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(54) **CRIMPING OF DETONATORS**

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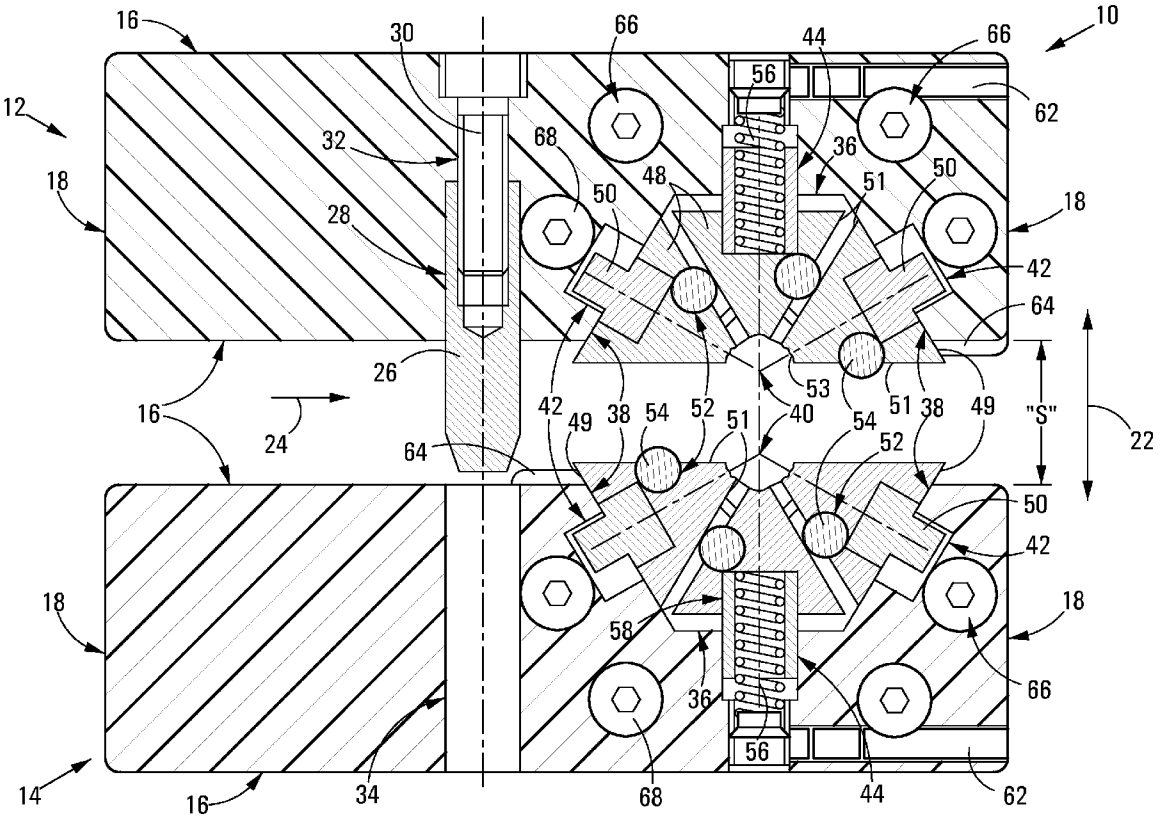
(57) **ABSTRACT**

A device for crimping the mouth of a detonator housing comprises a pair of opposed jaws reciprocally movable relative to each other, and a plurality of toothed segments on each jaw. The segments are moveable, are located in a jaw cavity, and together form a segmented ring. The side faces of each segment converge from a broad radially outer end towards a toothed radially inner narrow end. A resiliently stressable biasing element is provided between each adjacent pair of segments. The biasing elements act to space the segments of each pair apart when the jaws are spaced apart from each other, and also act to permit the segments, in response to movement of the moveable segments arising from the closing of the jaws, to abut against one another in series when the jaws are tightly in contact with each another, to form the segmented ring.



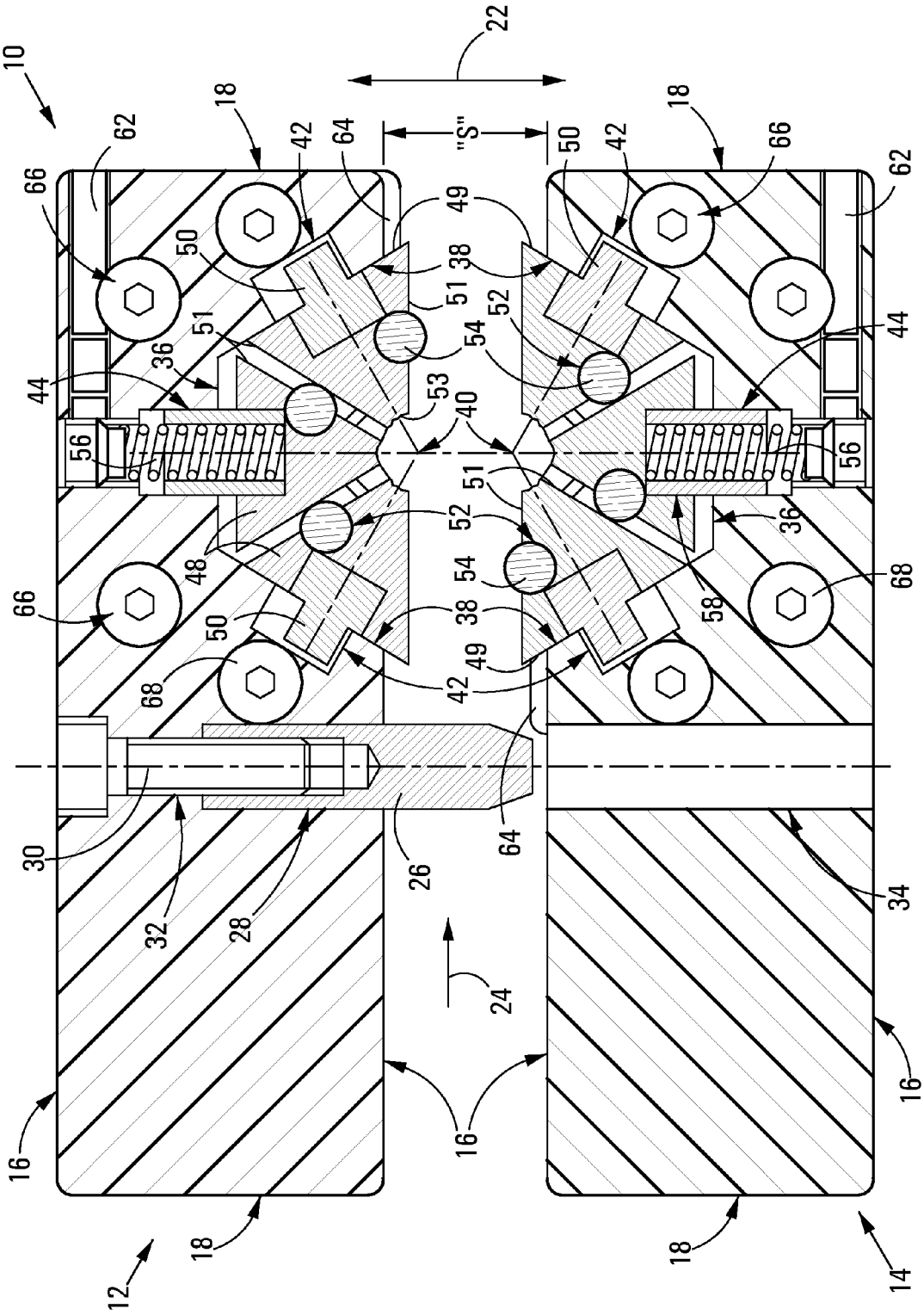

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FIG 1

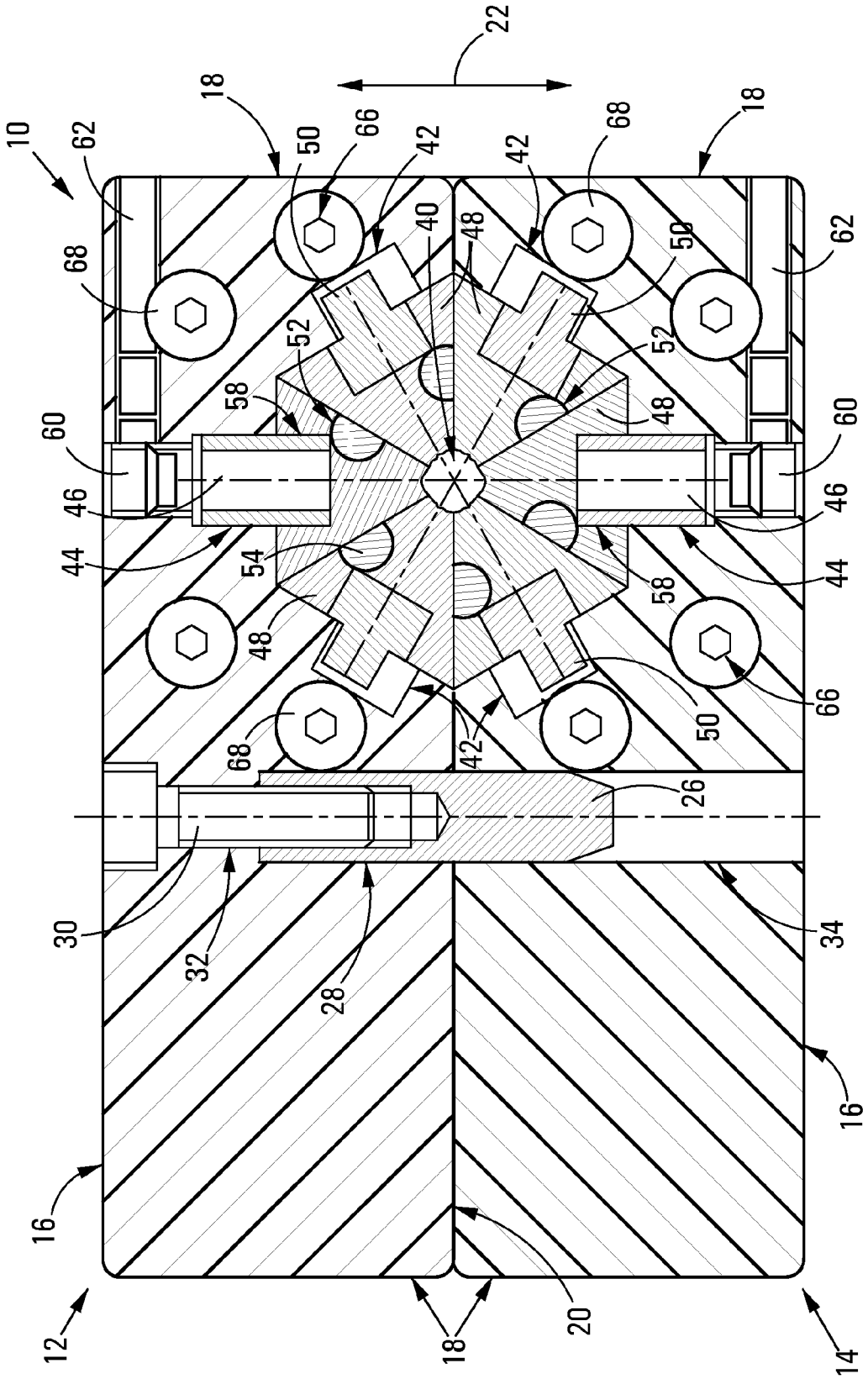
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FIG 2

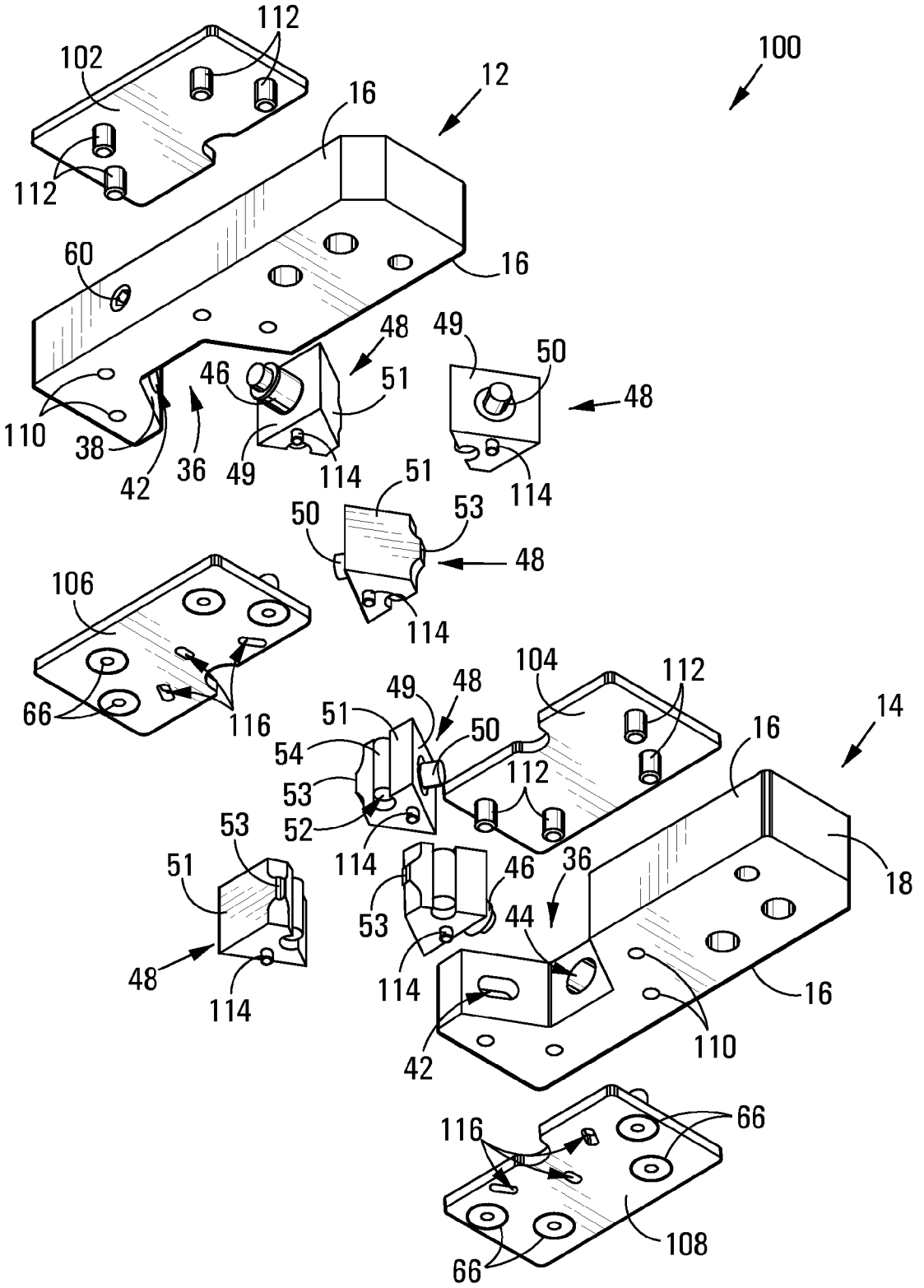
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FIG 3

CRIMPING OF DETONATORS

[0001] THIS INVENTION relates, broadly, to the crimping of detonators for detonating explosives. More specifically, the invention relates to a device and a method for crimping the mouth of a metal detonator housing around an initiating element such as a shock-tube, fuse or electrical lead protruding into the housing.

[0002] According to the invention, there is provided a device for crimping the mouth of a metal detonator housing around an initiating element protruding into the housing through the mouth, the device comprising

[0003] a pair of opposed jaws, at least one which is movable relative to the other and is reciprocally mounted so that at least one of the jaws is reciprocally movable alternately towards and away from the other jaw to successively bring the jaws tightly into contact with each other and then to space the jaws apart from each other;

[0004] a plurality of toothed segments arranged side-by-side in series on each jaw, at least some of the segments being moveable and at least some of the segments of each jaw being located in one or more cavities provided therefor in the jaw, each segment having a pair of side faces whereby the segment abuts an adjacent segment when the jaws are tightly in contact with each other so that the segments of the jaws together form a segmented ring, the side faces of each segment converging from a broad radially outer end of the segment towards a toothed radially inner narrow end of the segment, each segment thereby having a tapering shape when viewed in a direction parallel to the axis of the ring, with the teeth of each segment being parallel to said axis;

[0005] a resiliently stressable biasing element provided between each adjacent pair of segments in a jaw, the biasing element acting to space the segments of the pair apart when the jaws are spaced apart from each other and acting to permit the segments, in response to movement of the moveable segments arising from the closing of the jaws, to abut against one another in series when the jaws are tightly in contact with each another, to form the segmented ring, the ring defining, at its centre, a passage having a toothed cross-sectional outline provided by the toothed narrow ends of the segments for holding a crimped mouth of a detonator, the mouth having been crimped by the toothed inner ends of the segments in response to radially inward movement of the segments caused by the tight closing of the jaws.

[0006] Each jaw may have the same number of segments. The number of segments in each jaw may be selected by routine experimentation, bearing in mind difficulties in obtaining a desirably circular toothed passage when the jaws are tightly closed, when there are too few segments, and difficulties associated with expense and complexity of construction, when there are too many segments.

[0007] The number of segments in each jaw may thus be in the range of 2 to 8, more preferably 3 to 5, and conveniently 3.

[0008] More particularly, each jaw may have an odd number of segments, for example 3, 5 or 7, the preferred number again being 3, so that there are, in each jaw, a central segment and one or more additional segments on each side of the central segment.

[0009] At least one segment in each jaw, for example the central segment, may be fixed and hence immovably connected or integral with the remainder of its associated jaw, with a cavity being provided in the jaw on each side of the fixed segment for receiving one or more movable segments.

[0010] Alternatively, all of the segments may be movable, being in the nature of movable inserts, a single cavity being provided in each jaw for receiving the inserts, in which cavity the inserts are located.

[0011] Each cavity may provide one or more abutment faces for abutting respectively against the broad ends of the movable segments. The abutment faces may be flat and the broad ends of the movable segments may have radially outwardly facing surfaces which are also flat. Each abutment face and the radially outer surface of the associated segment may be provided with a radial projection which projects into an associated tangential slot, relative to the ring. The projection may be a radially outward projection from the outer surface of the broad end of the segment and the tangential slot may be provided in the abutment face of the recess, or in principle vice versa, with the projection projecting radially inwardly from the abutment face of the recess and the tangential slot being provided in the outer surface of the broad end of the segment.

[0012] When there is an odd number of segments in each jaw, however, there need be no slot and projection acting between the outer surface of the broad end of the central segment and the associated abutment face, the abutment face and outer surface of the central segment instead respectively being provided with opposed sockets, and a biasing member such as a coil spring under axial compression or an elastomeric block under similar axial compression, being located in the opposed sockets and spanning the interface between the outer surface of the broad end of the central segment and the abutment face, the compression of the biasing member acting to urge the outer face of the central segment away from the associated abutment face.

[0013] Each biasing element may be an elastomeric block which is held captive in a cavity provided therefor in the side face of one of the segments of the pair of segments between which it acts. The elastomeric block may project tangentially outwardly from its cavity relative to the axis of the ring, when the jaws are spaced apart from each other, the block thereby acting to space apart the segments of the pair, and is compressed and forced into its associated cavity by the side face of the other segment of the pair when the jaws are tightly in contact with each other. Each elastomeric block may be cylindrical in shape, being located in a correspondingly part-cylindrical cavity having an axis which is parallel to the axis of the ring.

[0014] Each jaw may comprise a more or less elongated rectangular flattened bar, conveniently of metal, the bar being longer than it is wide and wider than it is thick, so that it has a pair of major faces spanning its length and width, a pair of side edge faces spanning its length and thickness, and a pair of end edge faces spanning its width and thickness, the bars abutting against each other, by means of a pair of opposed side edge faces thereof, when the jaws are in the tightly closed condition. In this case the cavities holding the respective series of segments may be more or less semi-regular-polygonal indentations into the respective opposed side edge faces of the bars, the indentations extending from one major face of the bar to the other. The axes of the polygons may be parallel to the axis of the ring, and each cavity may in turn also extend

from one major face of the bar to the other. Each major face of each bar may be enclosed by a cover plate, which acts to hold the segments and biasing elements in place against axial movement thereof in the direction of the ring axis.

[0015] The device may include a guide pin protruding from at least one of the segments, into a complementary guide slot in the cover plate which abuts that segment. Typically, each of the segments may be provided with such a guide pin, with each guide pin then located in its own complementary guide slot.

[0016] The jaws may further be provided respectively on their side edge faces which abut when the jaws are tightly in abutment, with a guide pin and an opposed tubular guide socket, the pin entering the socket when the jaws approach each other, and leaving the socket when the spacing between the jaws is increased sufficiently, as the jaws leave each other.

[0017] In use, a succession of detonator housings are moved intermittently in series along a path extending between the jaws, in a direction perpendicular to the axis of the ring, with their associated initiating elements in place, optionally held there by a resiliently flexible sleeve or ferrule located coaxially between the mouth of the detonator housing and the initiating element, the detonator housings being aligned parallel to the ring axis, while the jaws are spaced apart, with each detonator housing being placed between the jaws and coaxially aligned with the ring axis, before the jaws are moved together into tight abutment with each other to clamp the detonator housing mouth between the jaws by means of the segments, the segments moving radially inwardly towards the ring axis to crimp the mouth of the detonator housing around the initiating element.

[0018] The invention accordingly extends to a method of crimping the mouth of a metal detonator housing around an initiating element, the method including the steps of:

[0019] moving a succession of detonator housing in series intermittently along a path extending between a pair of opposed jaws, the detonator housings being in turn located in a stationary condition between the jaws; and

[0020] moving the jaws into abutment with each other to grip a mouth of the stationary detonator housing located therebetween by means of toothed segments mounted on the jaws which, when the jaws are tightly in abutment with each other, form a segmented ring defining, at its centre, a passage having a toothed circumferential outline,

[0021] the segments being arranged simultaneously to move radially inwards towards and into contact with the mouth of the housing located between the jaws as the jaws approach each other, to crimp the housing against the initiating element by the time the jaws are in tight abutment with each other, the detonator housing being coaxially aligned with the axis of the ring and the detonator housings being moved in succession, while the jaws are spaced apart, in a direction perpendicular to the ring axis, the jaws being moved apart after the mouth of each detonator housing has been crimped, to allow the succeeding detonator housing to be moved into its stationary condition between the jaws, before the jaws are again moved together to crimp the mouth of said succeeding detonator housing.

[0022] In accordance with the method, moving the jaws into abutment may be against a bias which acts to space the segments apart from one another and to space the segments radially outwardly, automatically to enlarge the ring, as the jaws move apart.

[0023] It is a feature of the invention that it allows the series of detonator housings intermittently to be moved, typically in a straight line, along a path extending between the jaws and perpendicular to the ring axis, while the jaws are reciprocated in synchronisation with the intermittent movement of the detonator housings, between a tightly abutting condition with their segments located around a crimped detonator housing mouth, and a condition spaced apart to allow subsequent movement of the detonators along the path, thereby permitting low crimping cycle times, as short as about 2 s or less, for the crimping of each detonator housing mouth.

[0024] The invention will now be described, by way of non-limiting illustrative examples, with reference to the accompanying diagrammatic drawings, in which:

[0025] FIG. **1** shows a sectional plan view of a device in accordance with a first embodiment of the invention, in a direction parallel to the axis of its ring of segments, with its jaws spaced apart;

[0026] FIG. **2** shows a view corresponding to FIG. **1**, with the jaws tightly in abutment; and

[0027] FIG. **3** shows an exploded three-dimensional view from the bottom and side, of a device in accordance with a second embodiment of the invention.

[0028] Referring to FIGS. **1** and **2**, reference numeral **10** generally designates a device in accordance with a first embodiment of the invention for crimping the mouth of a metal detonator housing (not shown). The device **10** comprises, broadly, a pair of opposed elongate-rectangular hardened mild steel jaws **12**, **14**, having a length of 120 mm, a width of 40 mm and a thickness of 20 mm. The jaws thus have 120×40 mm^2 major faces, 120×20 mm^2 side edge faces designated **16**, and 40×10 mm^2 end edge faces designated **18**. In the drawings, the jaws **12**, **14** are viewed face-on to their major faces and are shown with their major faces co-planar, one face **16** of the jaw **12** being opposed to one face **16** of the jaw **14**, the opposed faces **16** being shown tightly in abutment at **20** in FIG. **2**, and spaced apart by a spacing "S" in FIG. **1**.

[0029] In the present example, the jaws **12**, **14** are reciprocably mounted on a hydraulic reciprocating mechanism (not shown) arranged to reciprocate them simultaneously between a closed condition, shown in FIG. **2**, and a fully open condition in which they are spaced apart sufficiently to allow a series of detonator housings to be crimped to pass between the jaws in a direction parallel to their edge faces **16**. The direction of reciprocation is normal to the faces **16** and is shown by arrow **22**, and the direction of movement of the detonator housings is shown by arrow **24**.

[0030] It is to be noted that in FIG. **1** the jaws **12**, **14** are not shown fully spaced apart, but only partly spaced apart, the jaws in their fully spaced-apart condition permitting a succession of detonator housings to pass therebetween in the direction of arrow **24**, midway between their opposed side edge faces **16**, without being interfered with by the guide pin **26** (described hereunder) provided on the jaw **12**. In other examples, the jaws may be movable by a pneumatic reciprocating mechanism or by a mechanical reciprocating mechanism such as a crank; and it will be appreciated that in other examples only one of the jaws **12**, **14** need reciprocate, the other being stationary.

[0031] In the present example, the detonator housings are carried past the jaws **12**, **14** by a conveyor mechanism (not

shown) situated below the jaws **12**, **14**, the edge faces **16**, **18** being vertical and the major faces being horizontal, with the detonator housings projecting upwardly from the conveyor mechanism to present their mouths at a desired elevation between the opposed side edge faces **16**. The conveyor mechanism moves a succession of detonator housings intermittently in the direction of arrow **24** when the jaws **12**, **14** are sufficiently spaced apart, and holds the detonator housings stationary at other times. Only one detonator housing at a time will be located between the opposed jaw faces **16**, the spacing between, and/or speed of movement in the direction of arrow **24** of, succeeding detonator housings moved by the conveyor mechanism being selected accordingly; and the movement of the detonator housings in the direction of arrow **24** will be appropriately synchronised with the reciprocation of the jaws **12**, **14** so that the detonator housings are moved in the direction of arrow **24** only when the jaws **12**, **14** are sufficiently spaced apart, and are held stationary at other times, particularly when interference with detonator housing movement by the pin **26** arising from too close a spacing between the jaws **12**, **14** is possible.

[0032] As shown in the drawings, the pin **26** is held captive in a passage **28** in the jaw **12**, by a screw **30** which screws axially into the inner end of the pin **26** and engages with a tapped extension **32** of the passage **28**. The jaw **14** is in turn provided with a passage **34** which receives the part of the pin **26** which projects from the jaw **12**, when the jaws **12**, **14** are sufficiently closely spaced from each other, to guide accurate movement of the jaws into face-to-face abutment of their side edge faces **16**.

[0033] Each jaw **12**, **14** is provided, in its side edge face **16** which faces the other jaw, with a semi-regular-hexagonal indentation **36** (see FIG. **1** in particular) which is broadly C-shaped and provides three abutment faces **38**, namely a central abutment face and a pair of lateral abutment faces respectively on opposite sides of the central abutment face. The faces **38** are flat and are directed radially inwardly towards the axis **40** of the hexagon of which they form part. Each of the lateral abutment faces **38** is provided with a slot **42**. Each slot **42** is located midway between the major faces of the associated jaw **12**, **14** and extends in a tangential direction relative to the associated axis **40**. Each central abutment face is provided with a centrally positioned passage **44** which receives a sleeve **46** as described hereunder (see FIG. **2**).

[0034] Three hardened mild steel segments **48** are provided in each indentation **36**, namely a central segment and a pair of lateral segments on opposite sides of the central segment. Each segment **48**, when viewed in a direction parallel to the axes **40**, is broadly equilateral-triangular in outline, having a broad end **49** which is radially outermost, for abutment against an associated abutment face **38**, a pair of side faces **51** for abutment against adjacent segments **48**, and a toothed inner narrow end **53**, having teeth which extend parallel to the axes **40**, the abutment in question taking place when the jaws **12**, **14** are in abutment, as shown in FIG. **2**. The broad ends **49** of the lateral segments **48** remain at all times, however, in abutment with the lateral abutment faces **38** having the slots **42**.

[0035] Each of the lateral segments **48** has an insert **50** screwed into a tapped socket in the broad end **49** of the segment **48**, the insert **50** providing a projection which projects radially outwardly, relative to the associated axis **40**, from the broad end of the segment **48**, into the associated slot **42** in the associated abutment face **38**. Location of this projection in the associated slot **42** holds the lateral segments **48** captive in the associated indentation **36**, the lateral segments in turn holding the respective central segments **48** captive in said indentations **36**. One side face of each segment **48** is provided with a part-cylindrical cavity **52** which holds a cylindrical rubber biassing element in the form of a cylindrical block **54** press-fitted into the cavity **52**.

[0036] As shown in FIG. **1**, each sleeve **46** contains a coil spring **56** under compression, each sleeve **46** projecting into a socket **58** provided therefor in the central segment **48** associated with the central abutment face **38** having the passage **44** receiving said sleeve **46**. Each sleeve **46** thus projects from the socket **58** in the associated central segment **58**, into the associated passage **44** in the associated abutment face **38**, being a press fit in the socket **58**, but being slidable in the passage **44**. The coil spring **56** acts against segment **48** at the inner end of the socket **58**, and against a plug **60** held in an extension of the passage **44** by a grub screw **62**. The springs **56** are omitted from FIG. **2** for ease of illustration.

[0037] Two plastics cover plates are provided to cover the major faces respectively of each jaw **12**, **14**. Minor projections of the lower cover plate can be seen in FIG. **1** at **64**. The cover plates are bolted to the jaws **12**, **14** by bolts **66** provided with washers **68**, the positions of the bolts **66** and washers **68** being illustrated schematically. The cover plates act to enclose the segments **48** to prevent unwanted movement of the rubber blocks **54** and the segments **48** in the direction of axes **40**, while protecting against the ingress of dirt.

[0038] It will be appreciated that, when the opposed faces **16** of jaws **12**, **14** are in tight abutment at **20** as shown in FIG. **2**, the broad end **49** of each central segment **48** abuts its associated abutment face **38**, the side faces **51** of adjacent pairs of the segments **48** all being in abutment and the rubber blocks **54** all being under lateral compression and forced laterally into their respective cavities **52**. The axes **40** will coincide and the segments **48** will form a segmented ring around a central axis, also designated **40** in FIG. **2**, provided by the coinciding axes **40** of FIG. **1**. When the opposed abutting faces **16** of the jaws **12**, **14** move apart, the springs **56** push the central segments away from their respective abutment faces **38**, and the rubber blocks **54** push adjacent pairs of segments **48** apart, as shown in FIG. **1**. It will be appreciated that, in FIG. **2**, the ring of toothed radially inner narrow ends **53** of the segments **48** combine to form a central passage around the central axis **40**, their teeth being parallel to said axis **40**.

[0039] In use, as mentioned above, the conveyor mechanism, when the jaws **12**, **14** are sufficiently spaced apart, successively and intermittently moves the detonator housings into position, in the direction of arrow **24**, to place them at the position of the central axis **40** shown in FIG. **2**, with the projections of the inserts **50** being located at the ends of their respective slots **42** which are closest to the opposed edge faces **16** of the jaws **12**, **14**, and with the rubber blocks **54** spacing the side faces of the segments **48** apart. When the jaws are moved together, with the detonating housing held stationary and coaxial with the central axis **40**, engagement of the lateral segments **48** of the jaw **12** with the lateral segments **48** of the jaw **14**, via the two rubber blocks projecting into the space "S" between the jaws **12**, **14**, compresses the various rubber blocks **54** and forces them into the associated cavities **52**, while bringing the side faces of the segments **48** into abutment. Simultaneously therewith, the springs **56** are compressed to bring the broad ends of the central segments **48** into

abutment with their associated abutment faces **38**; and the lateral segments **48** slide along their respective abutment faces **38** until the projections of their inserts **50** are at the ends of their associated slots **42** furthest from the opposed faces **16** of the jaws **12**, **14**, at which stage the situation shown in FIG. **2** is reached, with the opposed faces **16** in abutment.

[0040] It will be appreciated that, as the jaws **12**, **14** move together, as described above, the toothed radially inner narrow ends of the segments **48** converge axially inwardly towards the axis **40** and towards one another, until they form the substantially circular central passage shown around the central axis **40** in FIG. **2**. When they reach the mouth of the detonator housing located coaxially with the central axis **40**, said toothed radially inner ends act to crimp the mouth of the housing around the initiating element (and any sleeve or ferrule holding the initiating element) projecting in the housing. When the jaws **12**, **14** are subsequently moved apart, the rubber blocks **54** act automatically to space the side faces of the segments **48** apart in each jaw **12**, **14**, while the springs **56** automatically move the central segments **48** away from their respective abutment faces **38**, the projections of the inserts **50** of the lateral segments **48** moving back to the ends of the associated slots **42** closest to the opposed faces **16** of the jaws **12**, **14**, the outer ends of the lateral segments **48** sliding along their respective abutment faces **38**.

[0041] Referring to FIG. **3**, reference numeral **100** generally designates a device in accordance with a second embodiment of the invention, for crimping the mouth of a metal detonator housing (not shown).

[0042] Parts of the device **100** which are the same as, or similar to, those of the device **10** of FIGS. **1** and **2**, are indicated with the same reference numerals.

[0043] In the device **100**, the pin **26** in the jaw **12** and the complementary passage **34** in the jaw **14**, have been dispensed with.

[0044] The device **100** includes upper cover plates **102**, **104** and lower cover plates **106**, **108**. Bolts **66** protrude inwardly from the lower cover plates **104**, **108**, through passages **110** in the jaws **12**, **14**, and engage threaded sleeves **112** protruding inwardly from the upper cover plates **102**, **104**.

[0045] The device **100** also includes a guide pin **114** protruding from each of the segments **48**, with each guide pin nestling or located movingly in a guide slot **116** provided in one of the lower cover plates **106**, **108**. The guide pins **114** and guide slots **116** ensure accurate and consistent movement of the segments **48**.

[0046] It is a feature of the invention that the simple reciprocating movement of the jaws **12**, **14** (arrow **22**), and the simple intermittent movement of the detonator housings along their path between the jaws **12**, **14** (arrow **24**) allow rapid cycle times for the crimping of individual detonator housing mouths, expected to be of the order of 2 s or less.

[0047] Finally, it is to be noted that, although in the examples shown in the drawings the detonators are described as moving in the direction of arrow **24**, in other examples they can move in a direction perpendicular or normal to the direction of arrow **24**, and parallel to the direction of arrow **22**. In this case the jaws **12**, **14** will not only be reciprocated towards and away from each other in the direction of arrow **22**, but will also be indexed simultaneously in a direction parallel to the direction of arrow **24** into crimping stations in which they can reciprocate towards and away from each other, and out of said crimping stations in a direction parallel to the direction of arrow **24**, to allow subsequent movement of the series of detonators, in a direction parallel to the direction of arrow **22**.

1. A device for crimping the mouth of a metal detonator housing around an initiating element protruding into the housing through the mouth, the device comprising a pair of opposed jaws, at least one which is movable relative to the other and is reciprocally mounted so that at least one of the jaws is reciprocally movable alternately towards and away from the other jaw to successively bring the jaws tightly into contact with each other and then to space the jaws apart from each other each jaw being provided with three toothed segments arranged side-by-side in series on each jaw, all of the segments being movable and being in the form of movable inserts located in a single cavity provided in each jaw for receiving the inserts, each segment having a pair of side faces whereby the segment abuts an adjacent segment when the jaws are tightly in contact with each other so that the segments of the jaws together form a segmented ring, the side faces of each segment converging from a broad radially outer end of the segment towards a toothed radially inner narrow end of the segment, each segment thereby having a tapering shape when viewed in a direction parallel to the axis of the ring, with the teeth of each segment being parallel to said axis;

a resiliently stressable biasing element provided between each adjacent pair of segments in a jaw, the biasing element acting to space the segments of the pair apart when the jaws are spaced apart from each other and acting to permit the segments, in response to movement of the moveable segments arising from the closing of the jaws, to abut against one another in series when the jaws are tightly in contact with each another, to form the segmented ring, the ring defining, at its centre, a passage having a toothed cross-sectional outline provided by the toothed narrow ends of the segments for holding a crimped mouth of a detonator, the mouth having been crimped by the toothed inner ends of the segments in response to radially inward movement of the segments caused by the tight closing of the jaws.

2. The device according to claim **1**, wherein each cavity provides one or more abutment faces for abutting respectively against the broad ends of the movable segments.

3. The device according to claim **2**, wherein the abutment faces are flat and wherein the broad ends of the movable segments have radially outwardly facing surfaces which are also flat.

4. The device according to claim **2**, wherein a radial projection projects radially outwardly from the outer surface of the broad end of the segment into a tangential slot provided in the associated abutment face of the cavity.

5. The device according to claim **1**, wherein each biasing element is an elastomeric block which is held captive in a cavity in the side face of one of the segments of the pair of segments between which it acts.

6. The device according to claim **5**, wherein each elastomeric block projects tangentially outwardly from its cavity relative to the axis of the ring when the jaws are spaced apart from each other, thereby acting to space apart the segments of the pair, and is compressed and forced into its associated cavity by the side face of the other segment of the pair when the jaws are tightly in contact with each other.

7. The device according to claim **5**, wherein each elastomeric block is cylindrical in shape, being located in a correspondingly part-cylindrical cavity having an axis which is parallel to the axis of the ring.

8. The device according to claim **1**, wherein each jaw comprises an elongated rectangular flattened bar, the bar being longer than it is wide and wider than it is thick so that it has a pair of major faces spanning the length and width of the bar; a pair of side edge faces spanning the length and thickness of the bar; and a pair of end edge faces spanning the width and thickness of the bar, the bars abutting against each other by means of a pair of opposed side edge faces thereof, when the jaws are in the tightly closed condition.

9. The device according to claim **8**, wherein the cavities holding the respective series of segments are semi-regular-polygonal indentations in the respective opposed side edge faces of the bars and extend from one major face of the bar to the other.

10. The device according to claim **9**, wherein the axes of the semi-regular-polygonal indentations are parallel to the axis of the ring.

11. The device according to claim **8**, wherein a cover plate encloses the major face of each bar and acts to hold the segments and biasing elements in place against axial movement thereof in a direction parallel to the direction of the ring axis.

12. The device according to claim **11**, which includes a guide pin protruding from each of the segments, with a complementary guide slot in which each of the guide pins is movingly located, being provided in the cover plate.

13. The device according to claim **8**, wherein the jaws are provided respectively on their side edge faces which abut when the jaws are tightly in abutment, with a guide pin and an opposed tubular guide socket, the pin entering the socket when the jaws approach each other and leaving the socket when the spacing between the jaws is increased sufficiently, as the jaws leave each other.

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