

April 2, 1946.

M. W. FISCHER

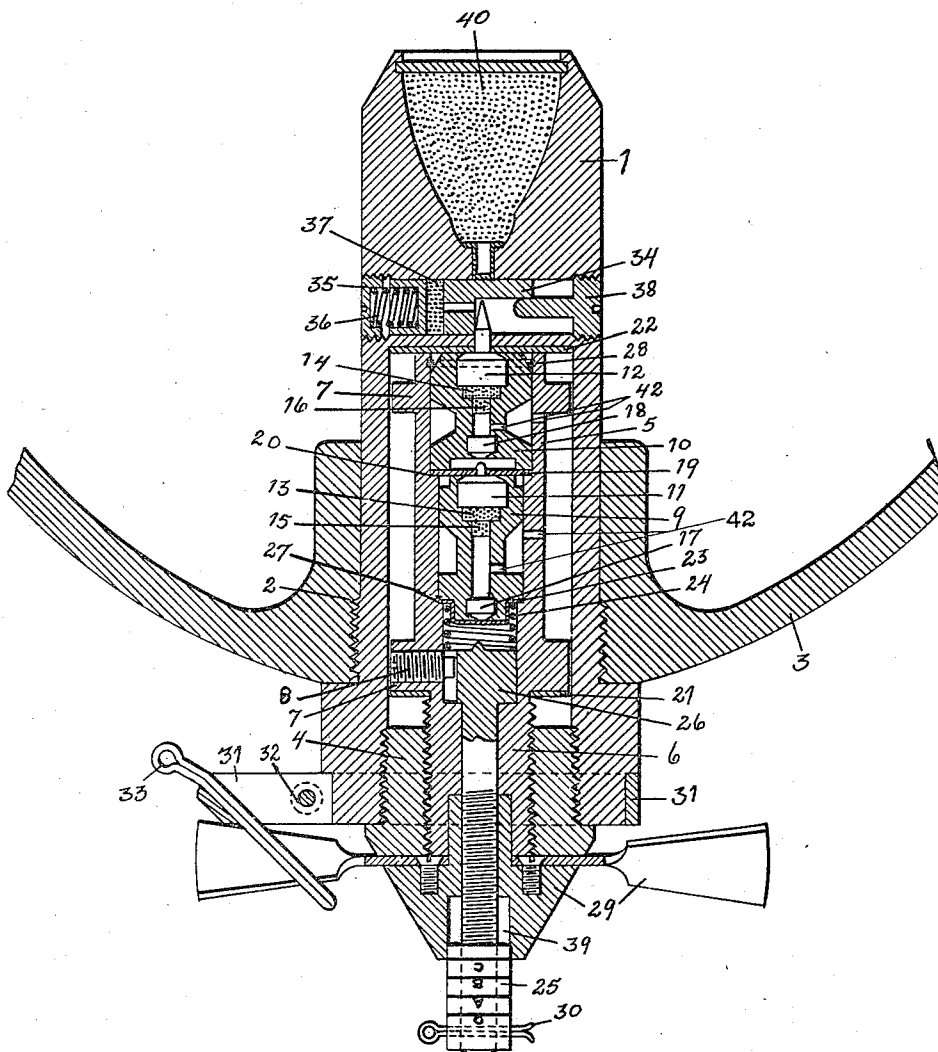
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FUSE

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3 Sheets-Sheet 1

Fig. 1.



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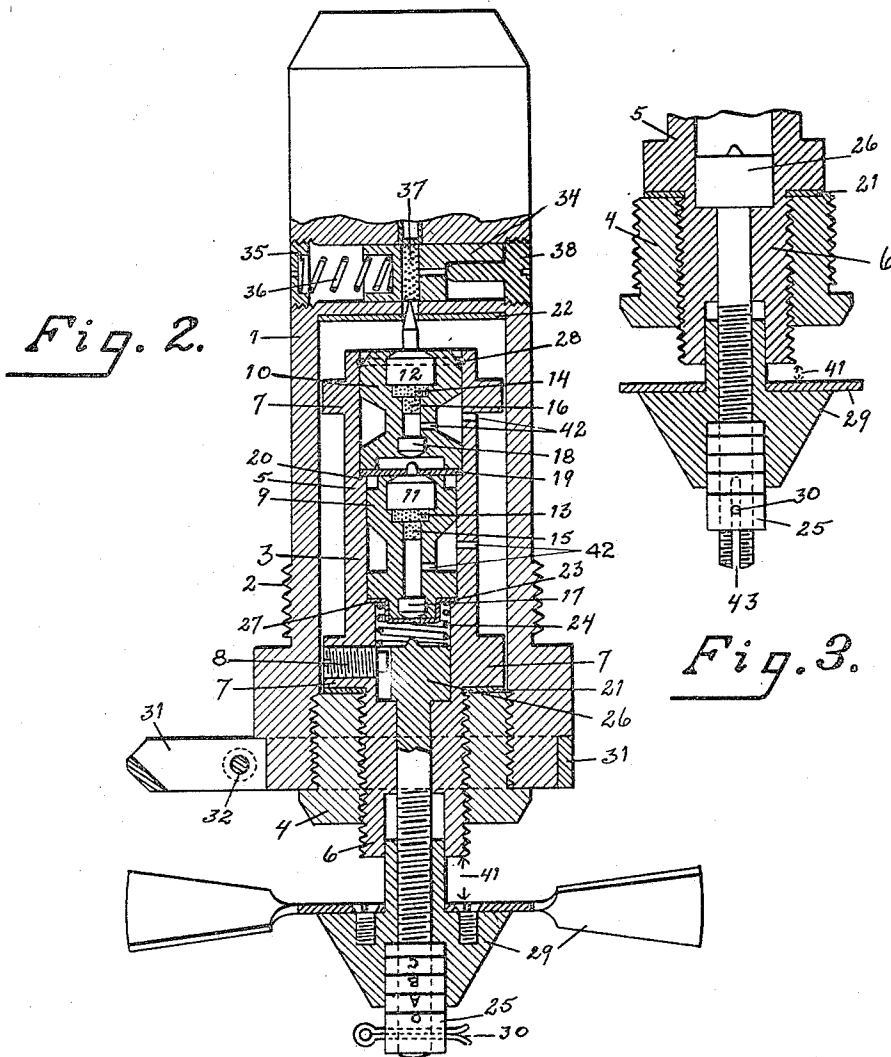
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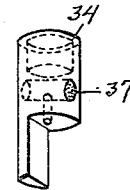
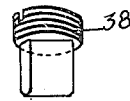
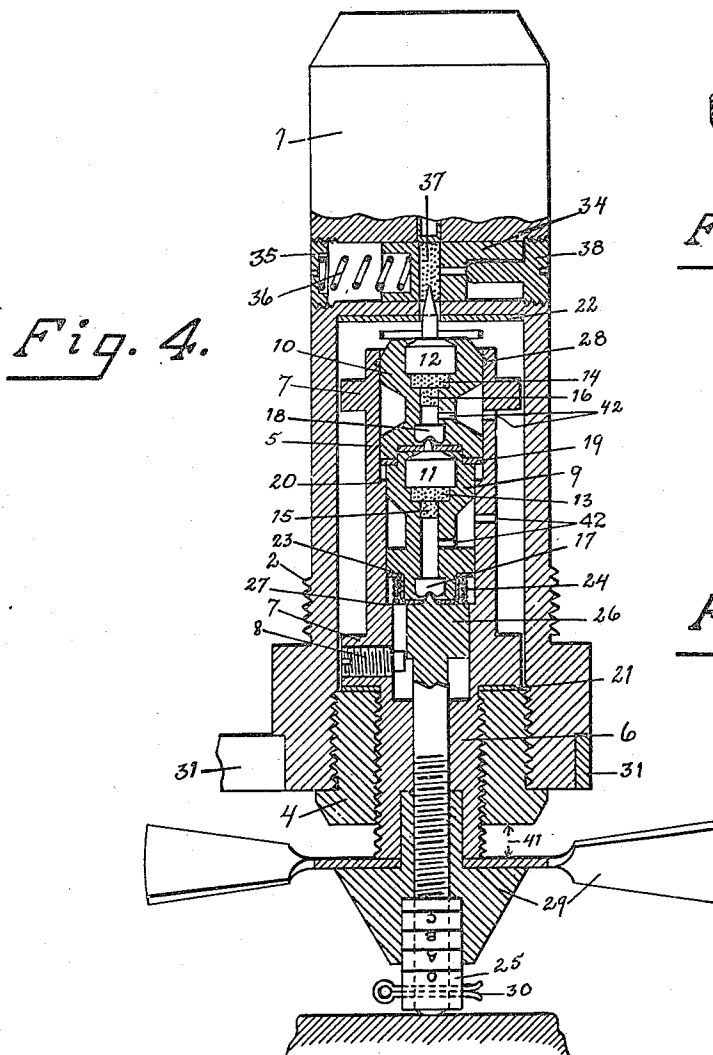
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UNITED STATES PATENT OFFICE

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FUSE

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5 Claims. (Cl. 102—81.2)

The invention relates broadly to aerial bombs and more particularly to a fuse therefor.

An object of the invention is to provide a fuse for use in a highly explosive aerial bomb.

Another object of the invention is to provide a fuse for aerial bombs that may be set to be fired at one of several desired intervals of time after contact with a target.

A further object of this invention is to provide a fuse for aerial bombs that can be readily rendered safe after it has been armed for firing.

A still further object of the invention is to provide a fuse for an aerial bomb that is cheap to manufacture, simple and efficient in operation, and that is assembled and disassembled without injury to the operator.

With the above and other objects in view, the invention consists in the construction, combination and arrangement of parts as will be described more fully hereinafter.

Reference is to be had to the accompanying drawings forming a part of this specification, and in which:

Fig. 1 is a longitudinal sectional view of the invention showing the fuse set in an unarmed position, time adjusting nut 25 adjusted to setting C;

Fig. 2 is a similar view showing the fuse set in an armed position for instantaneous firing, resulting from setting C;

Fig. 3 is a sectional view of the fuse firing mechanism set in position for delayed firing, resulting from setting A;

Fig. 4 is a sectional view of the fuse set for instantaneous firing resulting from setting C and at the moment of contact with a target;

Fig. 5 is a detail of the detonator holder, and

Fig. 6 is a detail of the detonator holder guide.

The fuse to be described hereinafter is composed of a body member, a time element, a time adjusting mechanism, an arming mechanism and a detonating mechanism.

The body member 1 is provided with a threaded portion 2 which is threaded into the shell 3 of an aerial bomb so that it extends partly within the bomb. The body member is divided into suitable compartments for the reception of the time element, detonating mechanism, and fulminate, all to be later described. The compartment holding the time element is open ended and is interiorly threaded at its open end to receive a threaded adapter ring 4 that is itself interiorly threaded.

The time element consists of a substantially cylindrical member 5 having a screw threaded extension 6 engageable in the adapter ring 4. Cylindrical member 5 is rotatable in the body member 1 and is maintained in its proper alignment with respect to the body member by projections or shoulders 7. One of these projections receives an adjustable key 8 through which the cylindrical member 5 receives its rotation, as will be described later. Cushion washer 22 protects the time elements when member 5 is in the unarmed position and gasket 21 reduces the shock when the forward shoulder of member 5 comes in contact with adapter 4. Time element holders 9 and 10 are mounted in the bore of the member 5, they being provided with firing pins 11 and 12, fulminate booster charges 13 and 14, time charges 15 and 16, and primer caps 17 and 18. Firing pins 11 and 12 are held in time element holders 9 and 10 respectively by a crimp in the metal of the holder. The firing pins are easily forced out on impact under the action of striker 26. Time charges 15 and 16 are compressed black powder. Vent holes 42 are to prevent building up a pressure which would change the time of burning of these charges. The time element holders are separated by a disk 19 which is made of a material that, under ordinary circumstances, will sustain the pressure of the firing pin 11, but if the setting of time adjusting nut 25 permits sufficient movement of striker 26 disk 19 will be ruptured as explained later when the bomb contacts with a target, permitting the firing pin 11 to make contact with primer cap 18. This disk abuts against a shoulder 20 formed by increasing the diameter of the bore of the member 5. Shoulders 20 and 27 respectively prevent forward movement of time element holders 10 and 9. Striker spring 24 prevents striker 26, when nut 29 allows sufficient movement, from striking primer cap 17 until overcome by the force of striking a target. Time elements 9 and 10 are held against the respective shoulders 27 and 20 by shear ring 28. When the time adjusting nut 25 is set to permit sufficient movement of striker 26, this ring will be sheared on impact with a target as will be explained later.

On impact, the movement that striker 26 will have relative to member 5 is fixed by the setting of time adjusting nut 25 which is secured at any particular setting by pin 30.

The fuse is armed by the motion of propeller 29 as the bomb drops through the air. Propeller and nut 29 advance until they strike time adjusting nut 25. The energy created by the momentum of propeller and nut 29 is then transmitted through key 8 to member 5 causing it to rotate, which rotation is continued under the driving

force of propeller 29 until it reaches adapter ring 4. This movement of member 5 withdraws firing pin 12 clear of detonator holder 34 allowing spring 36 to move said holder until it strikes the face of guide 38, thus placing main fulminate detonator 37 in line with firing pin 12. This is the armed position.

The functioning of the fuse will now be described: This fuse is fired in all cases by direct impact with the target, the kind of firing action depending on the impact force acting on striker 26 and the permitted movement of the striker relative to member 5.

Setting time adjusting nut 25 with mark O aligned with the forward edge of nut 29 secures instantaneous action on heavy impact only. This setting leaves no space such as 39 in Fig. 1. In arming, propeller and nut 29 move member 5 forward as previously described, but the arming is slower as member 5 must be turned with the first movement of propeller and nut 29, and furthermore this setting allows no movement of striker 26 relative to member 5 upon impact with the target. The fuse can be detonated only by the shearing of the threads between extension 6 of member 5 and ring 4. These threads are made of such material that they will shear only on heavy impact and not on impact with light construction or water. The shearing permits firing pin 12 to detonate main detonator 37 which in turn detonates the tetryl booster and bomb charge 40 which in turn detonates the bomb itself. This setting is designed for assuring the bomb to pass through light decks or roofs and to burst on impact with armor or concrete.

Setting time adjusting nut 25 with mark A aligned with the forward edge of nut 29, secures a long delay in firing when the bomb is to be used against penetrable targets such as light decks, roofs, etc. This setting leaves a small space 39 which on arming leaves space 41. Fig. 3, which, on impact with a light constructed target, allows sufficient movement of striker 26 relative to member 5 to strike and fire primer cap 17 but not to move time element holder 9. The primer flame ignites time train 15 and in turn fulminate charge 13, the explosion of which forces firing pin 11 through shear disk 19 and fires primer cap 18. Primer cap 18 ignites time train 16 and in turn fulminate charge 14 which drives firing pin 12 into the main fulminate detonator 37 which detonates the bomb as previously described. This long delayed action is designed to be used for impact on water from any altitude to give a depth charge effect. This setting also gives instantaneous action on impenetrable targets such as heavy armor or concrete by shearing the threads between extension 6 and ring 4 as previously described.

Setting time adjusting nut 25 with mark B aligned with the forward edge of nut 29 secures long delay on water impact from low altitudes, short delay on water impact from high altitudes and on penetrable targets and instantaneous action on impenetrable targets. This setting provides for a longer space 39 than for setting A which on arming leaves a correspondingly longer space 41, Fig. 2, and this on impact with a target allows sufficient movement of striker 26 relative to member 5 to shear disk 19, fire primer cap 18 and ignite time charge 16. This cuts the delay to one-half or less if desired. The difference between the actions on water impact from high altitudes and from low altitudes is governed by the strength of shear disk 19. At

low altitudes when the force of the impact is not sufficient to shear disk 19 the action will be as described under setting A for long delay. Upon heavy impact, the instantaneous action is as described under setting O.

Setting time adjusting nut 25 with mark C aligned with the forward edge of nut 29, secures instantaneous action on all solid targets, long delay action on water impact from low altitudes and short delay action on water impact from high altitudes. This setting leaves a longer space 39 than for setting B which on arming leaves a correspondingly longer space 41, Fig. 2, and this on impact with a target allows sufficient movement of striker 26 relative to member 5 to move time element holders 9 and 10 to shear the ring 28 allowing firing pin 12 to strike the main fulminate detonator 37, giving instantaneous explosive action. Shear ring 28 is strong enough to withstand water impact. This setting therefore will give long delay on water impact from low altitudes and short delay on water impact from high altitudes as explained for setting B. However, it will shear on impact with a heavy deck whereas the threads between threaded extension 6 and ring 4 will shear only on heavy armor or concrete.

Fig. 3 shows how time adjusting nut 25 can be secured by lock pin 30 and slot 43 at each half turn. This is sufficiently accurate for the settings required.

The arming propeller-and-nut 29 are secured from rotation until just before the bomb is used. This is accomplished by propeller locking pin 33 and propeller locking pin holder 31. The locking pin is secured in place between the propeller blades of which there are usually more than the two, shown in accompanying drawings. The locking pin holder is movable around the end of the fuse and is secured at any position by propeller holder lock screw 32 which also puts sufficient pressure on pin 33 to hold it in place.

In case the fuse has been armed unintentionally or accidentally, it can very conveniently be rendered safe for shipment, examination, or readjustment, by removing it from the bomb, if already attached, and unscrewing the detonator holder guide one-fourth turn until its slot is parallel to the axis of the fuse, since the flat guide will act upon the coacting flat portion of detonator holder 34 and rotate the holder so that the detonator 37 is at right angles to the axis of the fuse. The fuse may then be disassembled and reassembled without danger to the operator. The detonator holder may be removed by unscrewing detonator holder closing plug 35.

It will be noted that the design has eliminated all complicated machine operations, thus lending itself to ready and cheap manufacture on automatic machines, punch presses or die casting machinery.

While in the foregoing there has been illustrated and described such combinations and arrangements of elements as constitute the preferred embodiment of this invention, it is nevertheless desired to emphasize the fact that the interpretation of the invention should be conclusive only when made in the light of subjoined claims.

I claim:

1. An aero bomb fuse comprising a head formed with a cavity, a cylindrical member within said cavity, a firing pin at the rear end of said cylindrical member, a detonator holder held in an unarmed position by said firing pin, a threaded ring at the mouth of said cavity, a threaded extension

to said cylindrical member passing through and engaging the threads of said ring, said engaged threads being of such material that they will shear only upon heavy impact, and a propeller fixed to the forward end of said extension whereby said cylindrical member and firing pin are moved forward allowing said detonator holder to move to the armed position.

2. An aero bomb fuse comprising a head formed with a cavity with threads at its mouth, a cylindrical member having radial projections at each end for maintaining alignment within said cavity, two time element holders in tandem within said cylindrical member each containing a primer cap, a time charge and a fulminate booster charge, said cylindrical member having two shoulders within to prevent respectively the forward movement of said time element holders relative to said cylindrical member, a shear disk controlling the commencement of rearward movement of said forward time element holder relative to said cylindrical member, a shear ring controlling the commencement of rearward movement of said rear time element holder relative to said cylindrical member, a detonator holder held in an unarmed position by the firing pin of said rear time element holder, an inside and outside threaded ring engaging the threads at the mouth of said cavity, a cylindrical threaded extension to said cylindrical member passing through and engaging the inside threads of said ring, said engaged threads of said ring and extension being of such material that they will shear only on heavy impact, a striker passing through said threaded extension, a head on the rear end of said striker limiting its forward movement, a spring for controlling the commencement of the rearward movement of said striker relative to said cylindrical member, a key providing for rotation of said cylindrical member with said striker, a propeller-and-nut engaging the threads on the forward end of said striker whereby said cylindrical member and its contained elements are moved forward allowing said detonator holder to move to the armed position, a time adjusting nut limiting the forward movement of said propeller-and-nut relative to said striker which propeller-and-nut in turn upon impact limits the rearward movement of said striker relative to said cylindrical member, a propeller locking pin and holder, and a detonator holder guide by which said detonator holder can be rotated and the fuse rendered safe after arming.

3. An aero bomb fuse comprising a head formed with a cavity with threads at its mouth, a cylindrical member having radial projections at each end for maintaining alignment within said cavity, two time element holders in tandem within said cylindrical member each containing a primer cap, a time charge and a fulminate booster charge, said cylindrical member having two shoulders within to prevent respectively the forward movement of said time element holders relative to said cylindrical member, a shear disk controlling the commencement of rearward movement of said forward time element holder relative to said cylindrical member, a shear ring controlling the commencement of rearward movement of said rear time element holder relative to said cylindrical member, a detonator holder held in an unarmed position by the firing pin of said rear time element holder, an inside and outside threaded ring engaging the threads at the mouth of said cavity, a cylindrical threaded extension to said cylindrical member passing through and engag-

ing the inside threads of said ring, said engaged threads of said ring and extension being of such material that they will shear only on heavy impact, a striker passing through said threaded extension, a head on the rear end of said striker limiting its forward movement, a spring for controlling the commencement of the rearward movement of said striker relative to said cylindrical member, a key providing for rotation of said cylindrical member with said striker, a propeller-and-nut engaging the threads on the forward end of said striker whereby said cylindrical member and its contained elements are moved forward allowing said detonator holder to move to the armed position, and a time adjusting nut limiting the forward movement of said propeller-and-nut relative to said striker which propeller-and-nut in turn upon impact limits the rearward movement of said striker relative to said cylindrical member.

4. An aero bomb fuse comprising a head formed with a cavity with threads at its mouth, a cylindrical member having radial projections at each end for maintaining alignment within said cavity, two time element holders in tandem within said cylindrical member each containing a primer cap, a time charge and a fulminate booster charge, said cylindrical member having two shoulders within to prevent respectively the forward movement of said time element holders relative to said cylindrical member, a shear disk controlling the commencement of rearward movement of said forward time element holder relative to said cylindrical member, a shear ring controlling the commencement of rearward movement of said rear time element holder relative to said cylindrical member, a detonator holder held in an unarmed position by the firing pin of said rear time element holder, an inside and outside threaded ring engaging the threads at the mouth of said cavity, a cylindrical threaded extension to said cylindrical member passing through and engaging the inside threads of said ring, said engaged threads of said ring and extension being of such material that they will shear only on heavy impact, a striker passing through said threaded extension, a head on the rear end of said striker limiting its forward movement, a spring for controlling the commencement of the rearward movement of said striker relative to said cylindrical member, a key providing for rotation of said cylindrical member with said striker, a propeller-and-nut engaging the threads on the forward end of said striker whereby said cylindrical member and its contained elements are moved forward allowing said detonator holder to move to the armed position, a time adjusting nut limiting the forward movement of said propeller-and-nut relative to said striker which propeller-and-nut in turn upon impact limits the rearward movement of said striker relative to said cylindrical member, and a detonator holder guide by which said detonator holder can be rotated and the fuse rendered safe after arming.

5. An aero bomb fuse comprising a head formed with a cavity with threads at its mouth, a cylindrical member having radial projections at each end for maintaining alignment within said cavity, two time element holders in tandem within said cylindrical member each containing a primer cap, a time charge and a fulminate booster charge, said cylindrical member having two shoulders within to prevent respectively the forward movement of said time element holders relative to said cylin-

drical member, a shear disk controlling the commencement of rearward movement of said forward time element holder relative to said cylindrical member, a shear ring controlling the commencement of rearward movement of said rear time element holder relative to said cylindrical member, a detonator holder held in an unarmed position by the firing pin of said rear time element holder, an inside and outside threaded ring engaging the threads at the mouth of said cavity, a cylindrical threaded extension to said cylindrical member passing through and engaging the inside threads of said ring, said engaged threads of said ring and extension being of such material that they will shear only on heavy impact, a striker passing through said threaded extension, a head on the rear end of said striker limiting its

forward movement, a spring for controlling the commencement of the rearward movement of said striker relative to said cylindrical member, a key providing for rotation of said cylindrical member with said striker, a propeller-and-nut engaging the threads on the forward end of said striker whereby said cylindrical member and its contained elements are moved forward allowing said detonator holder to move to the armed position, a time adjusting nut limiting the forward movement of said propeller-and-nut relative to said striker which propeller-and-nut in turn upon impact limits the rearward movement of said striker relative to said cylindrical member, and a propeller locking pin and holder.

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