wall to effect the retention.

In one prior construction the inner spring contactor
was provided with resilient fingers which folded down a-
longside the outer shell or cup for the purpose of yield-
ably engaging the walls of the opening in the circuit
25 board, to effect the retention. However, this construction
had a drawback inasmuch as during the wave soldering of the
connector, it sometimes happened that the solder would

1 travel along the spring fingers and into the inner
spring contactor. This would impair the resilience of
the contactor and sometimes rendering it inoperative as
a consequence.

5 Mainly the objective in the past has been to main-
tain the cost of the receptacles at a very low, accept-
able figure inasmuch as large numbers of these components
are utilized in various types of assemblies, where they
constitute only a very small percentage of the overall
10 unit.

Many prior receptacle shells or cups have not been
fully satisfactory for the reason that they required
strictly held tolerances of the opening or hole diameters
in the circuit boards, and it was difficult or else un-
15 desirable to maintain such precise measurements of the
openings. In consequence, it was found that the shells
or cups would be only loosely held and not sufficiently
secure, or else that they had too tight a fit, in which
case it interfered with the easy insertion and also the
20 subsequent operations. Some shells would become distort-
ed where the openings in the circuit board were too small,
and this altered the proper functioning of the spring con-
tactor which was disposed in the shell.

In general, the prior working or forming of the shell
25 wall to effect a retention was found to be unacceptable,
also for the reason that it tended to restrict its use
in some cases. At the same time, the forming of the shell
walls in special shapes had to be critically considered

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1 because it was necessary to avoid an increase in
the cost of the receptacle shells, since this would
undesirably affect the cost of the assemblies where
the shells were utilized.

5 The above disadvantages and drawbacks of prior
connector receptacles for printed circuit boards
are obviated by the present invention which provides
a connector receptacle for insertion in an opening
of a printed circuit board to receive the contact
10 pin of a cooperable connector, comprising in combi-
nation a tubular shell adapted to fit into said
opening, said shell having an open mouth portion
and external shoulder means at said mouth portion,
constituting a stop which is engageable with the
15 circuit board, a spring contactor disposed in said
shell and adapted for engagement with said contact
pin of the cooperable connector, and an external
resilient spring retainer finger on the shell, ex-
tending lengthwise thereof for engagement with cir-
20 cuit board to maintain the shell in the opening
thereof against inadvertent dislodgement therefrom,
said retainer finger being movable independently of
the shell and in a lateral direction with respect
thereto, and being integral with the open mouth
25 portion thereof.

Other features and advantages will hereinafter
appear.

In order that the invention may be more
readily understood, reference will now be made to

1 the accompanying drawings, in which:

Fig. 1 is a side elevational view of a complete connector receptacle, with portions broken away and shown in vertical section to reveal interior details.

Fig. 2 is a top plan view of the receptacle of Fig. 1. The sectioning of Fig. 1 is taken on the line 1--1 of Fig. 2.

Fig. 3 is a perspective view of the spring contactor shell contained in the receptacle or cup body of the connector.

Fig. 4 is a side elevational view of the drawn sheetmetal connector body portion of the receptacle. The location of the printed circuit board with respect to the body portion is illustrated by the broken lines.

Fig. 5 is a top plan view of the body portion of Fig. 4.

Fig. 6 is a side elevational view of the connector body portion, as viewed in a plane taken at 90 degrees with respect to the viewing plane of Fig. 4, and

Fig. 7 is a top plan view of the connector body portion during an intermediate stage in its fabrication, wherein the resilient spring retainer fingers have not yet been folded downward, flat against the body portion.

Referring first to Fig. 1 of the drawings, the connector receptacle comprises essentially a two-piece assembly, an outer tubu-

lar shell or cup 10 also called herein a body portion, which is adapted to loosely slidably fit into an opening of a printed circuit board, and an inner spring contactor component 12 (illustrated also in Fig. 3) which is formed separately from the body portion 10 and assembled to it at a later time.

The spring contactor shell 12 comprises a tubular portion 14 having a flared mouth 16, and a plurality of resilient contact fingers 20 that converge from the portion 14 to yet a smaller, tubular formation 22. At the convergence of the contact fingers 20, triangular slits 24 are disposed, such slits showing as straight line cuts 26 at the tubular formation 22. The contact fingers 20 are thus separated from each other and individually movable, being biased toward the center or axis of the shell to maintain the tubular portion 22 mostly in a closed condition. The contactor shell 12 can fit snugly within the body portion 10 of the receptacle shell or cup at its upper part, and is retained therein by a pair of lugs or tabs 28 integral with a flared mouth 30 of the body portion 10, as clearly seen in Fig. 1.

It will be understood that the contactor shell 12 is so mounted that the spring fingers 20 thereof can shift laterally or radially outward an extent to accommodate the larger diameter of a cooperable contact pin which is inserted in the receptacle through the mouth portion 30.

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1 The receptacle body portion 10 is in the form of a
deep drawn metal shell having in addition to the flared
mouth 30, a main body portion 32 which is joined to the
small diameter of the flare 30, and a lower extremity por-
5 tion 34 of still smaller diameter, which joins the main
body portion 32 and forms an exterior annular shoulder
36 at the joint. During the forming of the shell or cup
body 10, the retainer tabs 28 are also blanked out, as
will be understood. The exterior diameter of the main
10 body portion 32 of the receptacle 10 is chosen to have
an easy sliding fit in openings provided in a printed
circuit board 38, such as that shown in broken outline
in Fig. 4.

 The receptacle body portion 10 is provided with
15 integral external resilient spring retainer fingers
40, two such fingers being illustrated in the drawings
and being disposed on opposite sides of the main body
portion 32 and extending lengthwise thereof. The spring
fingers 40 can be blanked or formed at the same time
20 that the tabs 28 are blanked out, and such forming of
the spring fingers 40 preferably occurs after the deep
drawing of the body portions 32, 34 has been effected.
Fig. 7 illustrates the blanking or formation of the
spring fingers 40 initially.

25 After such blanking of the fingers 40, or during
the blanking thereof, the fingers are given a flattened
N-configuration, with a pair of reverse bends 44, 46.

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1 Also, the free end portions of the spring fingers 40
have angular off-sets 48 which are adapted to extend
closely adjacent the external annular shoulder 36 of the
shell after the spring fingers have been folded downward
5 to their ultimate positions as shown in Fig. 4, being
reinforced thereby. That is, when the offsets 48 of the
spring fingers are engaged with the external shoulder 36,
a stiffening action of the fingers occurs by which the
retention of the shell is made more secure. The flattened
10 N-configuration of the fingers also provides external de-
pressions which tend to accommodate the edges of the open-
ing into which the receptacle is inserted, thereby pro-
viding a desirable detent action.

By the above construction, the likelihood of solder
15 from the wave soldering operation climbing up the fingers
40 and getting inside the shell 10 into the spring con-
tactor 12 is greatly minimized, as contrasted with prior
constructions where the resilient fingers that retain
the connector receptacle were provided on the spring
20 contactor 12 itself. In this prior construction the solder
could travel along the spring fingers directly to the
spring contactor, where it would flow inside and interfere
with the proper functioning of the same.

It has been found that with the present construction
25 there is provided a very advantageous, precise and yet
economical-to-fabricate connector receptacle adapted for
inserting in the openings of a printed circuit board. The

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1 flare 30 constitutes an external shoulder which
provides a stop for engagement with the circuit
board during the insertion of the receptacle, and
the resilient spring fingers 40 engage the circuit
5 board and securely retain the receptacle in the
desired operative position without danger of solder
being brought into the receptacle to interfere
with the necessary spring contact action. There is
no longer required the closely-held tolerances in
10 the openings of the circuit board, and also there
is eliminated any malfunctioning during insertion
of the receptacle as well as interference with the
proper operation of the inner spring contactor
shell 12. The devices are thus applicable for use
15 with conventional circuit boards despite the com-
mercially dictated variations in the openings nor-
mally encountered in such boards.

The inserting movement can be easily and quick-
ly carried out, either manually or by suitable
20 automatic or semi-automatic equipment, thereby
reducing the overall assembly time of the equipment
where it is used.

The connector receptacle thus constitutes an
extremely economical construction which can meet
25 the most exacting requirements and specifications.
It thus represents a distinct advance and improve-
ment in the connector art.



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CLAIMS:

1 1. A connector receptacle for insertion in an
opening of a printed circuit board to receive the
contact pin of a cooperable connector, comprising in
combination a tubular shell adapted to fit into said
5 opening, said shell having an open mouth portion and
external shoulder means at said mouth portion, con-
stituting a stop which is engageable with the circuit
board, a spring contactor disposed in said shell and
adapted for engagement with said contact pin of the
10 cooperable connector, and an external resilient spring
retainer finger on the shell, extending lengthwise
thereof for engagement with circuit board to maintain
the shell in the opening thereof against inadvertent
dislodgement therefrom, said retainer finger being
15 movable independently of the shell and in a lateral
direction with respect thereto, and being integral
with the open mouth portion thereof.

 2. A connector receptacle as claimed in claim
1, wherein said finger has an extremity which termi-
20 nates at a location intermediate the ends of the
shell.

 3. A connector receptacle as claimed in claim
1, and further including an additional spring re-
tainer finger, said fingers being disposed at op-
25 posite sides of the shell, having extremities which

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1 terminate at a location intermediate the ends of the
shell.

4. A connector receptacle as claimed in claim
2, wherein said resilient finger has a flattened N-
5 configuration.

5. A connector receptacle as claimed in claim
3, wherein said resilient fingers have a flattened
N-configuration.

6. A connector receptacle as claimed in claim
10 2, wherein said shell has an external annular shoul-
der intermediate its ends, said resilient finger
having a free end provided with an angular offset
disposed closely adjacent said annular shoulder.

7. A connector receptacle as claimed in claim
15 2, wherein said resilient finger at a point inter-
mediate its ends is adapted to engage the exterior
of the shell.

8. A connector receptacle substantially as here-
inbefore described and with reference to the accom-
20 panying drawings.
