Sept. 2, 1958 C. I. CLAUSING 2,850,596

SINGLE SOLENOID FOR OPERATING A SERIES CONNECTED CIRCUIT BREAKER AND DISCONNECT SWITCH

Filed May 9, 1955 3 Sheets-Sheet 1

FIG. 6.

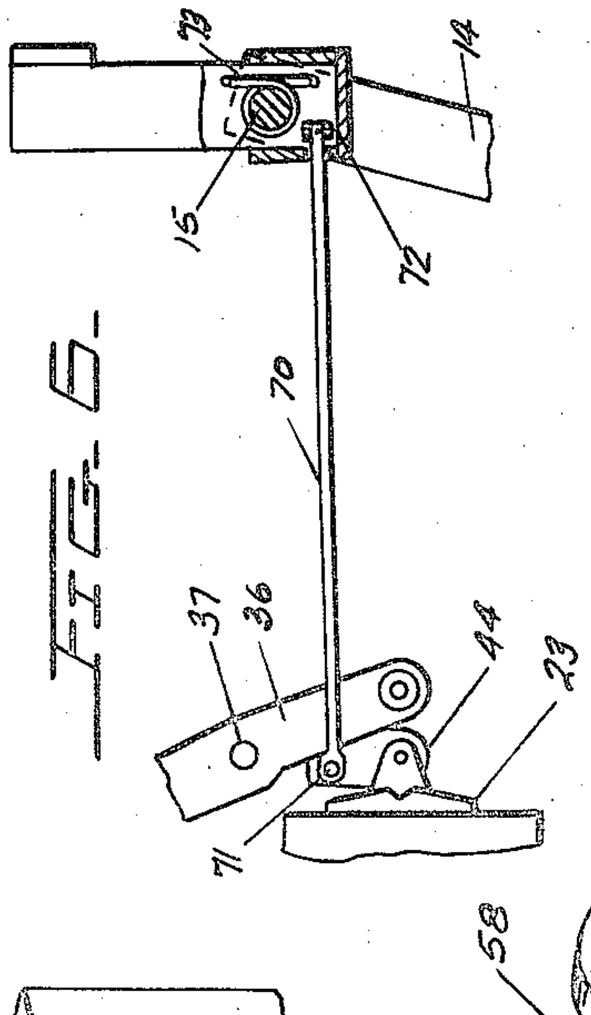

FIG. 7.

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Filed May 9, 1955 3 Sheets-Sheet 2

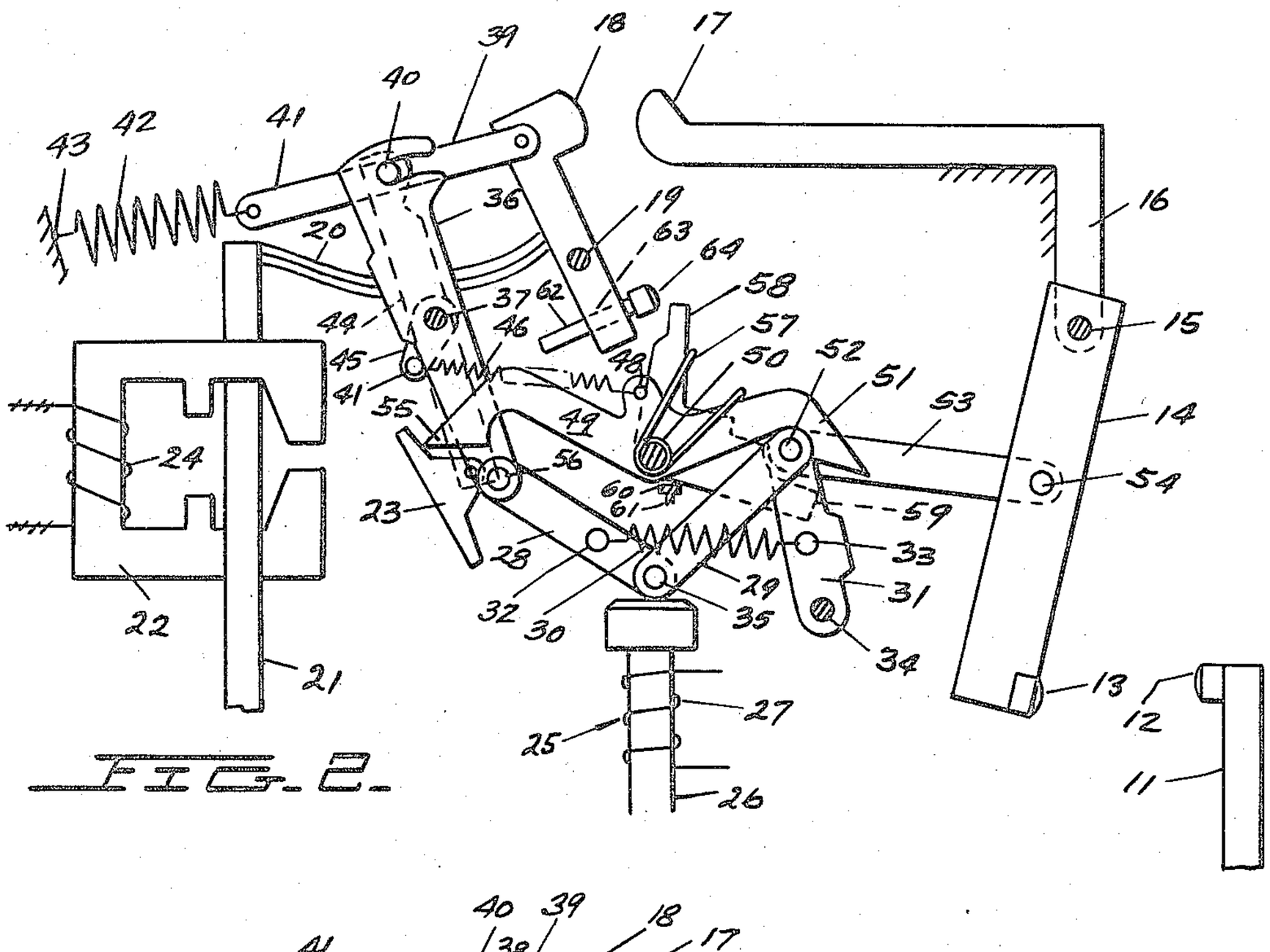

FIG. 2

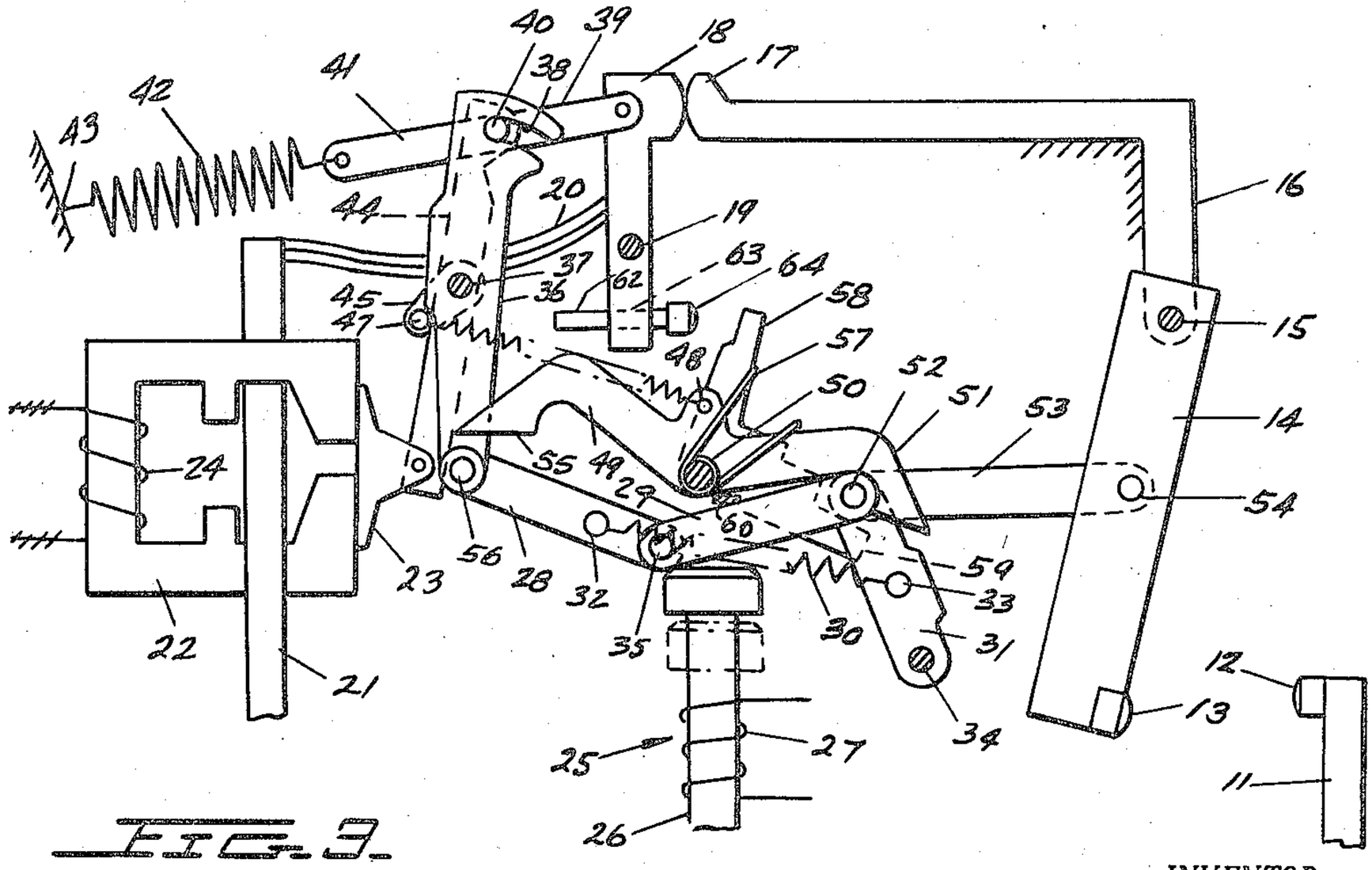

FIG. 3

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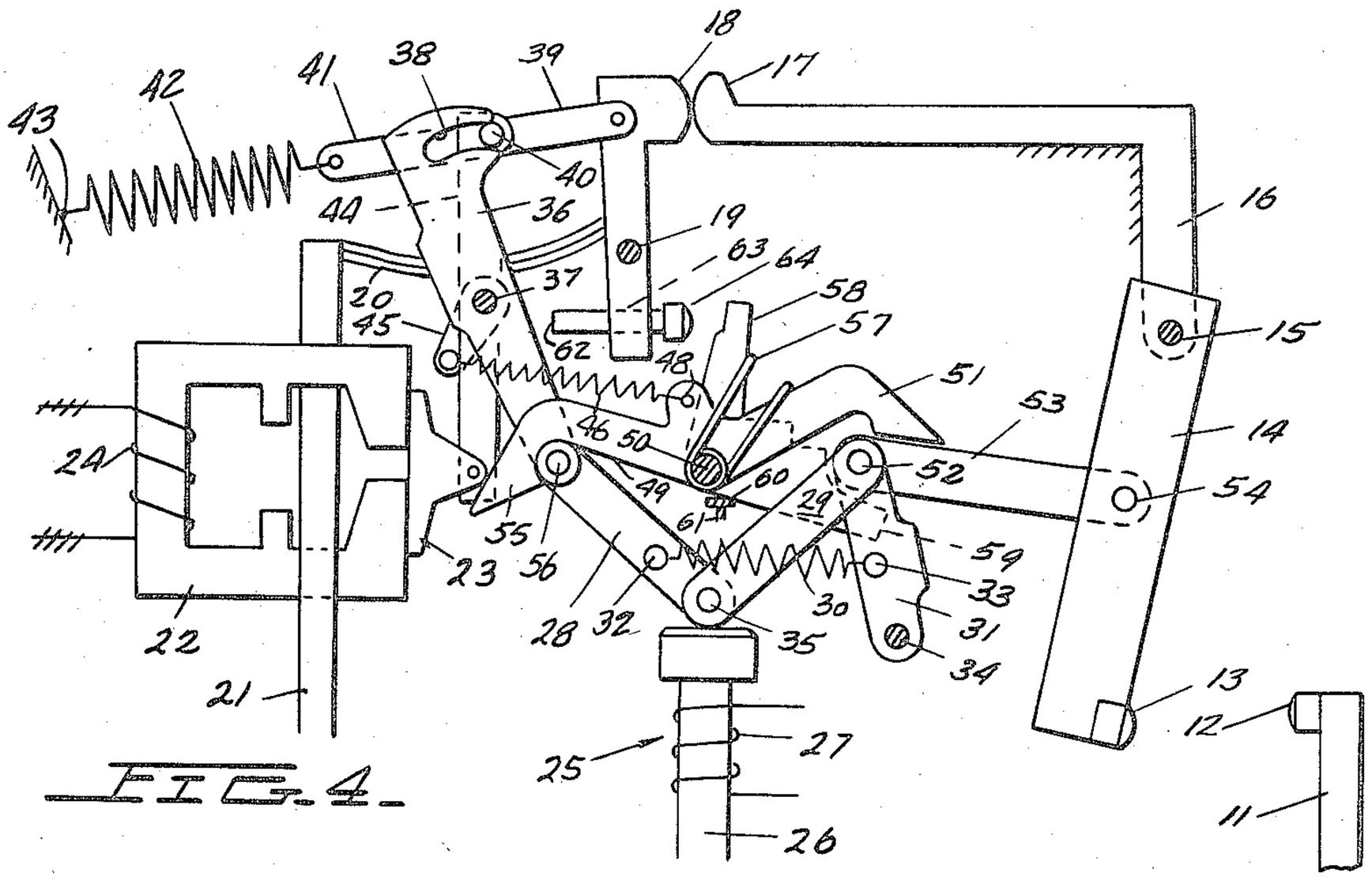

FIG. 4

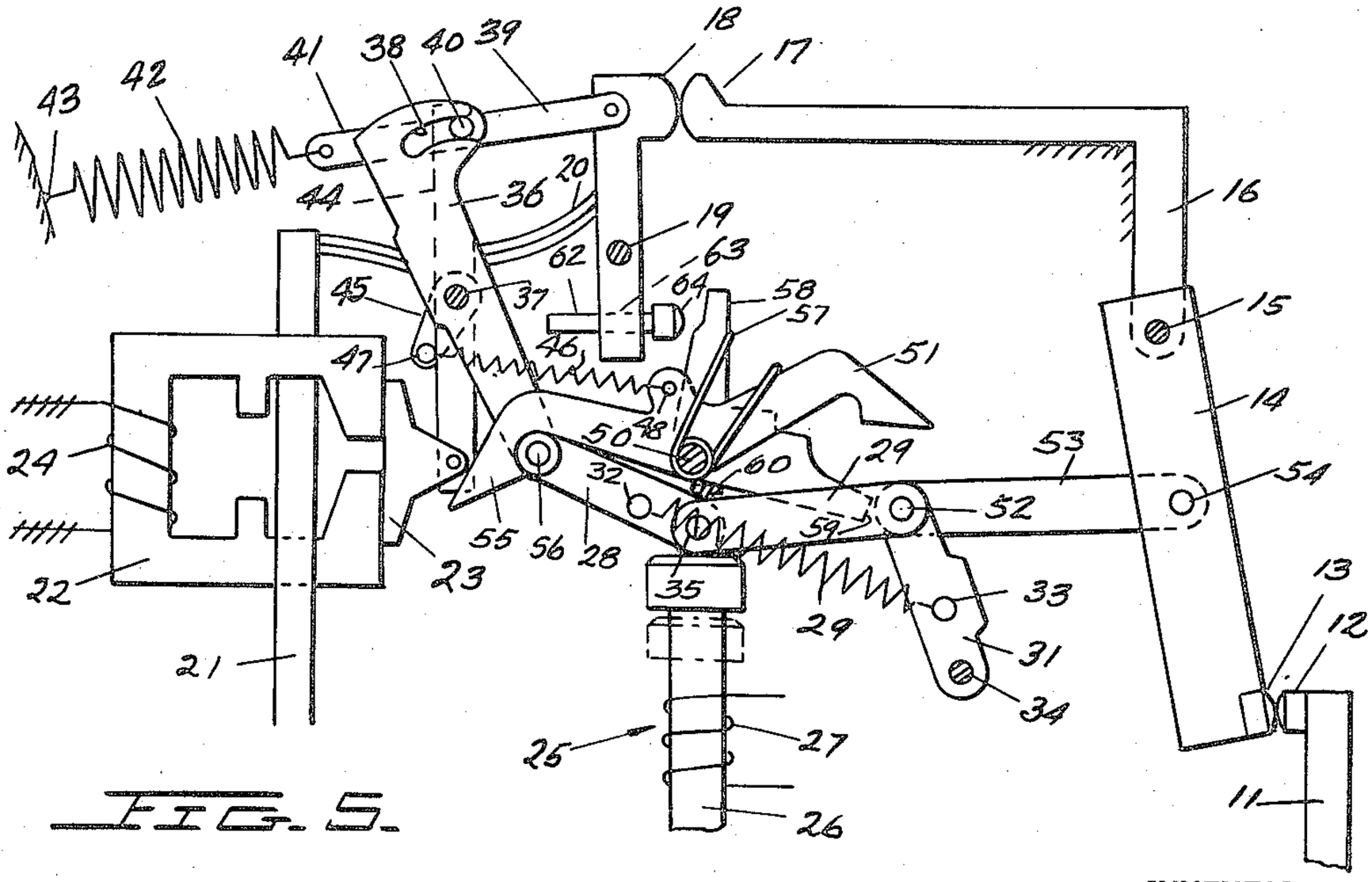

FIG. 5

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Patented Sept. 2, 1958

2,850,596

SINGLE SOLENOID FOR OPERATING A SERIES CONNECTED CIRCUIT BREAKER AND DISCONNECT SWITCH

Challiss I. Clausing, Collingswood, N. J., assignor to I-T-E Circuit Breaker Company, Philadelphia, Pa., a corporation of Pennsylvania

Application May 9, 1955, Serial No. 507,059

12 Claims. (Cl. 200—106)

My invention relates to a single operating means to operate a series connection of a circuit breaker and a disconnect switch, and more specifically, to a single solenoid and operating mechanism to operate a load interrupting device which exhibits trip free operation and comprises the series connection of a disconnect switch and a circuit breaker which does not have trip free characteristics.

The operating mechanism of my invention is first connected to the circuit breaker to engage the contacts thereof, and is then disconnected from the circuit breaker, and connected to engage the disconnect switch contacts. Since the operating mechanism is now disconnected from the circuit breaker, trip free operation will result if the disconnect switch is closed on a circuit fault.

Therefore, by providing the above series connection wherein the circuit breaker is used to interrupt the line which is being protected and the disconnect switch is used to initiate circuit energization after the circuit breaker contacts have engaged, trip free results will be preserved since the circuit breaker contacts will immediately disengage if the disconnect switch is closed under fault conditions in the circuit. This system can be specifically applied to high speed circuit interrupting devices wherein maintenance is decreased with the elimination of a complicated trip free mechanism.

As well as decreasing maintenance, this type system also increases reliability of the system interrupting device. By now providing this combination with my novel single solenoid and operating mechanism for operation of both the circuit breaker and disconnect switch, I provide further economy and saving of space without sacrificing efficiency of operation of the combination.

The novel single operating means of my invention will, as is shown hereinafter, perform two functions: the first function is to close the non-trip free circuit breaker contact and its second function is to close the disconnect switch to thereby complete energization of the circuit being protected. Furthermore, I interlock these two solenoid operations both mechanically and electrically so that they must occur in the proper sequence. The above mentioned interlocks will also operate to prevent the disconnect switch from being opened until the circuit breaker contacts have disengaged.

Although the embodiment shown hereinafter in the description of my invention is a high speed anode breaker utilizing a magnetic latch of the type described in Patent No. 2,412,247, assigned to the assignee of the instant application, it will be apparent that my system can be applied to any circuit interrupting device having a circuit breaker which can have non-trip free characteristics in series with a disconnect switch.

Accordingly, a main object of my invention is to provide a single operating means to operate both a non-trip free circuit breaker and series connected disconnect switch and allow trip free operation to result by disconnecting the operating means from the circuit breaker before the disconnect switch is closed to complete a circuit.

Another object of my invention is to energize the contacts of a series connection of a circuit breaker and disconnect switch from a single solenoid or similar operating means.

Still another object of my invention is to provide an energizing means and operating mechanism to energize the operation of a combination of a disconnect switch and circuit breaker having a non-trip free mechanism according to a predetermined sequence.

A further object of my invention is to provide a single operating means which is so interlocked both mechanically and electrically that said single operating means will first close the contacts of a circuit breaker and secondly close the contacts of a disconnect switch under any conditions.

Still another object of my invention is to provide an operating means which is so interlocked both mechanically and electrically that said single operating means will maintain the disconnect switch contacts closed until the circuit breaker contacts are disengaged.

Still a further object of my invention is to provide a single energizing means and mechanism for sequentially connecting an operating mechanism to a pair of circuit breaker contacts and to a disconnect switch contact.

A still further object of my invention is to provide a single solenoid to energize the operation of a series connected circuit breaker and disconnect switch to thereby provide small and economical operation means.

These and other objects of my invention will become apparent from the following description when taken in connection with the figures in which:

Figure 1 shows the preferred embodiment of my invention in an exploded perspective view.

Figure 2 shows the embodiment of Figure 1 of my invention as applied to a series connected circuit breaker and disconnect switch wherein both the circuit breaker contacts and the disconnect switch contacts are disengaged.

Figure 3 is similar to Figure 2 and shows the position of the linkages after the solenoid has been energized to engage the circuit breaker cooperating contacts.

Figure 4 is similar to Figure 3 and shows the linkage position after deenergization of the solenoid and prior to a second energization which will close the disconnect switch contacts to complete circuit energization.

Figure 5 is similar to Figure 4 after the single operating solenoid has been energized to engage the disconnect switch contacts.

Figure 6 shows a latching system which will prevent disengagement of the disconnect switch until the circuit breaker contacts disengage.

It should be noted that in each of the figures, the means to maintain the circuit breaker cooperating contacts in the engaged position is a magnetic type latch shown in the above mentioned Patent No. 2,412,247 and that the interrupting device of these figures would be preferably applied to a D. C. circuit. It will, however, be obvious that this magnetic latch can be replaced by any other type to thereby allow my system to have universal application to devices having series connected disconnect switches and circuit breaker.

Referring now to each of the above mentioned figures, the circuit interrupting device shown therein comprises a current path which contains a first terminal **11**, the fixed disconnect switch contact **12**, a movable disconnect switch contact **13** which cooperates with the fixed contact **12**, and the disconnect switch blade **14** which is pivoted at a fixed pivot **15**. Fixed pivot **15** is also a current carrying pivot which will allow current to pass from the disconnect switch blade **14** to a current conductor **16**. Current conductor **16** is then attached to a fixed contact **17** of a circuit breaker. The movable contact **18** of the circuit

breaker has a fixed pivot **19** and a current carrying jumper **20**. Current carrying jumper **20** is then attached to a second terminal **21** of the circuit interrupting device. The current path therefore comprises **11**, **12**, **13**, **14**, **15**, **16**, **17**, **18**, **20** and **21**.

The second terminal **21** is shown as passing through a magnetic structure **22** which cooperates with armature **23** to form a magnetic latch. Magnetic structure **22** is also shown as having an energizing winding **24** for initiating energization of the magnetic latch. That is, when the magnetic latch is energized, armature **23** will be firmly seated on the surface of the magnetic structure **22** as is shown in Figure 3.

The sequential engagement of the circuit breaker contacts **17** and **18** and the disconnect switch contacts **12** and **13** is initiated through the novel arrangement which comprises a single solenoid **25** which has a plunger **26** and an energizing winding **27**. A toggle comprising toggle arm **28** and toggle arm **29** is then biased into engagement with the solenoid plunger by means of a biasing spring **30** which is shown as being attached between toggle arm **28** and the link **31** at points **32** and **33** respectively. Link **31** is further shown as being pivotally connected at pivot point **34**. The toggle arms **28** and **29** are pivotally connected at the pivot point **35** and their outer extremities are then fastened to other linkages for subsequent operation of the circuit breaker contacts **17** and **18** or the disconnect switch contacts **12** and **13**. The outer extremity of toggle arm **28** is shown as being pivotally attached to a closing arm **36**.

As shown more specifically in the exploded perspective view of Figure 1, closing arm **36** is pivotally connected at a fixed pivot **37** and has a jaw at its outer extremity **38** which cooperates with a contact link **39** at pin **40** which subsequently drives the circuit breaker movable contact **18** about the pivot point **19**. A second contact link **41** is also attached to contact link **39** at the pivot point **40** and the link **41** is then attached to the main opening spring **42** of the circuit breaker. Main opening spring **42** is then fixed at one end at the point **43**.

A walking beam **44** is also pivoted at the pivot point **37** and carries the armature **23** of the magnetic latch at one end and has the other end formed to cooperate with pin **40** of contact link **39**. Hence when walking beam **44** is pivoted about point **37** and armature **23** is latched to the magnetic structure **22**, the walking beam will latch contacts **17** and **18** in the engaged position through contact link **39** and pin **40**. As further shown in Figure 1, swinging link **45** is also pivotally connected at pivot **37**. The other extremity of swinging link **45** is fastened to a biasing spring **46** at pin **47**. Pin **47** is extended in such a manner as to be maintained against the side of the walking beam **44**.

Biasing spring **46** has its second end fastened at point **48** of the hook latch **49**. Hook latch **49** is then pivotally connected at a fixed pivot **50** and is so constructed that the extremity **51** of hook latch **49** can engage pin **52** which also pivotally connects toggle link **29**, link **31**, and link **53**. Link **53**, as will be shown, is used to drive the disconnect switch contacts **12** and **13** to their engaged position.

It should be noted that link **53** is pivotally connected to disconnect switch blade **14** at pivot point **54**. The extremity **55** of hook latch **49** is also constructed to pivot about the fixed pivot **50** in such a manner as to engage pin **56** which pivotally connects the toggle link **28** and closing arm **36**.

Still another biasing spring **57** is shown as being fastened at fixed pivot point **50** and having its extremities end at the hook latch **49** and the right hand side of prop latch **58**.

It should be noted that the prop latch **58** which is pivotally supported at the fixed pivot **50** as is shown more specifically in the exploded perspective view of Figure 1 has an extremity **59** which, when the disconnect switch contacts **12** and **13** are in the engaged position, will be

rotated to lock the disconnect switch in the closed position at the pivot point **52**. This condition is shown more clearly in Figure 5.

A small switch **60** is then shown as being fixed in a position such that the switch **60** will be operated at a plunger **61** when the solenoid plunger **26** is in the position of Figure 4. That is, whenever the solenoid is energized, switch **60** will be activated after the plunger **61** is struck by the toggle arm **29**. Switch **60** is in turn electrically connected by a connection which is not shown to deenergize coil **27** of the solenoid **25** when it is activated by toggle arm **29**. Switch **60** therefore resets the toggle arms **28** and **29** after the solenoid is energized.

Whenever the circuit breaker contacts **17** and **19** are opened in response to fault conditions or under normal load operation, walking beam **44** will rotate about the fixed pivot **37** in such a manner as to strike the pin **62** which is shown as residing in slot **63** of the movable contact **18** of the circuit breaker. The head **64** of pin **62** will then strike prop latch **58** to thereby allow the opening of disconnect switch contacts **12** and **13**.

Although pin **62** is shown mounted in the movable contact arm **18**, it should be noted that it could be mounted in a fixed support to thereby allow a stronger hammer blow to strike prop latch **58**.

It should be clearly noted that this operation ensures the opening of the circuit breaker contacts **17** and **18** before contacts **12** and **13** of the disconnect switch are disengaged. That is, when the circuit interrupting device shown in these figures is used for current interruption, it is the circuit breaker contact in combination with arc extinguishing means which are normally used in conjunction with circuit breakers that is responsible for the current interruption. Conversely, it is the disconnect switch contacts **12** and **13** that are responsible for completing the circuit only after the circuit breaker cooperating contacts **17** and **18** have engaged.

Clearly, if the disconnect switch contacts **12** and **13** are engaged while fault conditions exist on the protected line, the fault sensing elements of the circuit breaker will be activated to disengage the circuit breaker cooperating contacts **18** and **17**. This action then precludes the use of a trip free linkage in the circuit breaker since trip free results are obtained as shown above.

The operation of my novel single solenoid and linkage for the energization of both the circuit breaker contacts **17** and **18** and the disconnect switch contacts **12** and **13** is as follows and is in the sequence of Figures 2, 3, 4 and 5.

Figure 2 shows the position of the solenoid and linkages when the circuit breaker contacts **17** and **18** are disengaged and the disconnect switch contacts **12** and **13** are disengaged. In Figure 2, extremity **51** of hook latch **49** is shown as being engaged with the pin **52** and it is held in this engaged position by spring **57**. It is now desired to engage the contacts **17** and **18** of the circuit breaker to thereby position the linkages as shown in Figure 3. Hence the polarizing coil **24** of the magnetic latch and the energizing coil **27** of the single solenoid **25** are energized by an outside means which is not shown.

As shown in Figure 3, the solenoid plunger **26** will move upward to thereby straighten toggle arms **28** and **29**. Since toggle arm **29** is latched by hook latch **49** at the pin **52**, the toggle arm **28** will move to the left. The motion of toggle arm **28** will be imparted to the closing arm **36** through pin **56** and the closing arm **36** will drive the contacts **17** and **18** of the circuit breaker to the engaged position through the contact link **39** which engages jaw **38** of the closing arm **36** at the pin **40**. At the same time, the walking beam **44** will be rotated clockwise about pivot point **37** to thereby cause armature **23** to latch or seal against the magnetic structure **22** of the magnetic latch. This now is the position of the linkages as shown in Figure 3.

It should be noted in Figure 3 that pin **47** is pushed ahead of closing arm **36** in its clockwise rotation. There-

fore spring **46** which is fastened to hook latch **49** has been extended. At the end of the stroke of the solenoid plunger **26**, Figure 3 shows that toggle arm **29** has engaged plunger **61** of switch **60**. This action then deenergizes the electrical closing circuit and solenoid plunger **26** will drop back to the position shown in Figure 4. The biasing spring **30** will cause pivot point **35** to be maintained on the surface of solenoid plunger **26** and the toggle will also drop back to the position shown in Figure 4 to thereby reset toggle arms **28** and **29** as well as closing arm **36** which is connected to toggle arm **28** at the pivot **56**. That is, closing arm **36** will be rotated counterclockwise about pivot point **37** and the contacts **17** and **18** of the circuit breaker will be maintained engaged by the action of the magnetic latch in conjunction with the latched walking beam **44**.

Furthermore, as the toggle arms **28** and **29** reset, the energy stored in the spring **46** is sufficient to overcome spring **57** and hook latch **49** is rotated counterclockwise about pivot point **50**. As shown in Figure 4, hook latch **49** has finished its rotation about the fixed pivot **50** and extremity **55** has now latched over the pin **56** to thereby anchor the outer extremity of toggle arm **28**. Solenoid winding **27** can now be energized once again to thereby straighten toggle arms **28** and **29**. Since, however, the hook latch **49** is latched at pin **56**, the outer extremity of toggle arm **29** will move to the right, thereby rotating link **31** clockwise and driving link **53** through pivot point **52** to cause disconnect switch blade **14** to rotate about the fixed pivot **15** and to subsequently engage the disconnect switch contacts **12** and **13**. This is the position of the linkages and contacts as shown in Figure 5.

As soon as the disconnect switch contacts are in the engaged position, prop latch **58** can be rotated about its fixed pivot point **50** to bring extension **59** of the prop latch **58** to block pin **52** and thereby create a positive engaging latch for disconnect switch contacts **12** and **13**. Rotation of prop latch **58** into its blocking position will then cause energization of plunger **61** to the switch **60** by means which is not shown to thereby cut off energization of the closing coil **27** of the single solenoid **25**.

Prop latch **58** is shown as being in the blocking position in Figure 5 which shows the normal current carrying positions for the disconect switch and circuit breakers of the interrupting service. Assuming now that when the interrupting device achieves the condition shown in Figure 5, that a trip signal due to a fault current is received by the magnetic latch, it is clear that the magnetic structure **22** will be deenergized to thereby release armature **23** whereupon the powerful opening spring **42** will cause disengagement of the circuit breaker contacts **17** and **18**. Hence the fault is cleared under normal circuit breaker operating conditions whenever contact disengagement takes place.

During the interruption of the fault and near the end of the opening stroke of the movable contact **18**, the walking beam **44** which will be forced in a counterclockwise direction by the contact link **41** will move in such a manner as to strike pin **62** to thereby cause the head **64** of pin **62** to strike the prop latch **58** which will in turn cause rotation of the prop latch **58** about the fixed pivot **50** to thereby release pin **52**. The combined forces of the disconnect switch contact springs which are not shown and the toggle reset spring **30** will then open the disconnect switch and collapse the toggle.

It should be noted once again that the operation of my novel single solenoid and mechanism require both electrical and mechanical means so that the circuit breaker contacts **17** and **18** will open first, clear the arc and the disconnect switch contacts **12** and **13** will subsequently operate.

Torsion spring **57** will then operate to rotate hook latch **49** in a clockwise direction to thereby latch pin **52**. Therefore, under automatic operation of the circuit breaker, the linkages and solenoid will move from the position shown in Figure 5 to the starting position shown in Figure 2. It

is desirable, however, to maintain the contacts **17** and **18** of the circuit breaker in the closed position to thereby ensure a nearly permanent seal of armature **23** as a protective measure against dirt even though the disconnect switch contacts **12** and **13** are not closed to energize the protected circuit.

If desired, a final rotation of hook latch **49** could be achieved by means not shown herein to reenergize the solenoid coil **27**. By so doing, the above mentioned sequence of going from Figure 2 to Figure 4 will be automatically completed and the circuit breaker contacts **17** and **18** will remain in the engaged position as shown in Figure 4. Subsequent energization of coil **27** will then complete the sequence by causing engagement of disconnect switch contacts **12** and **13**.

To summarize the operation of my novel arrangements, the following is apparent:

(1) A closing mechanism is provided common to both the circuit breaker contacts **17**, **18** and the disconnect switch contacts **12**, **13**.

(2) A circuit breaker linkage such as closing arm **36** extends to the circuit breaker contacts and is controlled by the closing mechanism.

(3) A disconnect linkage such as link **53** extends to the disconnect switch contacts and is controlled by the closing mechanism.

(4) A disconnect latching mechanism such as hook latch end **51** and pin **52** render the disconnect linkage uncontrollable by the closing mechanism and the circuit breaker linkage operable in response to the closing mechanism which in turn is activated by an energizing means such as solenoid **25**.

(5) After the circuit breaker contacts are engaged, a circuit breaker latching means such as the magnetic latch **24** maintains the circuit breaker contacts **17**, **18** in the engaged position.

(6) A mechanism such as springs **46** and **57** which is controlled by the engagement of the circuit breaker contacts **17**, **18**, operates the disconnect latching mechanism out of engagement and a circuit breaker latching mechanism such as hook latch end **55** and pin **56** into engagement, thereby rendering the circuit breaker linkage uncontrollable by the closing mechanism, and rendering the disconnect linkage responsive to a further activation of the solenoid **26**.

(7) After the disconnect switch contacts **12**, **13** are engaged, a disconnect latching means securely latches the disconnect switch contacts **12**, **13** in the engaged position.

(8) When the circuit breaker fault responsive means senses a fault, the circuit breaker latching means will be unlatched to allow disengagement of the circuit breaker contacts.

(9) A disconnect trip mechanism such as plunger **62** and prop latch **58** is controlled by the disengagement of the circuit breaker contacts to permit release of the disconnect switch latching means and allow disengagement of the disconnect switch contacts.

It should be noted that a more positive latching can be provided to assure that the disconnect switch contacts **12**, **13** cannot be opened, even though the latch **58** is defeated, until circuit breaker contacts **17**, **18** are opened.

This type latching system is specifically shown in Figure 6 as a rod **70** which is pivotally supported between pin **71** on walking beam **44** and bearing **72** on disconnect switch blade **14**. A spring clutch **73** is then provided on pin **15** to allow blade **14** to slip in the counterclockwise direction for closing, but once closed, spring clutch **73** grips the pivot pin **15** to prevent opening of the disconnect switch. The closing force provided by slip clutch will be sufficient to maintain the disconnect switch closed if prop latch **58** should be defeated by some means other than the opening of the circuit breaker contacts. When the circuit breaker is opened, however, walking beam **44**

moves counterclockwise about pivot point 37 and the rod 70 will move to the right in bearing 72 to engage the lower end of the clutch spring 73. This unwinds the clutch spring to a point where the pin 15 is released and the disconnect switch blade 14 can move to the open position.

Although I have shown preferred embodiment of my novel invention, it will now be obvious that many modifications and variations may be made by those skilled in the art. I prefer to be limited, therefore, not by the specific description given herein, but only by the appended claims.

I claim:

1. In a circuit interrupting device comprising a circuit breaker and a disconnect switch; said circuit breaker having cooperating contacts and means operatively connected to said cooperating contacts to automatically disengage said cooperating contacts in response to predetermined conditions in the circuit protected by said circuit interrupting device; said disconnect switch comprising cooperating contacts; said disconnect switch cooperating contacts connected in series with said circuit breaker cooperating contacts; a single operating means operatively connected to said circuit breaker and to said disconnect switch for operating said circuit breaker cooperating contacts into engagement and subsequently said disconnect switch main contacts into engagement, locking mechanism operatively connectible to said circuit breaker and disconnect switch cooperating contacts to maintain said circuit breaker and disconnect switch cooperating contacts engaged when brought to their respective engaged positions.

2. In a circuit interrupting device comprising a circuit breaker and a disconnect switch; said circuit breaker having cooperating contacts, said disconnect switch having cooperating contacts; said disconnect switch cooperating contacts connected in series with said circuit breaker cooperating contacts; a single operating means operatively connected to said circuit breaker and said disconnect switch for operating said circuit breaker contacts into engagement and subsequently operating said disconnect switch main contact into engagement; and latching mechanism operatively connectible to said circuit breaker and disconnect switch cooperating contacts to maintain said circuit breaker and disconnect switch cooperating contacts engaged; means operatively connected to said circuit breaker cooperable contacts to automatically disengage said circuit breaker cooperating contacts in response to predetermined conditions in the circuit protected by said circuit interrupting device, and mechanism operatively connected to said disconnect switch cooperating contacts, said mechanism controlled by the disengagement of said circuit breaker contacts for operating said disconnect latching mechanism out of latching position to permit disengagement of said disconnect switch contacts.

3. In a circuit interrupting device comprising a circuit breaker and a disconnect switch; said circuit breaker having cooperating contacts, said disconnect switch having cooperating contacts; said disconnect switch cooperating contacts connected in series with said circuit breaker cooperating contacts; a single operating means operatively connected to said circuit breaker and said disconnect switch for operating said circuit breaker contacts into engagement and subsequently operating said disconnect switch main contact into engagement; and latching mechanism operatively connectible to said circuit breaker and disconnect switch cooperating contacts to maintain said circuit breaker and disconnect switch cooperating contacts engaged; means operatively connectible to said circuit breaker cooperating contacts to automatically disengage said circuit breaker cooperating contacts in response to predetermined conditions in the circuit protected by said circuit interrupting device, and mechanism operatively connectible to said disconnect

latching mechanism controlled by the disengagement of said circuit breaker contacts for operating said disconnect latching mechanism out of latching position to permit disengagement of said disconnect switch contacts, and mechanism operatively connectible to said circuit breaker contacts operative to engage said circuit breaker contacts after disengagement of said disconnect switch contacts.

4. In combination, a circuit breaker having cooperable contacts, latching means operatively connectible to said contacts for maintaining said contacts in engagement, fault responsive means operatively connected to said contacts for effecting disengagement of said contacts, disconnect contacts connectible in series with said circuit breaker contacts, a closing mechanism common to said circuit breaker contacts and said disconnect contacts operatively connectible to said contacts for operating said respective contacts to their respective contact engaged position; and interlock mechanism operatively connected to said circuit breaker and disconnect contact for operating said disconnect contacts to their engaged position only after said circuit breaker contacts have been previously operated to their engaged position.

5. In combination, a circuit breaker having cooperable contacts, latching means operatively connectible to said contacts for maintaining said contacts in engagement, fault responsive means operatively connectible to said contacts for effecting disengagement of said contacts, disconnect contacts connectible in series with said circuit breaker contacts, a closing mechanism common to said circuit breaker contacts and said disconnect contacts operatively connectible to said circuit breaker and disconnect contacts for operating said respective contacts to their respective contact engaged position; and interlock mechanism operatively connected to said circuit breaker and disconnect contacts for operating said disconnect contacts to their engaged position only after said circuit breaker contacts have been previously operated to their engaged position, and only after said closing mechanism has been disassociated from operating said circuit breaker contacts.

6. In combination, a circuit breaker having a pair of cooperable contacts, a disconnect switch having a pair of cooperable contacts, said circuit breaker and disconnect contacts being connected in series, a common operating mechanism for said circuit breaker and disconnect contacts operatively connectible to said circuit breaker and disconnect contacts, and energizable to operate said circuit breaker contacts into engagement, means responsive to the engagement of said circuit breaker contacts operatively connectible to said circuit breaker contacts for deenergizing said operating mechanism, said operating mechanism being reenergizable to operate said disconnect contacts into engagement; said operating mechanism being operatively disconnected from said disconnect switch when said circuit breaker contacts are disengaged.

7. In combination, a circuit breaker having a pair of cooperable contacts, a disconnect switch having a pair of cooperable contacts, said circuit breaker and disconnect contacts being connected in series, a common operating mechanism being operatively connectible to said circuit breaker and disconnect contacts in a predetermined sequence, and mechanism operatively connected to said circuit breaker and disconnect contacts for sequentially connecting said operating mechanism first to said circuit breaker contacts and thereafter to said disconnect contacts.

8. In combination, a circuit breaker having a pair of cooperable contacts, a disconnect switch having a pair of cooperable contacts, said circuit breaker and disconnect contacts being connected in series a common operating mechanism operatively connected to said circuit breaker and disconnect contacts in a predetermined sequence, and mechanism operatively connected to said disconnect contacts for preventing said operating mechanism from

becoming engaged with said disconnect contacts while said circuit breaker contacts are disengaged; said operating mechanism being operatively disconnected from said disconnect switch when said circuit breaker contacts are disengaged.

9. In a circuit interrupting device comprising a circuit breaker and a disconnect switch; said circuit breaker having cooperating contacts and means operatively connected to said cooperating contacts to automatically disengage said cooperating contacts in response to predetermined conditions in the circuit protected by said circuit interrupting device; said disconnect switch comprising cooperating contacts; said disconnect switch cooperating contacts connected in series with said circuit breaker cooperating contacts; latching mechanism operatively connectible to said disconnect switch contacts and circuit breaker contacts to latch said disconnect switch contacts and circuit breaker contacts engaged when brought to their respective engaged positions; a solenoid operatively connected to a connecting means; said connecting means comprising a toggle and a latch and latch biasing means; said toggle having a first end and second end operatively connected to said disconnect switch cooperating contacts and said circuit breaker cooperating contacts respectively, the breaking portion of said toggle biased to be engaged with said solenoid; said latch operatively connectible to said toggle and constructed to latch said first end and unlatch said second end of said toggle to allow engagement of said circuit breaker contacts responsive to a first energization of said solenoid and said latch biasing means constructed to position said latch to subsequently latch said second toggle end and unlatch said first toggle end to allow engagement of said disconnect switch cooperating contacts responsive to a second energization of said solenoid.

10. In a circuit protecting device comprising a series connection of circuit breaker cooperating contacts for circuit interruption and disconnect switch cooperating contacts for circuit initiation; an operating means operatively connectible to said circuit breaker contact and constructed to engage said circuit breaker cooperating contacts upon energization of said operating means; a prop latch operatively connectible to said disconnect switch cooperable contacts to maintain said disconnect switch cooperating contacts engaged when brought to its engaged position; said circuit breaker contacts to be maintained in the engaged position by a magnetic latch; said operating means constructed to subsequently engage said disconnect switch cooperating contacts to initiate the circuit protected by said circuit protecting device in response to a second energization of said operating means.

11. In combination, a circuit breaker having cooperable contacts operable to engaged and disengaged position, a disconnect having cooperable contacts operable to engaged and disengaged position and connectible in series with said circuit breaker controls, circuit breaker biasing means connected to said circuit breaker contacts for biasing said circuit breaker contacts toward disengaged position, disconnect biasing means connected to said disconnect contacts for biasing said disconnect contacts toward disengaged position, a common closing mechanism operatively connectible to said circuit breaker contacts and said disconnect contacts, a circuit breaker linkage controllable by said closing mechanism and extending to said circuit breaker contacts, a disconnect linkage controllable by said closing mechanism and extending to said disconnect contacts, disconnect latching mechanism engaging said disconnect linkage for simultaneously rendering said disconnect linkage uncontrollable by said closing mechanism and rendering said circuit breaker linkage operable to respond to the activation of said closing mechanism for operating said circuit breaker contacts into engagement, a circuit breaker latching means operatively connectible to said circuit breaker contacts operative following engagement of said circuit breaker contacts for latching said contacts in engagement, a circuit breaker latching mechanism operatively connectible to said circuit breaker linkage and controlled by the engagement of said circuit breaker contacts for operating said disconnect latching mechanism out of engagement with said disconnect linkage and operating said circuit breaker latching mechanism into engagement with said circuit breaker linkage for rendering said circuit breaker linkage uncontrollable by said closing mechanism and rendering said disconnect linkage responsive to the further activation of said closing mechanism for operating said disconnect contacts into engagement, a disconnect latching means operatively connectible to said disconnect contacts and operative following engagement of said disconnect contacts for latching said disconnect contacts into engagement, means operatively connected to said circuit breaker latch means responsive to a fault current for operating said circuit breaker latching means to permit disengagement of said circuit breaker contacts by said circuit breaker biasing means, and a disconnect trip mechanism operatively connectible to said disconnect contacts and controlled by the disengagement of said circuit breaker controls for releasing the disconnect contact latching means to permit disengagement of said disconnect contacts by said disconnect biasing means.

12. In combination, a circuit breaker having cooperable contacts operable to engaged and disengaged position, a disconnect having cooperable contacts operable to engaged and disengaged position and connectible in series with said circuit breaker controls, circuit breaker biasing means operatively connected to said circuit breaker contacts for biasing said circuit breaker contacts toward disengaged position, disconnect biasing means operatively connected to said disconnect contacts for biasing said disconnect contacts toward disengaged position, a common closing mechanism operatively connectible to said circuit breaker contacts and said disconnect contacts, a circuit breaker linkage controllable by said closing mechanism and extending to said circuit breaker contacts, a disconnect linkage controllable by said closing mechanism and extending to said disconnect contacts, disconnect latching mechanism engaging said disconnect linkage for simultaneously rendering said disconnect linkage uncontrollable by said closing mechanism and rendering said circuit breaker linkage operable to respond to the activation of said closing mechanism for operating said circuit breaker contacts into engagement, a circuit breaker latching means operatively connectible to said circuit breaker contacts and operative following engagement of said circuit breaker contacts for latching said contacts in engagement, a circuit breaker latching mechanism operatively connected to said disconnect linkage and controlled by the engagement of said circuit breaker contacts for operating said disconnect latching mechanism out of engagement with said disconnect linkage and operating said circuit breaker latching mechanism into engagement with said circuit breaker linkage for rendering said circuit breaker linkage uncontrollable by said closing mechanism and rendering said disconnect linkage responsive to the further activation of said closing mechanism for operating said disconnect contacts into engagement, a disconnect latching means operatively connectible to said disconnect contacts and operative following engagement of said disconnect contacts for latching said disconnect contacts into engagement, a mechanism operatively connectible to said disconnect contacts and operative following engagement of said disconnect contacts and directly controlled when said circuit breaker contacts are in engagement for preventing disengagement of said disconnect contacts while said circuit breaker contacts are engaged, means operatively connectible to said circuit breaker latching means and responsive to a fault current for operating said circuit breaker latching means to permit disengagement of said circuit breaker contacts by said circuit breaker biasing

means, and a disconnect trip mechanism operatively connectible to said disconnect contacts and controlled by the disengagement of said circuit breaker controls for releasing the disconnect contact latching means to permit disengagement of said disconnect contacts by said disconnect biasing means.

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