United States Patent

Dalton et al.

[15] **3,644,873**

[45] **Feb. 22, 1972**

[54] ELECTRICAL CONNECTOR FOR A RADIO RECEPTACLE

[72] Inventors: **Wayne D. Dalton; Stanley C. Mackzum; Friedrich H. Mann; Paul F. Sensabaugh,** all of Lynchburg, Va.

[73] Assignee: **General Electric Company**

[22] Filed: **Oct. 22, 1970**

[21] Appl. No.: **83,064**

[52] **U.S. Cl.**.....**339/79,** 200/51.09, 200/153 LA, 320/2, 320/25, 339/186 R

[51] **Int. Cl.**.....**H01r 13/54**

[58] **Field of Search**.....339/75–79, 82, 339/91, 186; 200/51.09, 51.12, 61.59, 153 LA; 320/2, 25

[56] **References Cited**

UNITED STATES PATENTS

3,083,274	3/1963	Sparkes	200/51.09
3,348,116	10/1967	Freeman et al.	320/2

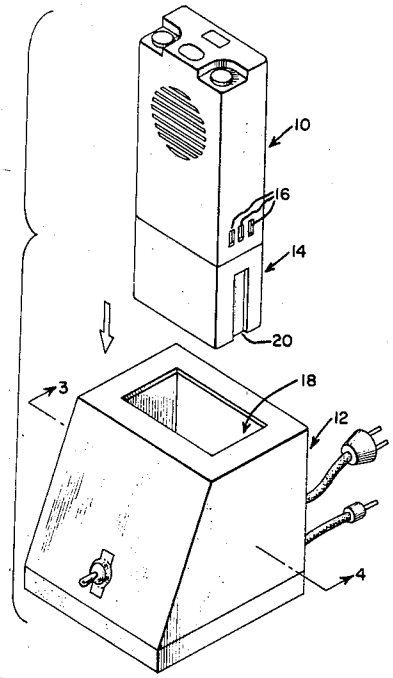
Primary Examiner—Joseph H. McGlynn

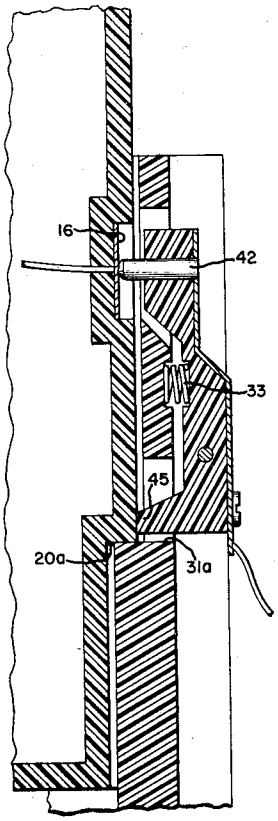
Attorney—James J. Williams, Frank L. Neuhauser, Oscar B. Waddell and Joseph B. Forman

[57] **ABSTRACT**

An electrical device is provided with a receptacle for receiving a radio. A lever carrying one or more contacts is pivotally positioned on one wall of the receptacle so that when the radio is inserted in the receptacle, the lever is pivoted and its contacts brought into engagement with contacts on the radio.

4 Claims, 4 Drawing Figures





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SHEET 1 OF 2

FIG. 1

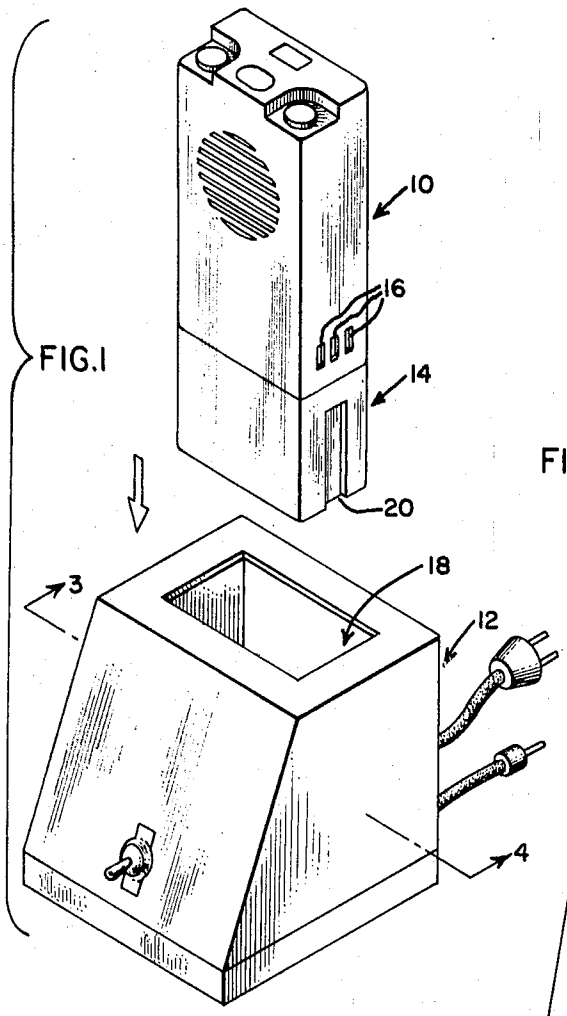
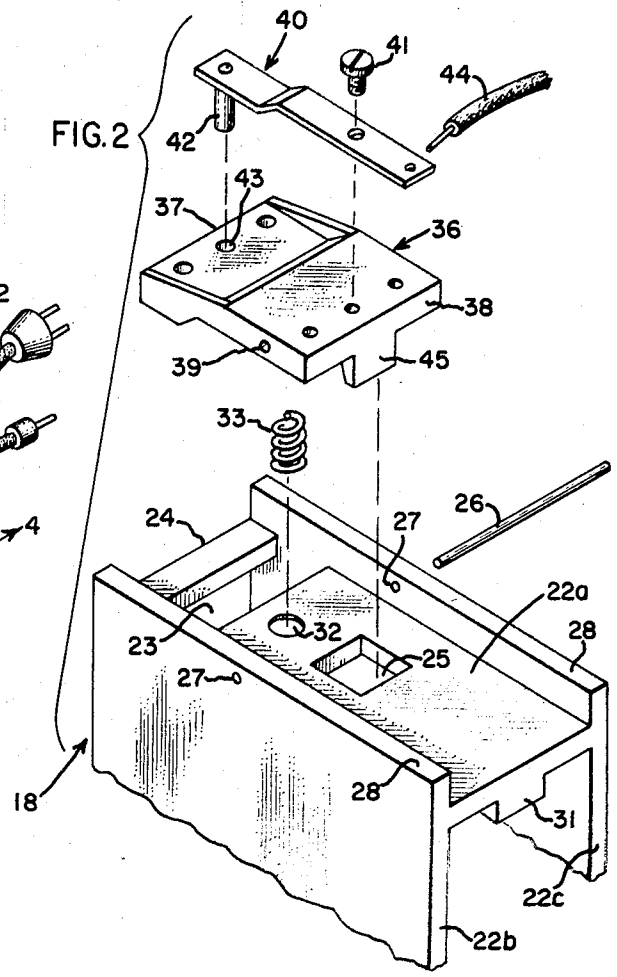


FIG. 2



INVENTORS:
WAYNE D. DALTON,
STANLEY C. MACKZUM,
FRIEDRICH H. MANN,
PAUL F. SENSABAUGH,
BY James J. Williams
THEIR ATTORNEY,

FIG.3

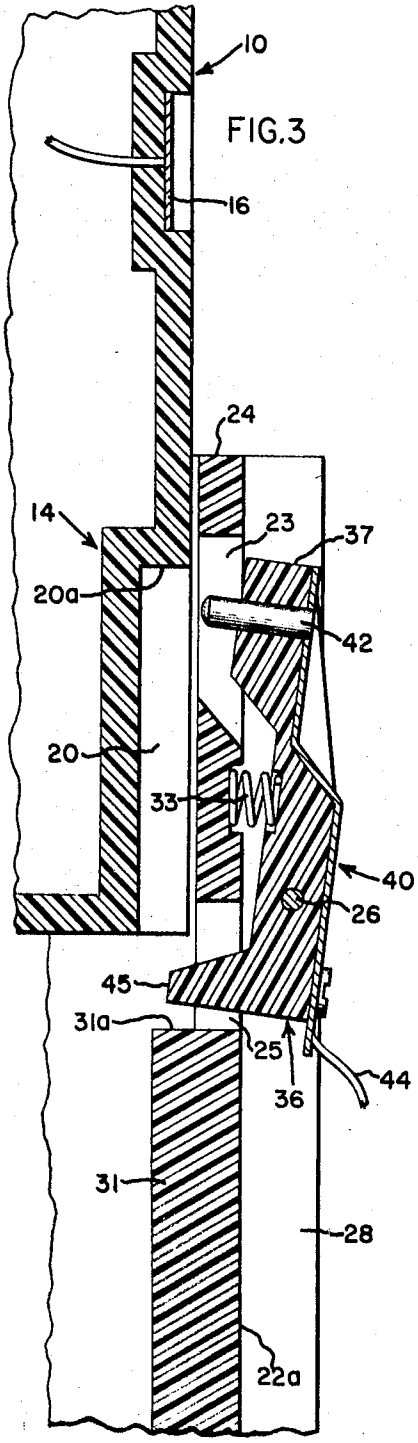
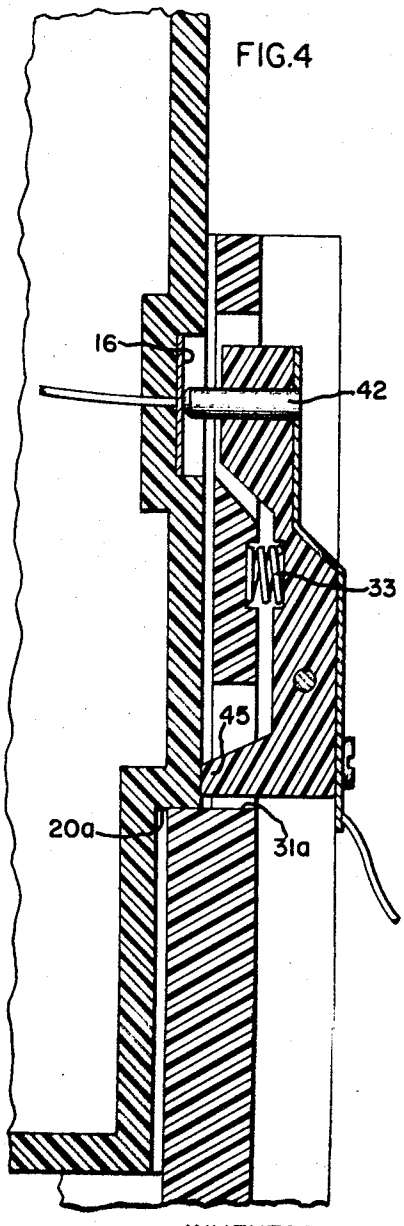


FIG.4



INVENTORS:
WAYNE D. DALTON,
STANLEY C. MACKZUM,
FRIEDRICH H. MANN,
PAUL F. SENSABAUGH,
BY James J. Williams
THEIR ATTORNEY.

ELECTRICAL CONNECTOR FOR A RADIO RECEPTACLE

BACKGROUND OF THE INVENTION

Our invention relates to an electrical connector, and particularly to an electrical connector for use in battery chargers or other devices having a receptacle for receiving a radio whose battery is to be charged, or for receiving a radio which is to continue operating while in the receptacle.

Many government, industrial, transportation, and service personnel carry a portable and personal radio receiver or radio transmitter-receiver to increase their effectiveness and usefulness. Typically, such radio equipment contains small batteries which power the equipment, and which periodically require recharging, leads from the battery, and other parts of the radio circuit, if desired, are connected to terminals on the outside of the radio equipment case for connection to the battery charger or to other components if desired.

Accordingly, a relatively specific object of our invention is to provide a new and improved electrical connector for a battery charger that permits a radio to be inserted in the charger and that provides good electrical connections between the charger or other components and the terminals on the radio case.

A general object of our invention is to provide a new and improved electrical connector for a radio receptacle.

Another object of our invention is to provide a novel electrical connector that permits a good and reliable electrical connection between two points to be easily made, and that also permits that connection to be easily broken.

SUMMARY OF THE INVENTION

Briefly, these and other objects are achieved in accordance with our invention by a connector having a lever that is pivotally mounted between its ends on one wall of a radio receptacle. The wall has a front opening adjacent the front end of the lever, and a rear opening adjacent the rear end of the lever. Mechanical means are provided to urge the front end of the lever away from the front opening. A contact is attached to the front end of the lever, and an operating cam is attached to the rear end of the lever and projects through the rear opening. When a radio is inserted in the receptacle, a surface on the radio case engages the operating cam and causes the lever to pivot so that its contact moves inwardly through the front opening to engage an appropriately positioned terminal on the radio case. A stop surface on the wall of the receptacle stops the radio at the proper point of insertion. When the radio is withdrawn, the mechanical means cause the lever to pivot back to its normal position with the contacts away from the wall. Thus, our connector provides an electrical connection that is easily and reliably made, and that can be easily broken when desired.

BRIEF DESCRIPTION OF THE DRAWING

The subject matter which we regard as our invention is particularly pointed out and distinctly claimed in the claims. The structure and operation of our invention, together with further objects and advantages, may be better understood from the following description given in connection with the accompanying drawing, in which:

FIG. 1 shows a perspective view of a radio which is to be inserted in a receptacle which may be provided with an electrical connector is accordance with our invention;

FIG. 2 shows an exploded perspective view of an electrical connector in accordance with our invention which can be used on the receptacle of FIG. 1; and

FIGS. 3 and 4 show cross-sectional views taken along the line 3—4 of FIG. 1 for illustrating the operation of our electrical connector of FIG. 2 as used in the receptacle of FIG. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENT

In FIG. 1, we have shown a radio receiver **10** which is to be inserted in the direction indicated by the arrow into a receptacle **12**. The receptacle **12** may include, by way of example, a battery charger for charging the batteries in the radio receiver **10**. As shown, the receiver **10** carries a separate, detachable compartment or case **14** which holds the batteries for operating the receiver **10**. However, the receiver and battery compartment may be contained in one unit. Leads from the batteries in the case **14** are brought out on terminals **16** positioned on one side of the receiver **10**. In addition, additional terminals may be provided on the receiver **10** so as to provide a connection to an external antenna in case the receiver batteries must be recharged in a charger located in an automobile or some other space enclosed by metal which would reduce the efficiency of the receiver **10**. The receptacle **12** may take any suitable form, but typically is provided with a source of electrical power, such as 115-volt, 60-cycle alternating current, which is rectified and reduced to the appropriate voltage, and with other connections, such as to an antenna, so that the receiver **10** can continue operating while in the receptacle **12**. The receptacle **12** is provided with a suitable hole or opening **18** which has the same configuration as the battery case **14** so that the radio receiver **10** and the battery case **14** fit snugly and properly in the receptacle **12**. We have shown the receiver **10**, the battery case **14**, and the opening **18** as being generally rectangular in configuration. However, it is to be understood that other shapes and configurations may also be provided. The battery case **14** is provided with a groove or keyway **20** positioned along one wall or along two opposite walls so as to fit in appropriately shaped projections on the wall or walls forming the opening **18**, and thus ensure the proper insertion of the battery cases **14** and a relatively snug fit between the battery case **14** and the opening **18**.

When the radio receiver **10** and the battery case **14** are inserted in the opening **18**, connections are made from the receptacle **12** to the terminals **16** by a connector in accordance with our invention and as shown in FIG. **2**. In FIG. **2**, we have shown a portion of the structure forming the opening **18** in FIG. **1**. This structure comprises a wall **22***a*, two parallel walls **22***b*, **22***c*, and a fourth wall (not shown) which would be opposite and parallel to the wall **22***a*. A front opening **23** is positioned near the front edge **24** of the wall **22***a*, and a smaller rear opening **25** is positioned toward the rear of the wall **22***a*. With respect to FIG. **1**, the front edge **24** of the wall **22***a* would be positioned at the upper surface of the receptacle **12**, and the rear of the wall **22***a* would be positioned at a lower point down within the receptacle **12**. A pivot is provided outside and adjacent the wall **22***a* , this pivot being provided by a pin **26**. The pin **26** is positioned in two holes or openings **27** located in walls or supports **28** adjacent the wall **22***a*. The pin **26** provides a pivot axis which is generally parallel to the inner surface of the wall **22***a*, and which is transverse to the longitudinal dimension of the wall **22***a*. This longitudinal dimension extends in the direction along which the receiver **10** and the battery case **14** are moved when placed in the receptacle **12**. A keying projection **31** is positioned on the inner surface of the wall **22***a* and extends from the opening **25** towards the rear of the wall **22***a*. A depression or groove **32** is provided in the outer surface of the wall **22***a* for receiving a compression coil spring **33**. The structure comprising the walls **22***a*, **22***b*, **22***c*, the other wall opposite the wall **22***a*, the supports **28**, and the projection **31** can be formed of a single, integral piece of insulating material, such as a thermosetting plastic.

A lever **36** is provided from a single, integral piece of insulating material such as a thermosetting plastic. The lever **36** is shaped so that it can be positioned between the supports **28**, so that its front end **37** is positioned near the opening **23**, and so that its rear end **38** is positioned near the opening **25**. A pivot hole **39** extends across the lever **36**. One or more electrical contact springs **40** are fastened on the lever **36** by any suitable means, such as a threaded screw **41**. The front end of

the contact spring **40** is provided with a projecting contact **42** which passes through a suitable opening **43** in the lever **36**. The rear of the contact spring **40** is arranged to be connected to a suitable wire **44** which goes to an appropriate part of the battery charging circuit. The contact spring **40** is made of a metallic, resilient material so as to provide suitable spring action for reasons that will be indicated hereinafter. The lever **36** is provided with an operating cam or projection **45** at its rear end **38**, this projection **45** being shaped to project through the opening **25** beyond the inner surface of the wall **22***a*. The lever **36** is also provided with a suitable hole or depression (not visible in FIG. 2) for receiving the upper end of the spring **33**. With the spring **33** positioned in the depression **32**, the lever **36** (with its plurality of contact springs **40**) is mounted by moving the lever **36** downward as viewed in FIG. **2** until is pivot hole **39** is aligned with the two holes **27** in the walls **28**. The pin **26** is pushed through the first hole **27**, the hole **39** in the lever **36**, and the second hole **27**. When the lever **36** is so mounted, the contacts **42** are over the opening **23**, and the projection **45** extends through the opening **25**.

FIG. **3** shows a cross-sectional view taken along the line **3–4** of FIG. **1**, and shows the lever **36** mounted in the proper position for engaging one of the contacts **16** on the radio receiver **10**. FIG. **3** also shows the receiver **10** and its battery case **14** positioned partially in the opening **18** in the receptacle **12**. In FIG. **3**, it will be noted that the projecting contact **42** on the spring **40** is positioned in the opening **23**, but does not extend to a point within the inner surface of the wall **22***a*. It will also be noted that the operating cam **45** does project to a point within the inner surface of the wall **22***a*, but does not project beneath the innermost surface of the keying projection **31**. As the receiver **10** and the battery case **14** are inserted, the groove or keyway **20** permits the battery case **14** to clear or pass beyond the operating cam **45** and the keying projection **31**. However, once the groove **20** passes by the operating cam **45**, the surface **20***a* at the end of the groove **20** engages the operating cam **45** and, as viewed in FIG. **3**, pushes the cam **45** to the right and causes the lever **36** to pivot about its pin **26** in a counterclockwise direction. At this time, the terminal **16** on the receiver **10** is opposite the contact **42** on the lever **36**. Pivoting of the lever **36** continues until, as shown in FIG. **4**, the lever **36** is in its maximum counterclockwise position with the spring **33** compressed, and with the contact **42** on the lever **36** in firm engagement with the terminal **16** on the receiver **10**. Travel of the radio receiver **10** is halted when the surface **20***a* on the receiver **10** engages a front surface **31***a* on the keying projection **31**. It will be apparent to persons skilled in the art that the resilient characteristics of the contact spring **40** permit the spring **40** to move away from the lever **36** at the front end **37** to accommodate dimensional tolerances between the receptacle **12** and the radio **10**.

When the battery has received sufficient charge, the radio receiver **10** may be removed. When the receiver **10** is removed, the spring **33** causes the lever **37** to pivot clockwise, the operating cam **45** moves into the groove **20**, and the contact **42** moves outward from the terminal **16**, thus permitting the radio receiver **10** and the battery case **14** to be easily removed.

It will thus be seen that we provide a new and improved connector, which is useful for radio receptacles, and particularly battery chargers. While we have shown only one embodiment of our connector, persons skilled in the art will appreciate that modifications may be made. For example, the lever **36** may have a number of shapes, depending upon design preference, so long as it is pivoted along an axis between its front and rear ends, and is suitably dimensioned so that its projecting contact registers with the appropriate terminal when the operating cam is engaged and the lever pivots. Additional levers, with the structure described, may be provided on other walls forming the opening **18**. Other samples of modification may be different types of springs for urging the lever to take a clockwise position as viewed in FIGS. **3** and **4**, and different types of contact configurations positioned on the lever. Different types of electrical connections may be provided in addition to or in place of connections for charging a battery, such as a connection between the radio and an antenna. And finally, the contact **42** on the contact spring **40** may, when it engages the terminal **16**, cause actuation such as moving a lever from one contact to a separate contact on the radio receiver. Therefore, while our invention has been described with reference to a particular embodiment, it is to be understood that modifications may be made without departing from the spirit of the invention or from the scope of the claims.

What we claim as new and desire to secure by Letters Patent of the United States is:

1. An improved device for providing electrical connections between an electrical device having a generally rectangular receptacle and between a radio having a generally rectangular shape for fitting into said receptacle, said device comprising:

a. at least one wall forming one side of a receptacle, said wall having an inner surface and an outer surface;

b. said inner and outer surfaces extending from a front edge of said wall in a selected direction toward the rear of said wall;

c. a keying projection positioned on said inner surface, said keying projection having a stop surface located at a selected point on said inner surface between said front edge and said rear, and extending from said stop surface toward said rear in a direction substantially parallel to said selected direction;

d. said wall having a front opening between said inner and said outer surfaces, said front opening being located to the rear of said front edge;

e. said wall having a rear opening between said inner and outer surfaces, said rear opening being located to the rear of said front opening and to the front of said stop surface;

f. a lever pivotally mounted on said outer surface for pivoting about the axis that extends parallel to said inner surface and transversely to said selected direction, and that is located to the rear of said front opening;

g. said lever having a front and a rear respectively positioned adjacent said front and rear openings;

h. means engaging said lever for urging said front of said lever away from said outer surface and said front opening, and for urging said rear of said lever toward said outer surface and said rear opening;

i. at least one electrical contact mounted on said front of said lever and extending therefrom toward said front opening;

j. and an operating cam positioned on said rear of said lever and extending therefrom through said rear opening and inwardly of said receptacle beyond said inner surface so as to be engaged by a surface of a radio to cause said lever to pivot about said axis so that said front of said lever moves toward said outer surface, and its contact passes through said front opening sand engages a corresponding terminal on said surface of said radio;

k. said radio having a corresponding shape for being guided by said keying projection when inserted in said receptacle, and for being stopped during insertion by said stop surface on said keying projection.

2. The improved device of claim **1** wherein said electrical contact is resiliently mounted on said lever.

3. The improved device of claim **1** wherein said urging means comprise a compression coil spring positioned between said lever and said outer surface.

4. The improved device of claim **3** wherein said electrical contact is resiliently mounted on said lever.

* * * * *

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,644,873 Dated February 22, 1972

Inventor(s) W.D. Dalton; S.C. Mackzum; F.H. Mann; P.F. Sensabaugh

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Col. 1, line 16, cancel"recharging, leads" and insert -- recharging. Leads --

Col. 3, line 15, cancel "until is" and insert -- until its --

Col. 4, line 39, cancel "about the" and insert -- about an --

Signed and sealed this 6th day of March 1973.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

ROBERT GOTTSCHALK
Commissioner of Patents

ORM PO-1050 (10-69)

USCOMM-DC 60376-P69
* U.S. GOVERNMENT PRINTING OFFICE : 1969 O—366-334

UNITED STATES PATENT OFFICE
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ROBERT GOTTSCHALK
Commissioner of Patents

FORM PO-1050 (10-69)

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