April 9, 1935. S. BAUER 1,996,849

SWITCH CLUTCH

Filed Feb. 9, 1934

Fig. 1.

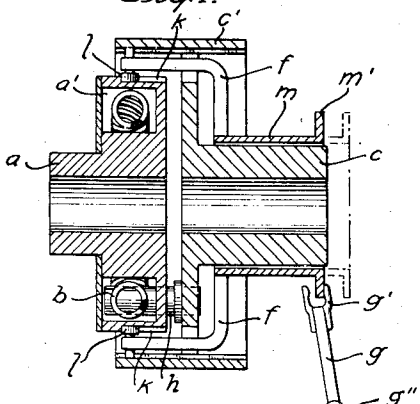
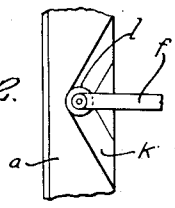


Fig. 2.



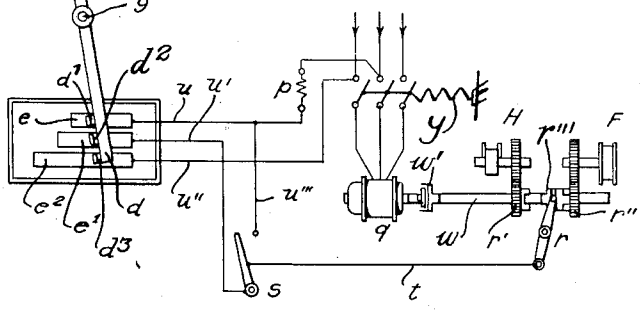


Fig. 3.

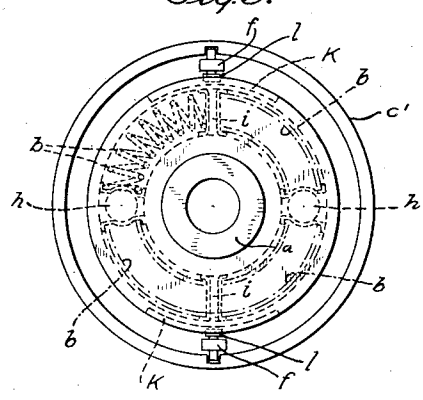


Fig. 4.

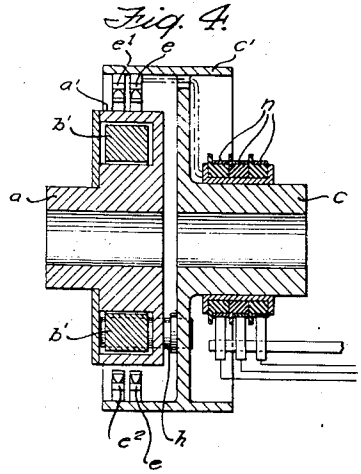
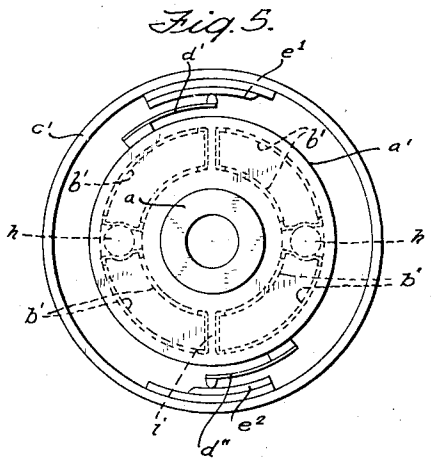


Fig. 5.



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SWITCH CLUTCH

Siegmund Bauer, Munich, Germany

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2 Claims. (Cl. 192—150)

In the designing of driving gears it is customary to provide means to prevent the individual gear members, lifting members and the like from being overloaded and from being broken, such means being friction clutches, braking clutches, shearing pins and similar devices or contrivances. All these means are, however, imperfect and do not operate accurately enough. In friction clutches, the coefficient of friction is uncertain, while shearing pins are likely to break during frequent normal use. There are working operations in which the admitted loads more or less vary and for which therefore the existing mechanical protective devices cannot be used at all.

For this reason the members involved are preferably protected by electrical means, for instance by the insertion into the motor circuit of current-relays, so-called maximum current releasing relays, or output relays operating in dependency on the motor output, so that the motor will be disconnected when a certain definite strength of current or a certain definite motor output is exceeded. This electrical release is accurately adjustable, it is true, but it necessitates the employment of many sensitive and expensive auxiliary apparatuses.

The present invention consists in a mechanically and electrically operating protective device, or clutch which renders it possible to obtain in a simpler manner than with the known protective devices a secure protection of a plurality of driving gear members, lifting gear members, and the like which are driven by one and the same motor and are designed for different loads. The present improved clutch has as its basis a well known automatic end release clutch intended for use in connection with electrically driven bulkhead doors and adapted to interrupt the motor current after the door has been closed and while the motor continues to run. Said known clutch is a gear clutch and is provided with an elastic element located between the members of the clutch and permitting relative turning of said members under the action of the torque arising during the operation of the clutch, that turning moment being utilized for interrupting the current after the door has been closed and as the torque requisite for closing the door is thereupon exceeded.

While, however, this known device is intended for use only as an end switch and becomes active only when a certain definite torque is exceeded, the clutch designed according to the present invention constitutes an improvement of said known device, in that the latter has been developed into a multiple overloading protective clutch which can selectively be adjusted for several working operations requiring torques of varying strength. The adjustment is, with this improved construction, effected by the aid of a plurality (three or more) of contacts cooperating with a movable contact element actuated by one of the clutch members, said contacts being successively cut off from, or operatively connected with corresponding circuits so that the current is switched off only when the permissible torque for which the corresponding contact has been adjusted relative to the corresponding working operation is exceeded.

In this manner it is possible (for instance with the aid of two or more contact members of different lengths, which are switched on to, or off from, the motor circuit when the device has been adjusted for the working operation to be dealt with) to adjust the clutch for several different torques for instance with the one-motor drive of a lifting gearing, or of a running gear, or with several closing devices of different size, and the like, and to disconnect the motor only when the torque permissible for the adjusted working operation is exceeded. For this manner of operation only an electric throw-over switch is required which is preferably actuated in a positive manner from the throw-over switch of the corresponding gear so that the current flows through the corresponding switch and the corresponding contacts only at a certain definite driving possibility.

My invention is shown diagrammatically and by way of illustration on the accompanying drawing on which Figure 1 is an axial section through a switch-clutch designed according to this invention, in combination with a wiring diagram and certain other parts. Figure 2 shows a detail of said clutch in plan view. Figure 3 is an end-view of the same clutch seen from the left in Fig. 1. Figure 4 is a view similar to Fig. 1 showing a modification, while Figure 5 is a view similar to Fig. 3 as seen from the left in Fig. 4.

In the embodiment shown in Figs. 1–3, the clutch body consists of the member *a* and the member *c*, *c'* which members respectively comprise a hub-like portion and a pulley-like portion *c'*. In the member *a* is provided an annular groove *a'* which is subdivided into semi-circular sections by two radial partitions *i*. In each of said semi-circular grooves are two helical compression springs *b* which contact at one end with the adjacent partition wall *i* and at the other end with a bolt *h* projecting from the other clutch member into one of said grooves through an arc-

uate slot provided in the bottom of the groove a'. Thus, each of the two bolts h is located between two of said springs, as distinctly shown in Fig. 3, and is, therefore, able to compress one of them as the clutch members are turned relatively to one another, it depending on the direction which of the springs is compressed and which is permitted to expand after having been compressed.

In the outer circumferential surface of the clutch member a are two oppositely located angular grooves k (Figs. 1 and 2) in each of which runs a roller l attached to the end of an angularly bent rod f. The two rods f are secured to a sleeve m slidable upon the hub-like portion c of the clutch member $c\,c'$, and provided with a flange m' engaged by the forked end g' of a two-arm lever g, d fulcrumed at g''. The lever arm d constitutes a switch arm; it is provided with three contact brushes d', d^2, d^3 that slide upon three contact strips e, e^1, e^2 of different length. It will be obvious that this takes place each time the lever g, d is rocked by the sleeve m as the latter is shifted by the arms f and the rollers l.

o denotes a three-phase switch and q is a three-phase motor. Two of the contact plugs of said switch are connected with the contact strips e and e^2, by the wires u' and u'', while the contact strip e^1 is connected by a wire u', with a switch arm s connected mechanically, by a rod t, with a clutch lever r cooperating with clutch members r' and r'', of which r' belongs to a lifting gear H and r'' to a driving or running gear F. The clutch members r', r'' constitute pinions and are loosely mounted on a shaft w which at w' is connected with the motor shaft. The pinions r', r'' are prevented from axial displacement on shaft w, on which is also mounted the intermediate clutch member r''' engaged by the clutch lever r. The intermediate clutch member which rotates with shaft w is axially movable thereon so that it can engage either the pinion r' or r''. If the clutch member r''' is coupled with r'' as shown in Fig. 1, then the running gear F is operated by the motor, while in the other end position of the intermediate clutch member the lifting gear H is operated by the motor. The switch lever s can be conductively connected with the wire u by a wire u'''. p is a zero voltage coil inserted into the wire u between the corresponding plug of the switch o and the point where the wire u''' is connected with said wire u. The switch lever g, d, in the case of an overload, acts to interrupt the current by means of the contacts e^1 and e^2 and the coil p.

The switching off of the motor in the case of several, differently large outputs, or at several, differently great torques respectively, is effected in the following manner:

If in the position of the parts shown in Fig. 1, the switch o is closed, current flows from o over u'', e^2, d^3, d, d', e, u and p back to switch o which is held closed by the tension coil p. No current flows in e', because in the shown position of the clutch lever r the switch lever s is open as shown. As the torque of the motor increases, the contact brushes d' and d^3 carried by the lever arm d slide over the strips e and e^2 respectively from right to left, and as soon as the predetermined torque is exceeded, the contact brush d' leaves the contact strip e. Consequently, the tension coil p which is an electro-magnet acting on the switch levers of switch o is without current, and switch o is opened, a spring shown at y in Fig. 1 pulling the switch levers away from their contacts. The motor q is now disconnected.

If the clutch lever r is moved to its other end position to engage the clutch member r', in which case switch lever s is closed, then, upon the closing of switch o also current will flow through the strip e' and if upon an increase in the torque of the motor the contact brush d' slides off the strip e, the current passing through tension coil p is not immediately interrupted, but only after also contact brush d^2 has left strip e' which occurs when the greater torque in case of an overload of the lifting gear H has been reached.

In the modification shown in Figs. 4 and 5, the helical springs (b) of Figs. 1 and 3 have been dispensed with and in lieu thereof circularly bent rubber buffers b' are provided which cooperate with bolts h in the same manner as the springs in Figs. 1 and 3. The contact strips e, e^1 and e^2 are, however, in this case arranged within the clutch at the inner wall of the pulley-like casing c', the contact springs e and e^1 being arranged diametrically opposite to the contact strip e^2, as are, consequently, also the corresponding contact springs d' and d'' which are affixed to the clutch member a. The strips e, e^1, e^2 are of different length, accurately as in Fig. 1, and they are conductively connected with rings n secured to the hub-like part c of the clutch member c, c', as indicated by dotted lines in Fig. 4. The other arrangement and combination of the members constituting the electric plant is just the same as in the right-hand portion of Fig. 1.

When the rotation of the clutch members relatively to one another exceeds a certain degree, the contact springs d' d'' slide off from the contact strips e, e^1, e^2 whereby the current is interrupted. By a suitable selection of the length of the contact strips it is possible to adjust the device for that load at which the switching off is to take place. Instead of the current being completely switched off, the regulation may be effected in such a way that upon a slight turning of the clutch members relative to one another more current is switched on, whereas in the case of too much turning relatively to one another of the clutch members current is switched off.

I wish it to be understood that I do not limit myself to the embodiments shown and described, because other modifications are possible lying within the scope of my invention.

I claim:

1. In an overload release mechanism, the combination with the motor-circuit, of a torque-controlled clutch comprising relatively movable members and an elastic element interposed between said members, a plurality of contacts included in said motor-circuit and designed and arranged to be opened and closed in a definite succession corresponding to a predetermined torque applied to said clutch, an automatic switch included in said motor-circuit and controlled by said contacts, and a movable contact element operated by one of said clutch-members so as to successively cut out said contacts from said motor-circuit to thereby shut off the motor-current upon the torque of the motor corresponding to its required working operation being exceeded.

2. The combination as specified in claim 1, including a mechanically operable switch in said motor-circuit, clutch elements operatively associated with the driven parts to be connected with and disconnected from the motor, a clutch arm adapted to be moved into engagement with either of said clutch members, and means connecting said clutch arm with said switch.

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