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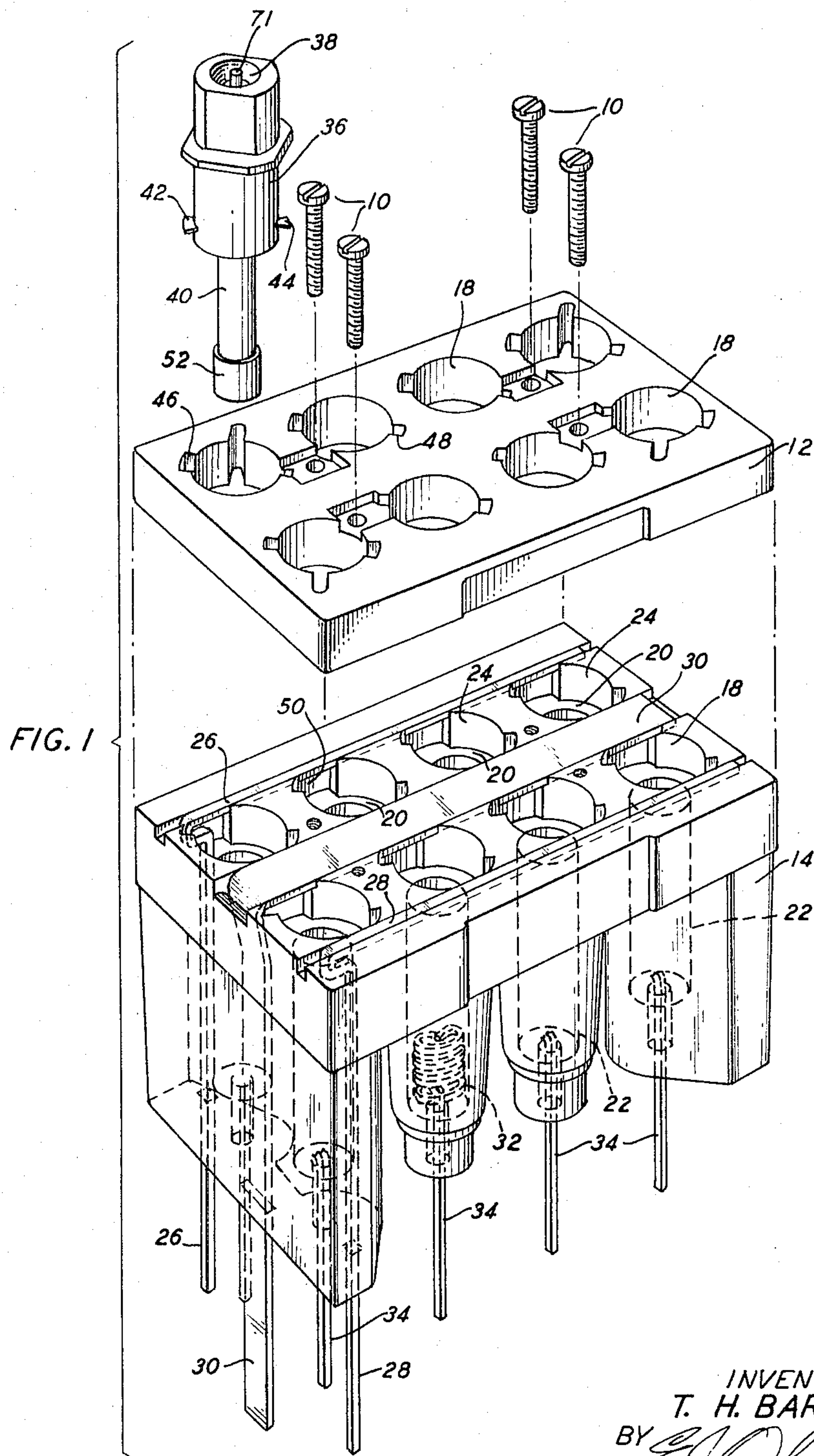
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3,299,236

MODULAR FUSE BLOCK ASSEMBLY

Filed Aug. 12, 1964

3 Sheets-Sheet 1



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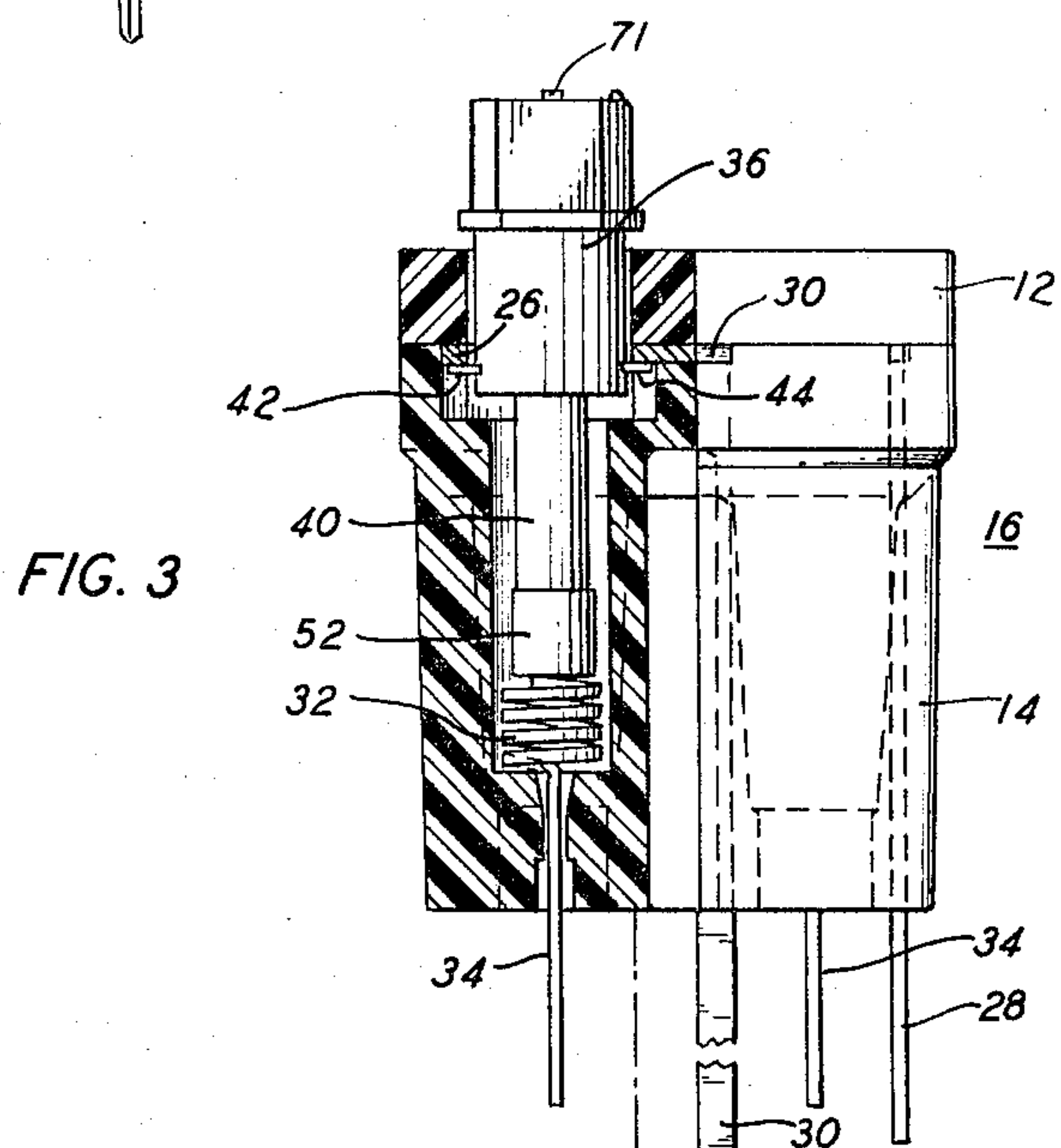
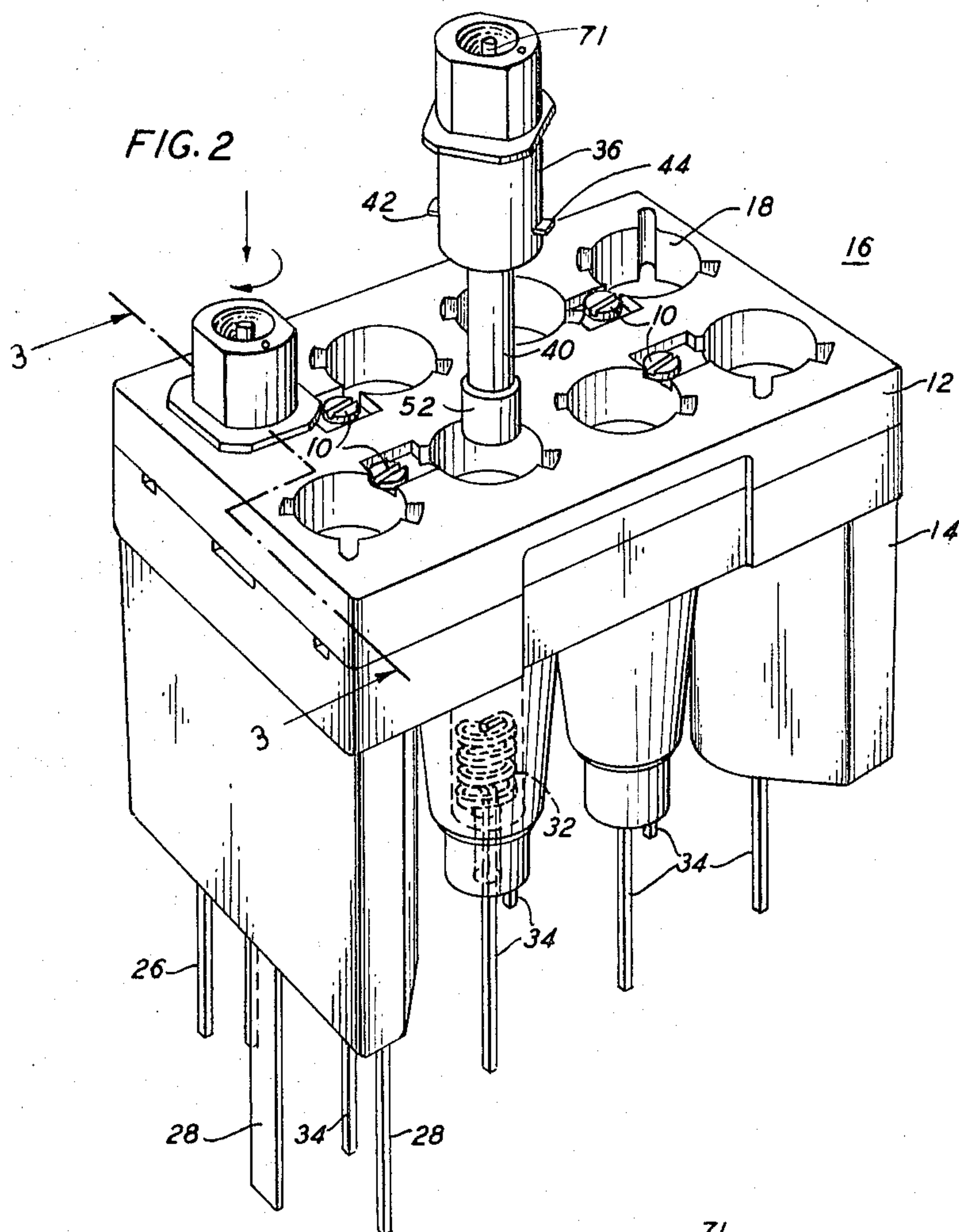
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MODULAR FUSE BLOCK ASSEMBLY

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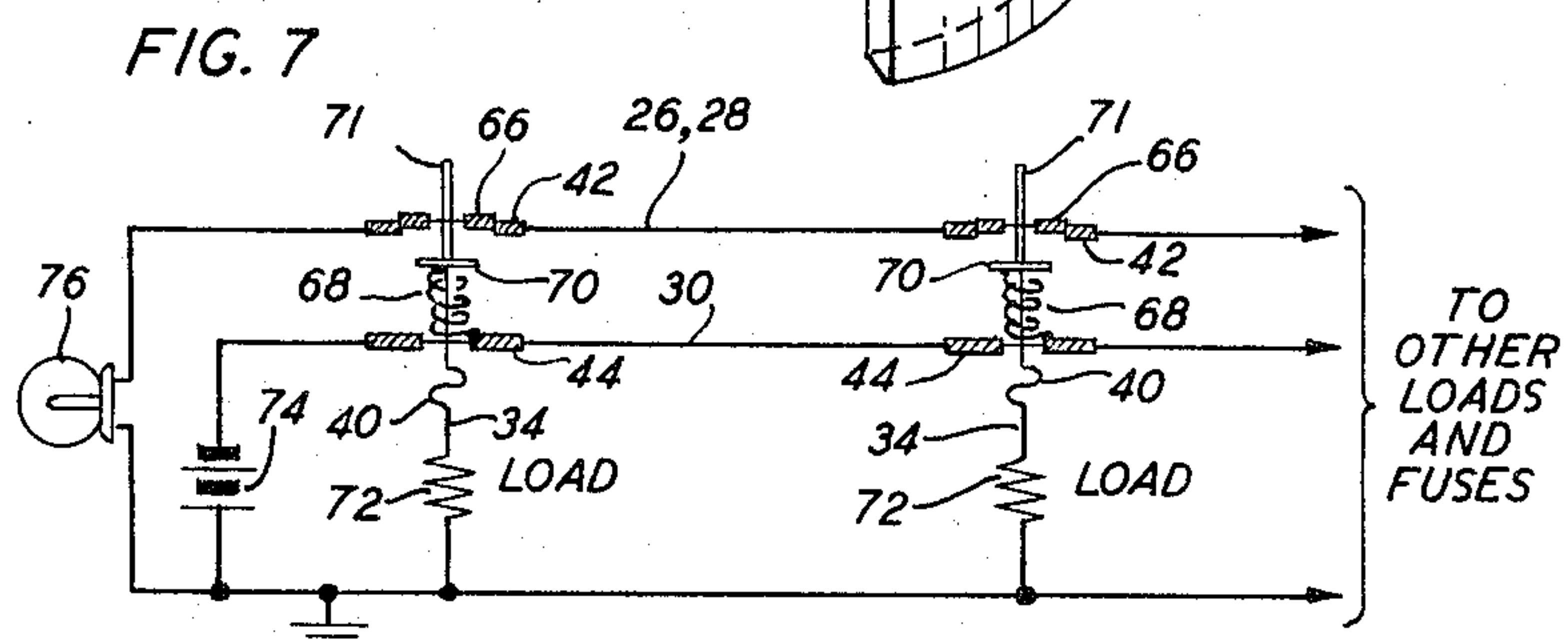
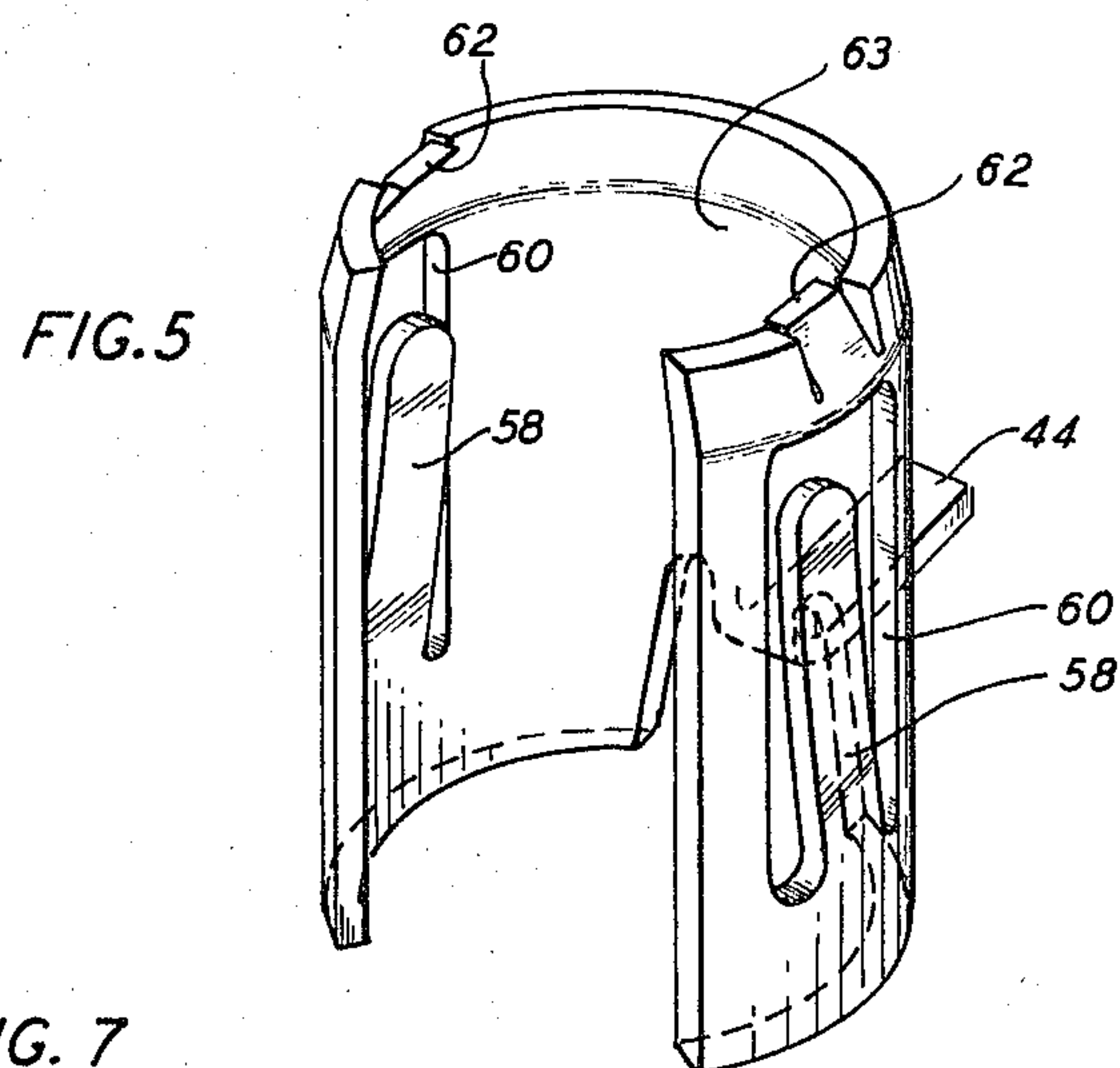
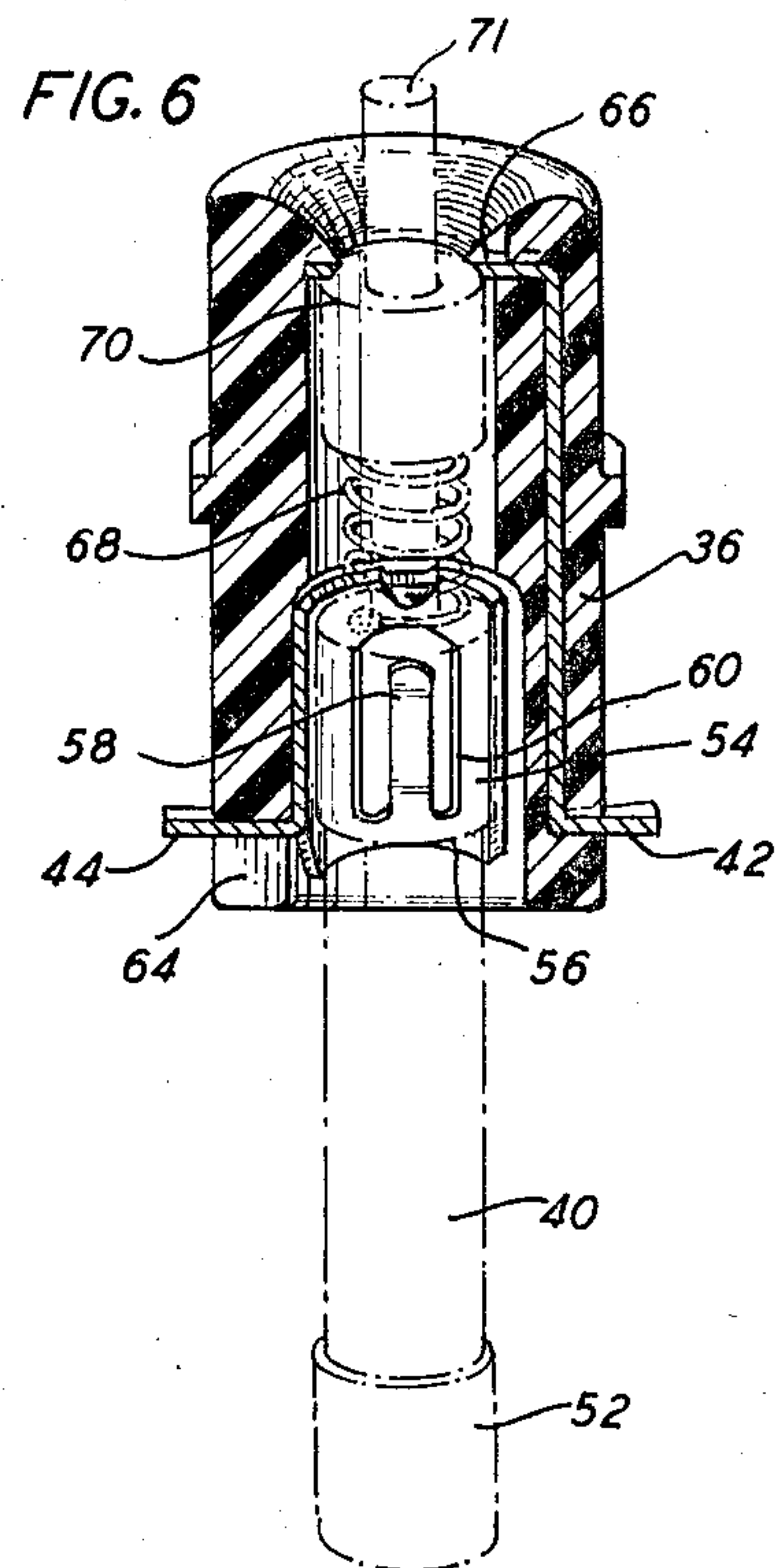
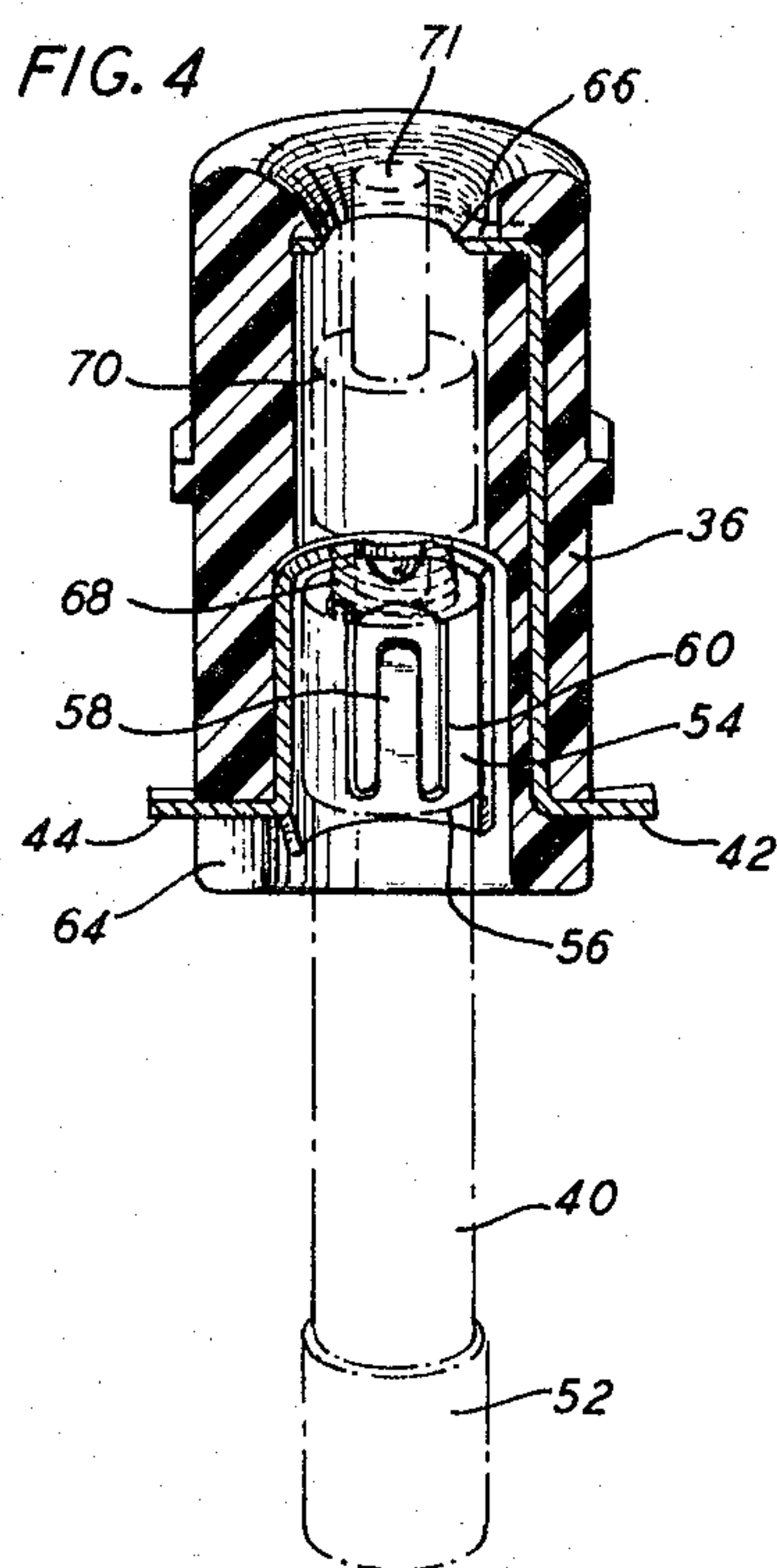
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MODULAR FUSE BLOCK ASSEMBLY

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MODULAR FUSE BLOCK ASSEMBLY

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9 Claims. (Cl. 200-133)

This invention relates to circuit controlling devices and particularly to assemblies enclosing disconnect fuses.

A specific aspect of the invention concerns fuse block assemblies wherein contact is established by gripping a fuse cartridge with an insulating fuse cap and inserting the cartridge into a chamber against the force of a spring in the chamber, until two conducting projections on the cap can be twisted into position behind two bus bars traversing the chamber. The spring, by urging the cartridge outwardly, seats the projections against the bus bars and holds the cap in place.

Serious difficulty arises where the projections are seated against the bus bars not only to hold the cap in place but also to complete circuit connections. In such cases, if the grip of the cap upon the cartridge and the force of the spring on the cartridge positions the cap angularly relative to the cartridge, one of the conductive projections may fall short of contacting the bus bars. These discontinuities may result in failure to energize loads or alarm systems where such are the functions of the circuit in which the fuse block assembly is incorporated.

An object of the present invention is to avoid these difficulties, and more generally to improve circuit controlling devices such as fuse block assemblies.

Another object of the invention is to improve fuse caps and their contact making ability with fuse blocks.

Still another object of the invention is to permit the fuse caps to grip fuse cartridges and thereby avoid safety hazards in inserting the cartridge or removing it from the block, while nevertheless assuring intimate contact between the projections and the bus bars.

According to a principle of this invention, these ends are achieved by gripping the fuse cartridge with means in the fuse cap that allow the cartridge a degree of movement in the direction of the projections and by pivoting the cartridge on embossings transverse to the plane of the projections. This pivotal action and freedom of movement of the cartridge impart a corresponding freedom to the cap relative to the cartridge. Thus, if the block and chamber and spring constrain the cartridge position within the chamber the cap can move in the direction of the projections and permit the outward force of the spring to adjust it so that both projections contact both bus bars.

The principle of the invention is stated above as to a comparatively specific environment for purposes of simplicity. The various features of novelty, both broader and more specific, are pointed out in the claims.

Other objects and advantages of the invention will become obvious from the following detailed description when read in light of the accompanying drawings, wherein:

FIG. 1 is an exploded view of a fuse block assembly illustrating the invention;

FIG. 2 is a perspective view of the fuse block assembly in FIG. 1;

FIG. 3 is a section 3-3 of FIG. 2;

FIG. 4 is a perspective partially cutaway view of a fuse cap holding fuse cartridge and embodying features of the present invention;

FIG. 5 is a detailed view of a terminal within the fuse cap of FIG. 4 embodying features of the invention;

FIG. 6 is a partially cutaway perspective view of the

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terminal in FIG. 4 showing the fuse cartridge after the fuse has "blown"; and

FIG. 7 is a circuit diagram utilizing a fuse block assembly according to the invention.

In FIGS. 1, 2, and 3, four threaded bolts 10 fasten a molded phenolic cover 12 onto a molded phenolic base 14 to form a fuse block 16. The latter defines eight parallel elongated cavities 18 of circular cross-section each having an annular step 20 that separates a narrower fuse receiving chamber 22 from an upper and wider fuse-cap receiving chamber 24. Intersecting the peripheries of the chambers 24 are two L-shaped alarm bus bars 26 and 28 both fitted into appropriate channels molded in the phenolic base 14. A battery bus bar 30 passing through the center of the block also intersects the peripheries of the chambers 24 but at their other sides. At the bottom of each chamber 22 vertically oriented helical springs 32 terminate in downwardly projecting terminal wires 34 that extend through the bottom of the base 14.

A longitudinal molded phenolic fuse cap 36 having an interior opening 38 that passes coaxially therethrough frictionally grips a fuse cartridge 40. The fuse cap 36 is one of eight identical fuse caps, each of which is intended to hold a cartridge 40 in the cavities 18 and thereby contact the fuse cartridge with proper bus bars in the usual manner. When a fuse "blows," manually lifting the cap removes the cartridge which can then be taken from the cap and replaced.

When the lower portion of a fuse cap 36 is pushed into one of the chambers 24 the cap forces the cartridge 40 axially against the spring 32. During entry of a cap 36 into one of the chambers 24 two coded diametrically opposing bayonets 42 and 44 extending radially from the bottom of the fuse cap 36 pass through coded keyways 46 and 48 extending downwardly along the peripheries of the cavities 18. In their downward passage the keyways 46 and 48 bypass the bus bars 26, 28, and 30 and terminate in offset recesses 50 directly below the bus bars. Thus, the fuse cap 36 can be forced with the fuse cartridge 40 against the axial urging of the springs 32 until the bayonets 42 and 44 pass below the level of the bus bars 26, 28, and 30 and then can be twisted so that the bayonets fit into the recesses 50 beneath the bus bars. When released, upward force upon the cap 36 through the cartridge 40 from the spring 32 seats the bayonets 42 and 44 against the bus bars 26, 28 and 30 to form electrical contacts. Another electrical contact is formed with the spring 32 by a ferrule 52 at the bottom of cartridge 40. These electrical contacts are shown in FIG. 3.

FIG. 4 illustrates the details of a fuse cap 36. Here, a contact terminal 54 illustrated in more detail in FIG. 5 grips an upper ferrule 56 of the fuse cartridge 40 with two diametrically opposed fingers 58 that extend resiliently upward and inward from cutouts 60 in the terminal. The remainder of the inner cylindrical surface on the terminal 54 is larger than the ferrule to provide a clearance for radial movement of the ferrule 56. The fingers 58 are displaced approximately ninety degrees from the bayonets 42 and 44. When a cartridge 40 is first inserted into the opening 38 of the fuse cap 36 its axial entrance is limited by two diametrically opposed inwardly extending bosses 62 directly above and in line with the fingers 58. After reaching the bosses 62 the cartridge 40 may pivot its axis about the bosses within the clearance established by the larger arcuate interior portions of the terminal 54, and relative to the fuse cap 36 in the direction of the bayonets 42 and 44. Thus, the axes of the cap 36 and cartridge 40 may be intersecting or askew.

The bayonet 44 extends integrally from the curved portion of the terminal 54 between the fingers 58, through

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a slot 64 in the cap 36. Forming a second stop to upward axial penetration within the opening 38 is an alarm terminal 66 molded into the cap 36 and constricting the space of the opening near the top of the cap. The conductive terminal 66 connects integrally with the bayonet 42.

The fuse cartridge 40, at its end having the ferrule 56, possesses a conductive coil spring 68 electrically contacting the ferrule 56 as well as a conductive alarm cap 70. The force of the coil spring 68 is stored by means of a tensioned fuse wire stretching through the fuse cartridge from the cap 70 to the lower ferrule 52. Severing of the fuse wire, such as by excessive current therethrough, releases the coil spring 68 which pushes the alarm cap axially against the terminal 66 as shown in FIG. 6 so as to electrically connect not only the alarm cap 70 with the terminal 66 but also the bayonets 42 and 44. A visual indicating stem 71 on the alarm cap 70 and passing through the terminal 66 to the top of cap 36 pops up to show that a particular fuse wire in the particular cartridge has been severed.

The fuse block assembly is used by individually placing a fuse cartridge 40 into a fuse cap 36 as shown in FIG. 4. The fuse cartridge, of course, must have an unsevered fuse so that energy is stored in the coil spring 68. Preferably eight such fuse caps and fuse cartridges are used with the block 16. Each separate fuse cap 36 with a fuse cartridge is then placed in an appropriate cavity 18 of the block 16 and forced downwardly against the upward urging of the spring 32 while the bayonets 42 and 44 slide in the keyways 46 and 48 until the bayonets have passed under the bus bars 26, 28, and 30. Each fuse cap is then twisted to place the bayonets 42 and 44 into the recesses 50 and released. Contact is now established between each bayonet 42 and the alarm bus bar 26 or 28, as well as between each bayonet 44 and the battery bus bar 30. (See FIG. 3.) Each one of the cartridges 40 in the fuse cap assembly is connected in a circuit as illustrated in FIG. 7. That is, eight loads can be protected from overload by eight fuses held by eight caps in a common block 16 with eight terminal wires 34.

FIG. 7 illustrates schematically how two fuse cartridges 40 of the eight protect two loads, and either can set off a single alarm. The two fuse circuits are identical and parallel and the other six available may be connected similarly. The reference numerals of FIGS. 1 to 6 designate the same parts shown schematically in FIG. 7. A first load 72 receives energy from a source 74 through a ground connection and current passes back to the source through a terminal wire 34, the ferrule 52, the unsevered fuse wire of cartridge 40, the upper ferrule 56, the bayonet 44, and the bus bar 30.

When an overload current severs the fuse wire in the cartridge 40 it disconnects the load 72. It then permits the coil spring 68 to push the alarm cap 70 against the terminal 66 so as to short the bayonets 42 and 44. Current will then flow from the source 74 through ground to a visual or audible alarm 76, through one alarm bus 26 or 28, through the bayonet 42, the alarm cap 70, the spring 68, the bayonet 44, through the battery bus 30, and back to the source.

The second load 72 connects through another terminal wire 34 to the same source. Both of these loads are then separately controlled by their respective fuse cartridges 40 with separate caps 36 although energized from a single source 74. A single alarm is sufficient to indicate disruption of service to either of the loads. Six more loads energized from the same source can be protected with the six other fuses and the same alarm. The visual indicators 71 pop up to indicate which particular fuse has "blown." The faulty fuse cartridge can then be removed by pushing in the cap 36 and twisting it until the bayonets 42 and 44 pass through the keyways 46 and 48. The spring 32 then pushes the cap and cartridge 40 out. Both of the latter can be removed simply by holding only

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the cap 36 and lifting. A new cartridge is then placed in the cap and then pushed into the block 16 by the cap.

It is evident that in the circuit configuration of FIG. 7 it is essential that intimate contact between the bayonets 42 and 44 in each fuse cap with the bus bars 26, 28, and 30 be reliably maintained. At the same time, it is essential for reasons of safety that the cartridges be withdrawn with the caps 36 as the latter are removed from the block 16. By gripping the cartridges 40 with the fingers 58 in a plane transverse to the bayonets 42 and 44 by forcing the cartridge 40 against two bosses 62 behind the fingers and permitting clearance for the cartridge 40 to pivot about the bosses in the directions of the bayonets, it is possible to assure such intimate contact despite the variety of forces that may position the cartridge 40 at a peculiar angle. It may happen that after inserting and twisting the fuse cap 36 the cartridge 40 is positioned at a peculiar angle which would tend to stop outward movement of the cartridge and the fuse cap 36 as soon as one of the bayonets 42 or 44 contacted one of the bus bars. However, the free pivotal movement of the cartridge permits corollary pivotal movement of the fuse cap. Thus, the upward force of the spring 32 and the torque applied by the contacting bus bar against the contacting bayonet would turn the fuse cap 36 in the vertical plane of the bayonets until contact between the previously noncontacting bayonet provides sufficient force against its bus bar to establish an equilibrium position and contact. Such contact is shown in FIG. 3.

If the fingers were not present and the clearances between the cartridge 40 and the terminal 54 were too great, such intimate contact would exist, but each time a fuse cap were withdrawn from the fuse block 16 the fuse would not come out with it, but would have to be removed by hand. This constitutes a safety hazard. On the other hand, as has been the case in the past, the terminal 54 has simply been circular and tightly gripped the ferrule 56 of the cartridge 40. Under these circumstances, it was quite possible and often happened that if the cartridge were forced into askew position it would prevent movement of the fuse cap after only one bayonet such as 42 had made contact, and the other bayonet failed to contact its bus bar.

It will be obvious to those skilled in the art that the invention may be embodied otherwise without departing from its spirit and scope.

What is claimed is:

1. A fuse block assembly, comprising a fuse block forming a plurality of elongated chambers for receiving elongated fuses, said chambers extending transversely into said fuse block, bus bars in said block having portions extending transversely into each of said chambers, springy means within each of said chambers for biasing each fuse longitudinally outward from said chambers, a plurality of fuse caps each removably positioned in a portion of one of said chambers and each having fuse holding means grasping an end of one of the fuses when the fuse is seated in the block by said cap, a pair of diametrically opposing tabs extending outwardly from each of said caps and entering said respective chambers behind the portion of said bus bars when the fuse is seated, said tabs engaging the inwardly facing surface of said bus bars in response to the outward force of said springy means on said fuses, each of said holding means having a pair of diametrically located resilient fingers in a plane transverse to a line between said tabs and a pair of protrusions within each of said caps in the plane transverse to said caps against which the end of said fuse pivots.

2. A fuse block assembly comprising a fuse block forming a chamber for receiving a longitudinal fuse transverse to a face of said block, springy means within said chamber for biasing the fuse outwardly, a pair of bus bars having portions passing through said chamber at respective opposite diametric locations, a cap having fuse holding means for grasping one end of the fuse, said cap being

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removably positioned in a portion of said chamber with the fuse when the fuse is seated in the chamber, a pair of conductive tabs at the end of said cap portion entering the block or chamber, said tabs projecting radially outward behind said bus bars, said tabs when the fuse is seated engaging the inwardly facing surface of said bus bars in response to an outward force of said springy means on the fuse, said fuse holding means having a pair of diametrically located resilient fingers for grasping the end of the fuse in a plane transverse to a line between said tabs, and a pair of protrusions in the plane transverse to said tabs and on the interior of said cap against which the end of said fuse pivots.

3. A fuse block assembly comprising, two removably engaged fuse holding means for jointly holding a fuse, a first of said fuse holding means having current conducting means, contacting means projecting from the second of said holding means behind said current conducting means when the fuse is jointly held by both of said holding means, and spring means in one of said fuse holding means for urging the fuse in a direction that engages said contacting means electrically with said current conducting means, one of said holding means having frictional means for grasping the fuse frictionally when said holding means are disengaged, said holding means with said frictional means having pivoting means engaging the fuse along a line transverse to the direction in which said contacting means project and having sufficient space between said frictional means so said fuse can rock about said pivoting means in the direction of said contacting means.

4. A fuse block assembly comprising, two removably engaged fuse holding means for jointly holding a fuse, a first of said fuse holding means having current conducting means, contacting means projecting outwardly from the second of said holding means behind said current conducting means when the fuse is jointly held by both of said holding means, and spring means in one of said fuse holding means for urging the fuse in a direction that forces the holding means apart and engages said contacting means electrically with said current conducting means, one of said holding means having resilient gripping means acting transverse to said contacting means for grasping the fuse independently and having pivoting means engaging the fuse along a line transverse to said contacting means and having sufficient space so said fuse can rock about said pivoting means in the direction of said contacting means.

5. In a fuse block assembly where a spring in a fuse receiving member having a conductor bar urges a fuse that is held by a fuse holding member in a direction such that contacting means projecting from the holding member behind the conductor bar to engage it, the improvement comprising pivot means on said holding means extending transverse to said contacting means and against which said fuse can rock in the direction of said contacting means, said holding means having fuse gripping means in line with said pivoting means and acting transverse to said contacting means, said holding means having sufficient additional space to allow the fuse to rock in the direction of said contacting means.

6. A fuse block assembly comprising, base means forming an elongated fuse cavity and having a pair of current conducting means, holding means removably engaged with said base means at said cavity for holding an elongated fuse, two opposing contacting means projecting radially from said holding means behind the respective ones of said conducting means when the fuse is placed in the cavity, spring means in said cavity for urging said fuse in a direction to move said holding means and base means apart so as to engage said contacting means with said conducting means, and resilient gripping means in said

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holding means engaging opposite sides of said fuse along a plane transverse to the contacting means, said holding means having pivot means in the plane transverse to which the contacting means project and forming sufficient space to permit the fuse to rock in the direction of said contacting means.

7. A fuse cap comprising, insulating means defining a chamber for receiving at least a portion of an elongated fuse cartridge, a pair of diametrically opposite conductive tangs extending outwardly from said insulating means, a pair of opposing bosses extending inwardly into the chamber transverse to the direction of the tangs and forming a pivot, resilient means in said chamber for applying force in the direction of the bosses so as to hold the fuse, said chamber having sufficient space to allow rocking of said fuse about said pivot.

8. A fuse block assembly comprising a fuse block forming a chamber to receive a fuse, a pair of contact members in the chamber, fuse holding means having contactors removably positioned in said chamber deeper than the contact members and to pass behind the members, resilient means for biasing the fuse outwardly whereby said fuse holding means are biased outwardly and said contactors are pressed against said contact members, said fuse holding means having a portion surrounding an end of the fuse and two diametrical flexible fingers in a plane transverse to said contactors for engaging the fuse end, a pair of protrusions located diametrically transverse to said contactors in the interior of said fuse holding means against which the end of the fuse can pivot.

9. A fuse block assembly, comprising a fuse block forming a chamber for receiving an elongated fuse, springy means within said chamber for biasing the fuse outwardly, a pair of bus bars in said chamber, a cap having fuse holding means for grasping one end of the fuse and being removably positioned in a portion of said chamber behind the fuse, securing means on the cap adapted to enter the passage for engaging the inwardly facing surfaces of said bus bars in response to outward force of said springy means on the fuse, said securing means including a pair of conductive tabs, said fuse holding means having a pair of diametrically located resilient fingers in a plane transverse to a line between said tabs, and a pair of protrusions in the plane transverse to said tabs in the end of said cap against which the end of the fuse pivots.

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