April 16, 1929. G. PAILIN 1,709,281

DRAW-OUT TYPE ELECTRIC SWITCH GEAR

Filed March 30, 1926 4 Sheets-Sheet 1

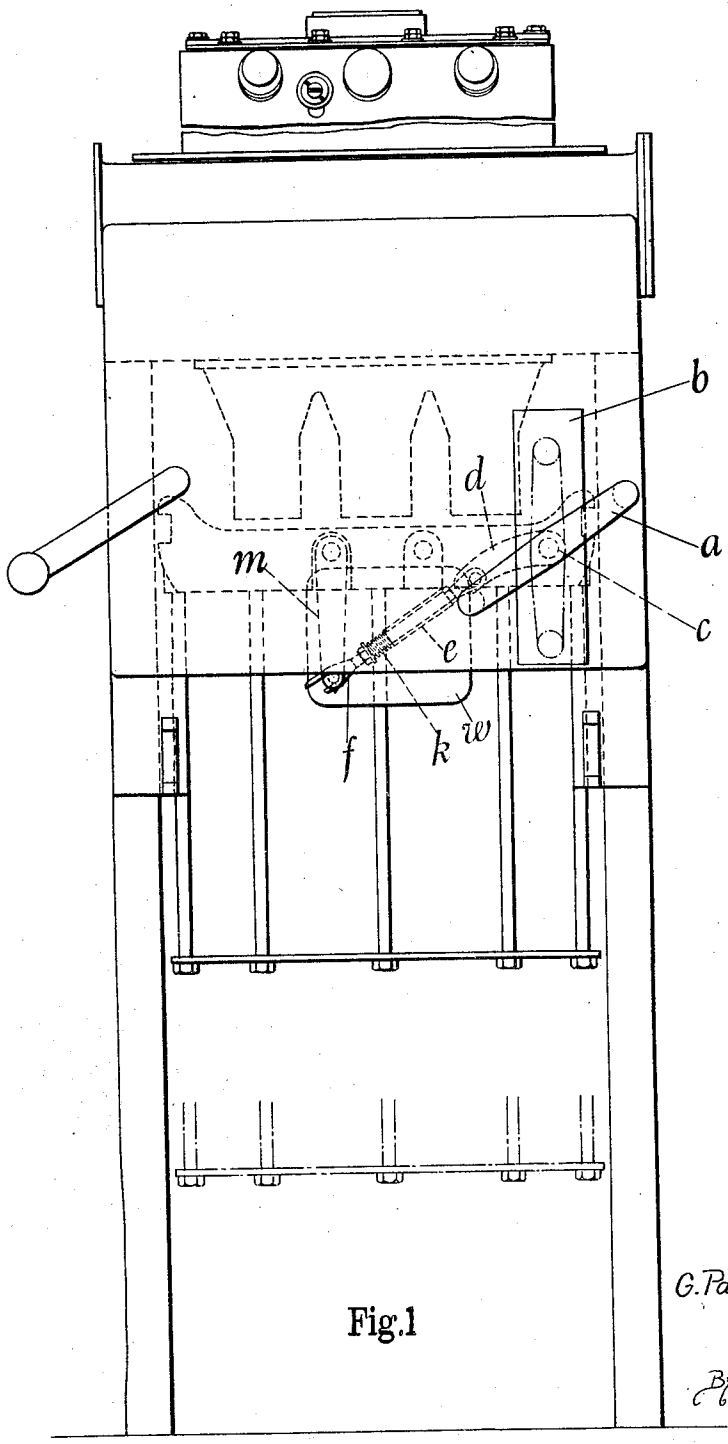


Fig.1

G. Pailin
INVENTOR

By: Marks & Clerk
Attys

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DRAW-OUT TYPE ELECTRIC SWITCH GEAR

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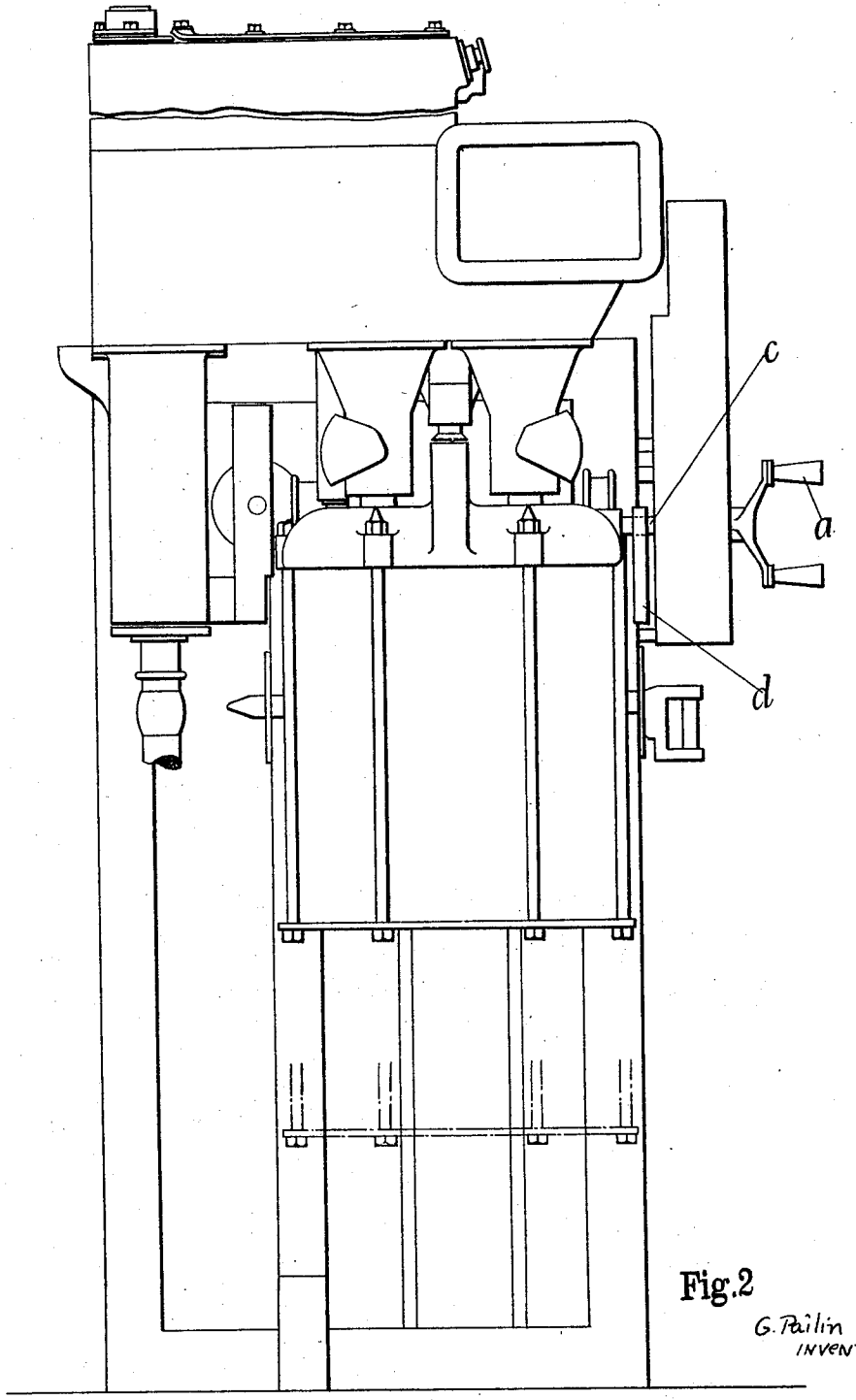


Fig.2

G. Pailin
INVENTOR

By: Marks & Clerk
Attys

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DRAW-OUT TYPE ELECTRIC SWITCH GEAR

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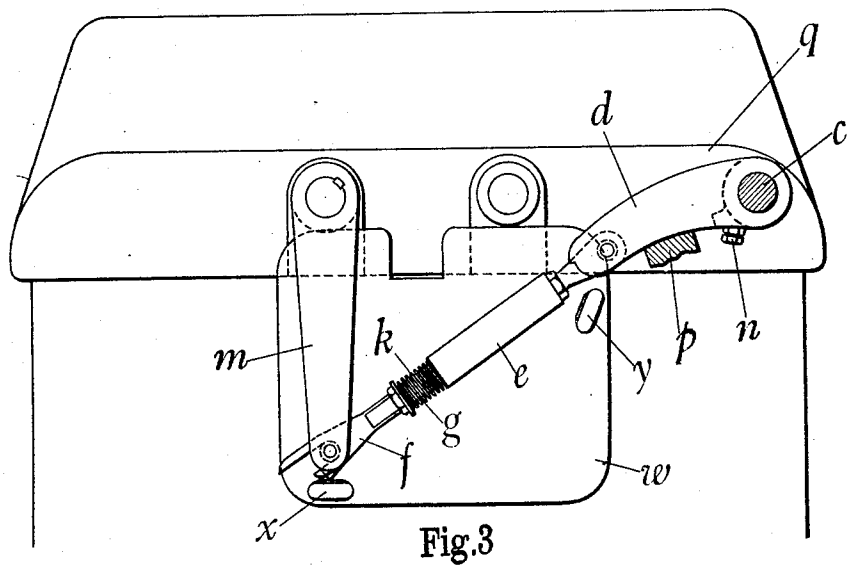


Fig.3

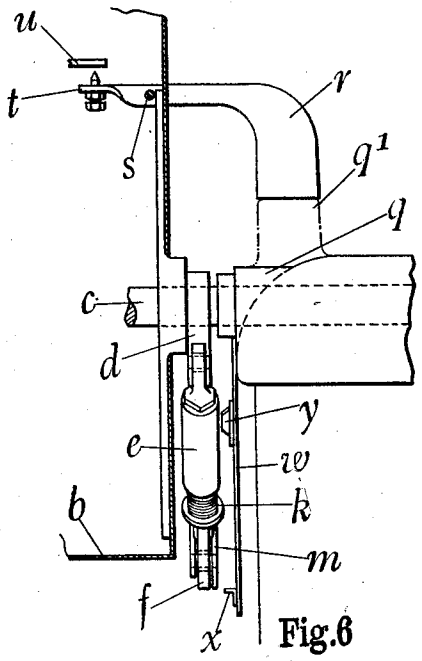


Fig.6

G. Pailin
INVENTOR

By: Marks & Clerk
Attys

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DRAW-OUT TYPE ELECTRIC SWITCH GEAR

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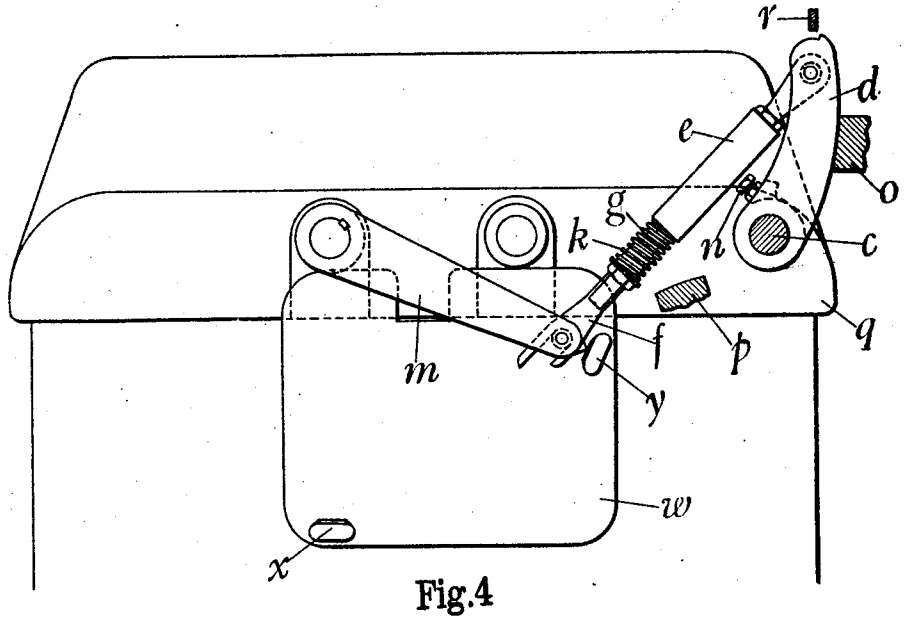


Fig.4

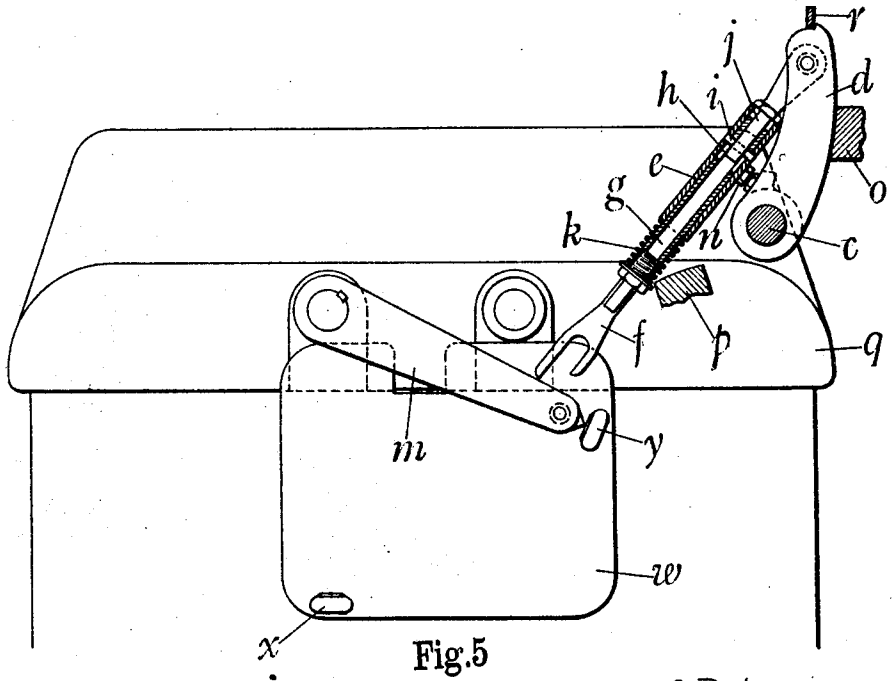


Fig.5

G. Pailin
INVENTOR

By: Marks & Clerk
Attys

Patented Apr. 16, 1929. 1,709,281

UNITED STATES PATENT OFFICE.

GEORGE PAILIN, OF MANCHESTER, ENGLAND.

DRAW-OUT-TYPE ELECTRIC SWITCH GEAR.

Application filed March 30, 1926, Serial No. 98,571, and in Great Britain October 17, 1925.

In draw-out type oil circuit breakers it is usual to mount the control handle with its automatic trip coils and auxiliary contacts, directly upon the breaker, so that the withdrawal of the breaker involves withdrawal of the control handle and the trip coils. This necessitates the provision of plugs and sockets for making the connections between the current transformers on the fixed portion of the breaker and the trip coils on the removable portion. Such plugs and sockets are difficult to align satisfactorily and involve the making of joints between the plug and wire and the socket and wire which is a disadvantage.

The object of my present invention is to provide an improved and simplified control arrangement in which the employment of plugs and sockets in the control circuits is obviated.

My invention comprises the provision of the control handle or its equivalent and the trip coils upon the fixed portion of the circuit breaker, and the arrangement of a mechanical coupling between such control handle and the breaker operating shaft which automatically disconnects itself when the breaker is withdrawn and automatically re-engages when the breaker is replaced.

Referring to the accompanying explanatory drawings:—

Figure 1 is a front elevation and Figure 2 a side elevation of a draw-out type electric switchgear unit having my improved control arrangements applied thereto in one convenient form.

Figures 3 and 4 are detail views of the control arrangements with the circuit breaker in the "on" and "off" positions respectively.

Figure 5 is a view similar to Figure 4 but showing the oil breaker partially lowered.

Figure 6 is a detail side view of the control arrangements showing the interlocking device in diagrammatic form.

The same reference letters in the different views indicate the same parts.

In the illustrated application of my invention, the control handle or wheel a actuates the spindle c through suitable operating mechanism (not shown) the spindle being journalled in the panel b fixed to the main frame of the breaker. The said panel serves also for the usual electrical instruments and trip coils. Said spindle c has keyed thereon an arm d to which is pivotally secured the member e having projecting therefrom the bifurcated arm or hand f. The construction of the parts e and f is as follows:—The part f is threaded externally and screws into the sleeve g which is slotted at h and has a cross pin i therethrough, the said pin being secured in the part e and also passing through the part j which is pivotally secured to d. By reason of the employment of the elongated slots h and of a spring k around the sleeve g as shown, the fork f is normally held in its extended position as shown, but when the fork is in engagement with the end of the arm m by which the circuit breaker is operated, the fork can move inwards against the pressure of the spring k for the purpose hereinafter described.

The arm d has an adjustable stop n thereon against which the part e can bear when the fork f is free from the arm m and in the "off" position as shown in Figure 5. A stop o limits the upward movement of the arm d and a stop p serves to limit the downward movement of said arm as shown in Figure 3.

The circuit breaker top plate q (see Figure 6) has a projection q^1 thereon which, when the circuit breaker is fully closed raises the weighted end of the lever r pivoted at s and so releases the end t of said lever from the tripping catch shown diagrammatically at u. The arrangement is such that the slightest downward movement of the circuit breaker allows the weighted end of the lever r to fall. The end t then raises the tripping catch u and by suitable and ordinary means operates means for tripping the circuit breaker so as to ensure that the circuit is not broken on the isolating plugs. In like manner, when the circuit breaker is being raised, the arrangement prevents the circuit being closed on the isolating plugs before the circuit breaker is fully raised.

The arm or lever r which is shown in cross section in Figures 4 and 5 serves also to prevent any movement of the arm d or handle a when the circuit breaker has been lowered to the slightest extent. In Figure 4, the breaker is shown in the switch "off" position but with the breaker fully raised. The lever r is quite clear of the arm d. In Figure 5, the lever r has been lowered into engagement with d, due to a partial lowering of the circuit breaker. This ensures that the fork f is always in position for reengagement by the arm m when the circuit breaker is raised or plugged in.

The operation of the control arrangement is as follows:—For normal operation of the

circuit breaker with the latter fully raised or plugged in, the handle *a* is turned to cause the fork *f* to engage the operating arm *m* of the circuit breaker, the latter preferably having a pin with a roller thereon for engagement by the fork. The "on" position is shown in Figure 3. If the circuit breaker be moved to the "off" position from any cause, then the fork *f*, part *e* and arm *m* assume the positions shown in Figure 4.

The arrangement of the fork *f* and its flexible connection to the part *e* allows the part *e* and the handle *a* to travel quicker than the arm *m* without the fork becoming disengaged from *m*; such a condition might arise if the throw-off speed of the parts *e* and *a* should be greater than the throw-off speed of the lever *m*. Also, the flexibility in the fork renders it unnecessary to adjust the length of the fork *f*, parts *e*, *j* and *d* with great accuracy with relation to the position of the end of the arm *m* engaged by the fork.

The part *w* forms a template for setting the circuit breaker, the raised piece *x* indicating switch "on" and the similar piece *y* the switch "off" position.

If any attempt be made to lower the circuit breaker, the latter will be immediately tripped by the arrangement shown diagrammatically in Figure 6 and the operating arm *m* moved to the "off" position. The hand control gear will be locked in the "off" position as shown in Figure 5 by the lever *r* and the fork *f* supported by means of the stop *n* in a position for re-engaging the arm *m* when the circuit breaker is again plugged in.

It will be understood that the means for raising and lowering the circuit breaker may be of any ordinary form and constitute no part of the present invention.

I may vary the construction of the improved control gear to suit requirements.

I claim:—

1. In electric switch-gear of the draw-out type, in combination, a fixed frame portion having contacts, a removable circuit breaker assembly having contacts adapted to cooperate with those on the fixed frame, an operating shaft on said breaker, an arm on said shaft, a control means mounted on said frame, a part operated by said control means adapted to engage said arm, and means adapted to hold said part in position whilst said circuit breaker is withdrawn to ensure its re-engaging said arm when the circuit breaker is restored.

2. A draw-out type electric switch-gear as claimed in claim 1 wherein said control means is adapted to operate a fork which is adapted to engage with an arm on said operating shaft and a stop adapted to hold said fork in position for reengagement by said arm when said circuit breaker is withdrawn.

3. A draw-out type electric switch-gear as claimed in claim 1 wherein said control means includes a resiliently extensible fork adapted to engage with an arm on said operating shaft, and a stop adapted to hold said fork in position for reengagement by said arm when said circuit breaker is withdrawn.

4. A draw-out type electric switch-gear as claimed in claim 1 including tripping means carried by said circuit breaker cooperating with said operating means to lock the same in the "off" position when said circuit breaker is being removed or is not in a position to fully engage said cooperating contacts.

5. A draw-out type electric switch-gear as claimed in claim 1 including tripping means carried by said circuit breaker and means to operate said tripping means upon attempted removal of said breaker assembly from said fixed frame.

In testimony whereof I have signed my name to this specification.

GEORGE PAILIN.