

Jan. 16, 1968

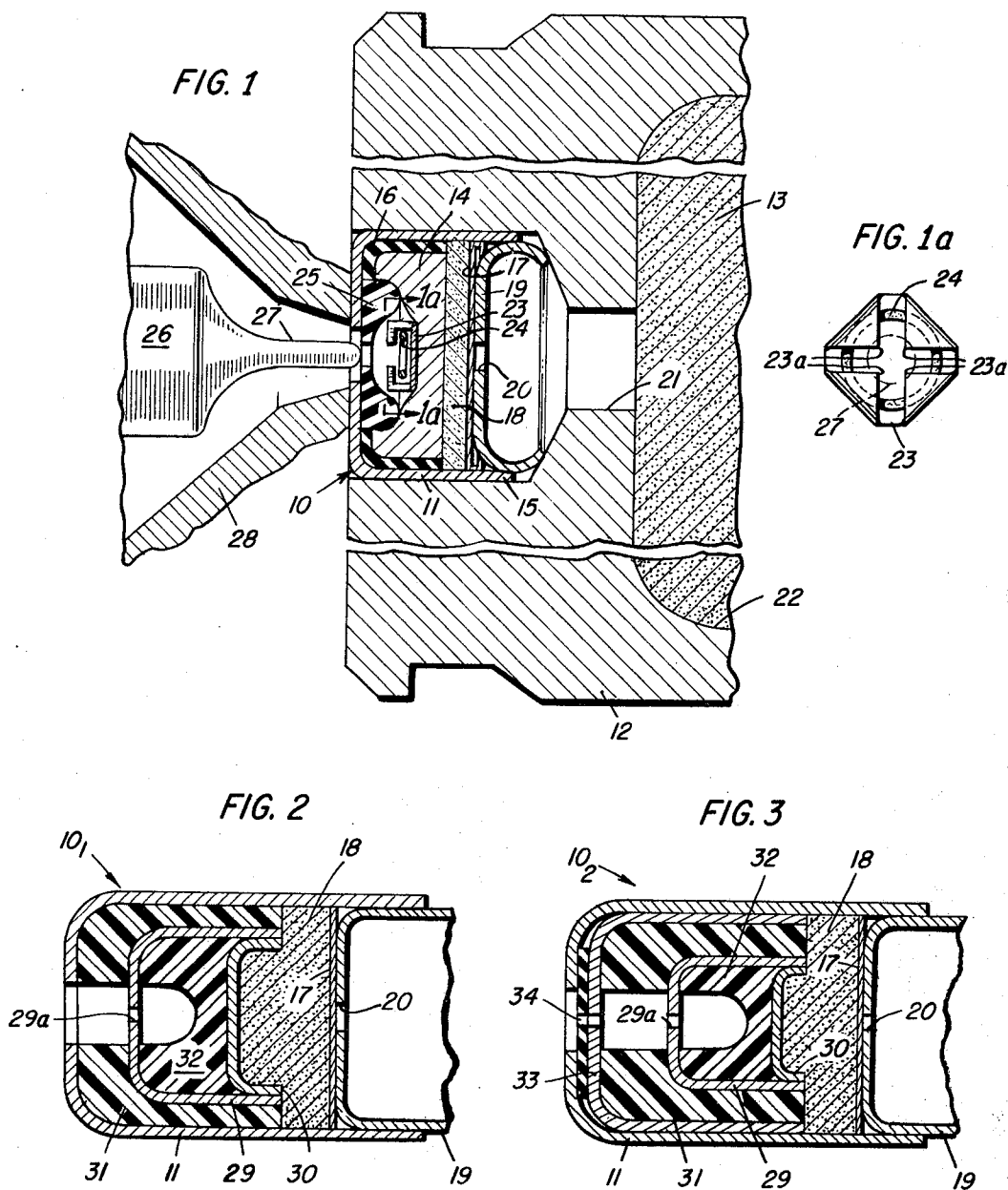
M. F. WALTHER

3,363,565

RECESSED AMMUNITION PRIMER

Filed Aug. 10, 1966

2 Sheets-Sheet 1



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FIG. 4

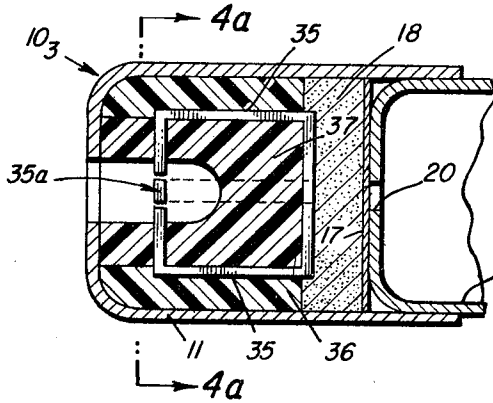


FIG. 4a

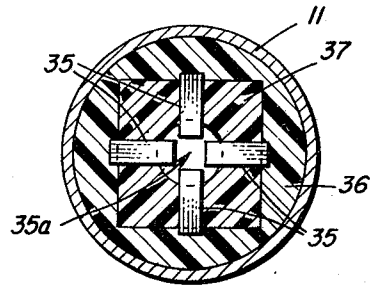


FIG. 5

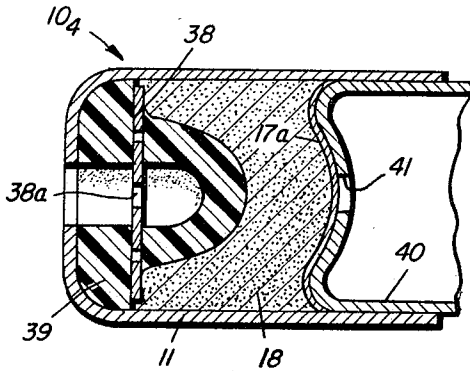


FIG. 7

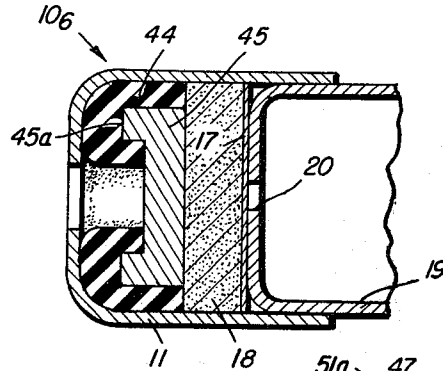


FIG. 6

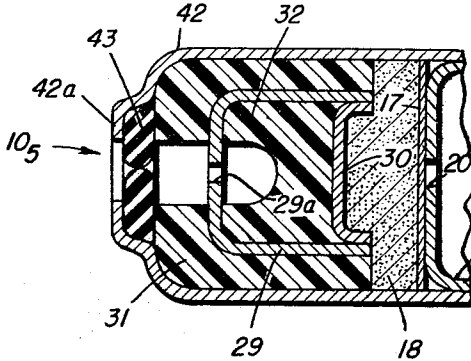
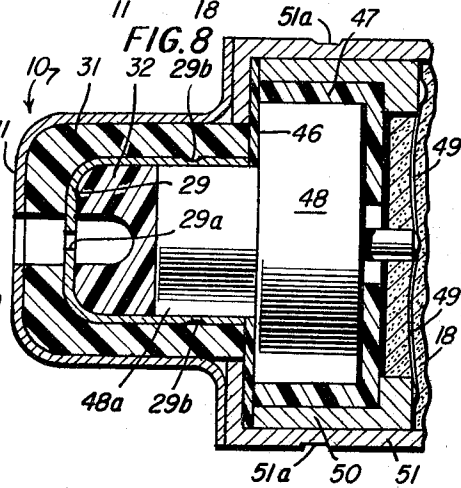


FIG. 8



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RECESSED AMMUNITION PRIMER

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ABSTRACT OF THE DISCLOSURE

There is disclosed an ammunition primer which has a recessed contact button to avoid accidental contact by other objects during handling of the ammunition and prevent the possibility of stray current firing the primer and setting off the charge. The improvement requires a more slender firing pin and permits sliding contact between the button and pin, allowing the button to be stopped during its travel rather than on its end for the purposes of safety.

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

The present invention relates generally to the ordnance art and, more particularly, to an ammunition primer for a cartridge which primer is designed to obviate inadvertent ignition of the propellant charge by either physical or electromagnetic means.

Currently, most ammunition primers utilize a contact button which is substantially flush with the aft end of the projectile case. This construction has proven to be both undesirable and even dangerous because, during the course of handling the ammunition, premature firing may occur if some object other than that specifically provided for firing should impinge upon the contact button. More importantly, in electrical firing systems where a primer mixture is used which is electrically conductive, stray electromagnetic energy may accidentally heat the mixture to its ignition temperature and, upon deflagration thereof, the evolution of the hot solids and gases would ignite the propellant in the cartridge case to prematurely fire the slug.

Among the techniques used to prevent inadvertent ignition of ordnance ignition elements are filters and safety switches. For gun ammunition these methods are too cumbersome. For those ordnance components which are not permanently connected to the firing circuit but utilize a moving firing pin, techniques of construction can be employed as herein described to avoid the possibility of premature ignition.

Accordingly, it is an object of the present invention to sufficiently shield the contact button in ammunition primers in order to guard against the possibility of a premature firing of the projectile.

Another object of the present invention is to recess the contact button in ammunition primers in order to render them safe from stray electrostatic or electromagnetic energy which might ignite the primer mixture.

A further object of the present invention is to provide a recessed ammunition primer for machine gun ammunition which may be fired electrically and which permits better contact with the firing pin.

A still further object of the present invention is to provide an ammunition primer which has a recessed contact in an electromagnetically shielded hole which will avoid the chance of unintentional firing and which will permit sliding contact with a firing pin rather than on its point.

A still further object of the present invention is to provide an ammunition primer whose contact means is suf-

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ficiently recessed within a metallic cup, such cup acting as a Faraday cage in significantly attenuating stray electrostatic and electromagnetic energy which may produce inadvertent firing.

Other objects, advantages and novel features of the present invention will become apparent from the following detailed description of the invention when considered in conjunction with the accompanying drawings wherein:

FIG. 1 is a partial longitudinal section of the aft portion of the ammunition case showing a primer assembly in accordance with the present invention, a portion of the breech block and firing pin also being shown;

FIG. 1a is a section taken along line 1a—1a of FIG. 1 showing its contact means;

FIGS. 2 through 8 are views similar to FIG. 1 showing various embodiments of the recessed ammunition primer of the invention without a showing of the breech block and firing pin or cartridge case; and

FIG. 4a is a section taken along 4a—4a of FIG. 4 showing its contact means.

The present invention is basically directed to a means for improving upon the conventional ammunition cartridge in such a manner that, along with a slight change in typical firing pin contours, it can be useful for purposes of electrical machine gun firing or conventional guns using an anvil type primer.

Referring now to the drawings wherein like reference characters designate like or corresponding parts throughout the several views, there is shown in FIG. 1 a primer cup 11 centrally disposed within pocket or cavity 15 formed at the aft end of the cartridge 12 which contains the propellant charge 13. Primer cup 11 is formed with a relatively small central hole in its base and lies flush with the aft face of cartridge 12. Within the rearward portion of cartridge 12 is an electrically conducting contact button 14 which is dish-shaped in a manner that its central portion is spaced farther from the cartridge aft face than its side portions. Contact button 14 is separated from primer cap 11 by an insulating member 16. The insulating means throughout the several views may be of plastic or rubber or some other substance sufficiently resilient to absorb the back pressure upon detonation of the charge. A washer 25 is disposed between contact button 14 and primer cup 11 as an extension of insulating member 16 and shaped so as to fit snugly within button 14. The central hole in washer 25 is also relatively small and is in axial alignment with the hole in primer cup 11. A thin paper disc 17 may be pressed into cup 11 during assembly in order to compact primer mixture 18 within the primer assembly 10. A cup support 19 is seated within cup 11 and protrudes slightly therebeyond in cavity 15. Cup support 19 is provided with a central aperture 20, so that upon ignition of mixture 18, the hot gases and solids will rupture disc 17 and pour forth through aperture 20 to initiate propellant 13 in cartridge 12. It should be noted that cup support 19 serves to prevent the collapse of cup 11 and to retain the primer mixture 18 properly in place.

Propellant charge 13 which propels the slug of the ammunition, of course, fills the cavity 22 of the cartridge 12. Propellant charge 13 is in direct communication with the space within cup support 19 by means of a "spit hole" 21.

Seated centrally within the dish-shaped contact button 14 and spot welded thereto, is an electrically conducting contact member 23. This member may be made of brass or its equivalent and may be circular or as in FIG. 1a square-shaped having its four corners or ears 23a bent up and around a resilient spacer-washer 24 at assembly. Washer 24 is primarily for the purpose of maintaining ears 23a spaced from its base throughout sliding contact with the firing pin.

The forward end of a portion of a typical breech block 28 is shown with a firing pin 26 commencing entry into primer assembly 10 through its nose 27.

In operation, the firing pin 26 is electrically fired by some suitable means, not shown, within its breech block 28 whose bored end is in contact with the aft end of cartridge case 12. The firing pin 26 is of conventional design except for its nose 27 which is modified into a slender profile. Upon firing, nose 27 enters primer assembly 10 through the hole in the base of primer cup 11 which is smaller than normal in order to increase the electromagnetic shielding. This hole is, however, large enough to receive nose 27 without interference throughout firing pin entry. As the pin continues on its travel, it expands the small hole in washer 25, since the washer hole is slightly smaller than the primer cup hole. As the pin 26 nears its final position where it will seat in the breech block 28, it makes contact with contact member 23, thereby passing current through button 14 and igniting mixture 18. Such contact is made not through the blunt end of nose 27, but rather by a sliding and scratching of the nose with the tips of ears 23a. FIG. 1a shows in phantom the nose 27 in contact with member 23. This sliding or scratching communication with contact member 23 results not only in a better contact but it tends to reduce breakage of the firing pin nose 27 after repeated use.

From the above design, it is apparent that the likelihood of any stray electrostatic or electromagnetic currents which would initiate mixture 18 has been greatly reduced since the primer cup 11 acts in effect as a Faraday cage which, in the presence of electromagnetic energy, will absorb most of the electric charge and effectively shield the contact means, so long as the firing pin or other means is not projecting through the aperture in cup 11 during such presence. Also, it should be noted that because of the low current density of cup 11 in the vicinity of mixture 18, ignition of primer 18 there-through is of little concern.

Turning now to FIG. 2 of the drawings, another embodiment 10₁ of a primer assembly is shown wherein insulating means or cups 31, 32 of thermosetting plastic and cups 11, 29, 30 and 19 of brass are seated within each other and pressed together to form the primer assembly 10₁. Primer cups 11 in all the figures except 6 are similar. Insulating cup 31 in this figure as well as in FIGS. 3, 6 and 8 is formed with a through bore of the same dimension as that of the bore in cup 11. Cup 29, FIGS. 2, 3, 6 and 8, acts as the contact member analogous to that of member 23 in FIG. 1. It is constructed with radial cuts, not shown, around a central hole 29a in order to facilitate the insertion and withdrawal of the firing pin nose 27. As in FIG. 1, contact is slidably made with the pin rather than on its end. Cups 32, FIGS. 2, 3, 6 and 8, are provided with a central cavity and each are so disposed behind hole 29a so as to accommodate the firing pin as it passes through the contact 29. This cup acts to keep cups 29 and 30, FIGS. 2, 3 and 6, in a spaced apart relation with the latter acting as a contact button for mixture 18.

In FIG. 3, primer assembly 10₂ differs only from assembly 10₁ in that the former has an additional cup 33 which is similar in construction to contact 29 except that it is larger. A rubber gasket 34 is provided in this embodiment between cups 11 and 33, or as an alternative, an insulated coating may be applied to cup 33. When the firing pin enters primer assembly 10₂, the cup 33 folds over inwardly and remains insulated from the firing pin by means of gasket 34 which remains in contact with the folded-over portion of cup 33. In this embodiment, maximum shielding protection is achieved by means of cup 33.

In FIGS. 4 and 4a, primer assembly 10₃ differs from the aforementioned designs in a manner in which the contacts are formed. Here, a plastic insert 37 of thermosetting material, circular or square in cross section, as shown, is

provided with a cavity at its one end for accommodating the entrance of the firing pin. Insert 37 is also provided with slots in each of its sides. The contact means in this design is comprised of a plurality of electrically conducting C-shaped members 35 with one leg of each being inserted into one of the respective slots. The length of each leg is equal to one-half the width of insert 37 less one-half the leg width. Therefore, the inserted legs collectively form an aperture 35a, clearly shown in FIG. 4a, through which the firing pin nose 27 may slidably protrude. The contacts 35 are held in place by plastic collar 36 which serves also to insulate contacts 35 from primer cup 11. The other legs of members 35 are fully exposed to mixture 18 for purposes of conducting electric current thereto.

In FIG. 5, primer assembly 10₄ consists of a minimum of parts wherein a contact disc 38 is simply molded centrally in a plastic hat-shaped cup 39 whose cavity opens toward the primer cup 11 base hole in order to accommodate entrance of the firing pin. Cup 39 serves also to insulate insert 38 from cup 11. A centrally disposed hole 38a in contact 38 serves to slidably receive nose 27 in the same manner as the aforementioned contacts. Here cup 40 serves the same purpose as cup 19 in the other embodiments except that it is contoured in a manner to maintain a relatively constant cross-section of the space in which the primer mixture 18 occupies. Hole 41 is formed for the same purpose as hole 20 of the other designs.

In FIG. 6, primer assembly 10₅ differentiates from the design shown in FIG. 2 only by the introduction of a means for obtaining a smaller primer cup opening. Such is achieved by a rubber washer 43 which, when assembled in the aft portion 42a of primer cup 42, is sufficiently constricted to effectively shield hole 29a in contact member 29. Upon entry of the firing pin, washer 43 will yield to permit sliding contact with member 29.

The primer assembly 10₆ of FIG. 7 is a design which provides a certain amount of shielding by means of insulation 44 in the form of a plastic tube involuted at one end in a manner to mate with contact button 45 which is a brass disc, or its equivalent, having an extension 45a on one side thereof around its periphery. This involuted tube presents an opening centrally located and of a diameter equal to that of the hole in primer cup 11. In this embodiment only, the blunt end of the firing pin nose 27 contacts button 45 as it passes through the hole in primer cup 11.

Disc 17 in the embodiments shown in FIGS. 1, 2, 3, 4, 6 and 7 is of the same design and functions for the purposes mentioned in the description of FIG. 1. Disc 17a is different only in that it assumes a shape similar to cup 40.

Referring now to FIG. 8, the recessed ammunition primer of the present invention is shown as applied to the wire bridge-type initiator used in some ammunition cartridges. In this embodiment 10₇, an electrode 48 of brass or other suitable material is disposed forward of insulation cup 32 with a portion 48a thereof fitted within cup 29. In order to insure proper contact with the electrode, a circumferential groove 29b may be provided in cup 29. An insulating washer 46 is disposed between electrode 48 and a brass cup 51 while an insulation cup 47 separates a wire bridge support cup 50, of brass or other suitable material, from the electrode. Attached to the forward face of the electrode is a typical nose piece to which is secured, as by welding, the wire bridge 49, of wire strips attached at one end thereof to the nose and at their opposite ends to cup 50. Primer mixture 18, which surrounds wire bridge 49, is ignited by the bridge wires via electrode 48 and cup 29. Along the circumference of cup 51, a groove 51a may be provided similar to the one on cup 29, thereby maintaining the integrity of the primer assembly.

From the foregoing description, it is apparent that an ammunition primer for a cartridge has been designed which provides a limited exposure of the ammunition's electro-explosive contact to the environment by means of a recessed primer disclosed in several embodiments. The

principal advantage of the present design is the ability to use the ammunition with increased safety and with less regard to strong electromagnetic influences. This design is unique and offers advantages over prior designs because a recessing of the primer button has been provided which not only protects the primer from environmental influences but it also permits sliding contact with a firing pin rather than contact on its point while effectively shielding the contact means against stray electromagnetic energy. A more slender firing pin is therefore warranted which assures better contact for ignition. Furthermore, because of the slenderness of the firing pin and its ability to enter the primer assembly before making contact, stoppage of the firing pin's travel becomes more feasible. It might also be possible to design a machine gun system wherein a locking of the breech block may be made while the pin is moving to thereby create an automatic delay without separate synchronizing switches.

The present invention provides a simple solution for guarding against accidental ignition due to electrostatic or electromagnetic energy by means of a Faraday shield not heretofore conceived for ammunition primers which effectively prevents premature firing. Also, the design is inexpensive, easy to manufacture and simple in operation.

Although the invention has been described in terms of electric firing devices, it is not to be so limited since the subject recessed ammunition primer is capable of use in any percussion type cartridge.

Obviously many modifications and variations of the present invention are possible in the light of the above teachings. It is therefore to be understood that within the scope of the appended claims the invention may be practiced otherwise than as specifically described.

What is claimed is:

1. A recessed ammunition primer in a cartridge comprising:

- a primer cup disposed centrally within the primer pocket formed at the aft end of the cartridge, said cup having a small central hole in its base;
- electrically conductive contact means inwardly spaced within said primer cup;
- electrically conductive explosive primer mixture disposed inwardly of said contact means; and
- a first means to shield said contact means from environmental influences and at the same time allow a firing to be effected only by means of a firing pin sufficiently slender to enter the axially aligned holes for contacting said contact means said first shielding means comprising:

- a first insulating means for maintaining the spacing of said contact means within said primer cup by being disposed substantially therebetween and said first insulating means having a small central opening in axial alignment with said cup base hole.

2. The primer of claim 1 wherein said contact means comprises a disc-shaped contact button and said first insulating means comprises a tube involuted at one end for support of said button.

3. The primer of claim 1 wherein said contact means comprises a dish-shaped contact button and a contact member seated within said button, said contact member having extension means thereon, whereby a sliding contact may be made by the firing pin with said contact member extension means.

4. The primer of claim 1 wherein said contact means

comprises a first cup centrally disposed within said primer cup and having a small central hole in its base, an electrode contacting said first cup, wire bridge means secured to said electrode, said wire bridge means comprising a wire bridge support cup and a wire bridge in direct communication with said primer mixture, second insulating means disposed between said first cup and said electrode, and third insulating means disposed between said support cup and said electrode.

5. The primer of claim 1 wherein said contact means comprises a first cup centrally disposed within said primer cup and having a small central hole in its base and a second cup seated within said first cup, second insulating means disposed between said first and second cups, said second insulating means being provided with a central cavity directly behind said first cup base hole, whereby sliding contact by the firing pin may be made with said contact means through said base hole.

6. The primer of claim 5 and further including a means for additionally shielding said contact means.

7. The primer of claim 6 wherein said additional shielding means comprises a third cup centrally disposed within said primer cup and substantially contiguous thereto, said third cup having a central hole in its base smaller than said primer cup base hole, and third insulating means disposed between said third and primer cups in the vicinity of their respective base holes, whereby the region of said third cup around its base hole will fold over and remain insulated from the firing pin upon its entry into the primer.

8. The primer of claim 6 wherein said additional shielding means comprises a rubber washer disposed between said first insulating means and said primer cup at the vicinity of said primer cup base hole, said washer having a closed central hole therein in axial alignment with said primer cup base hole which central hole is made to open upon entry of the firing pin into said primer.

9. The primer of claim 1 wherein said first insulating means comprises an insert having a cavity at one end thereof opening toward said primer cup base, part of said insert cavity forming said insulating means opening, said insert also having slots extending through the wall of said cavity, said contact means comprising a plurality of C-shaped strips with one leg of each said strip being received within respective ones of said insert slots to collectively form an aperture for facilitating a sliding firing pin contact, and said first insulating means being comprised further of a collar for maintaining said strips in place.

10. The primer of claim 1 wherein said first insulating means comprising a hat-shaped cup with its cavity forming part of said insulating means opening, and said contact means comprising a disc transversely disposed within said hat-shaped cup, said disc having a central slot therein, whereby sliding contact by the firing pin may be made with said contact means through said disc slot.

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