Nov. 10, 1970 P. HOLM 3,539,750

SWITCH FOR HIGH AMPERAGE CURRENT

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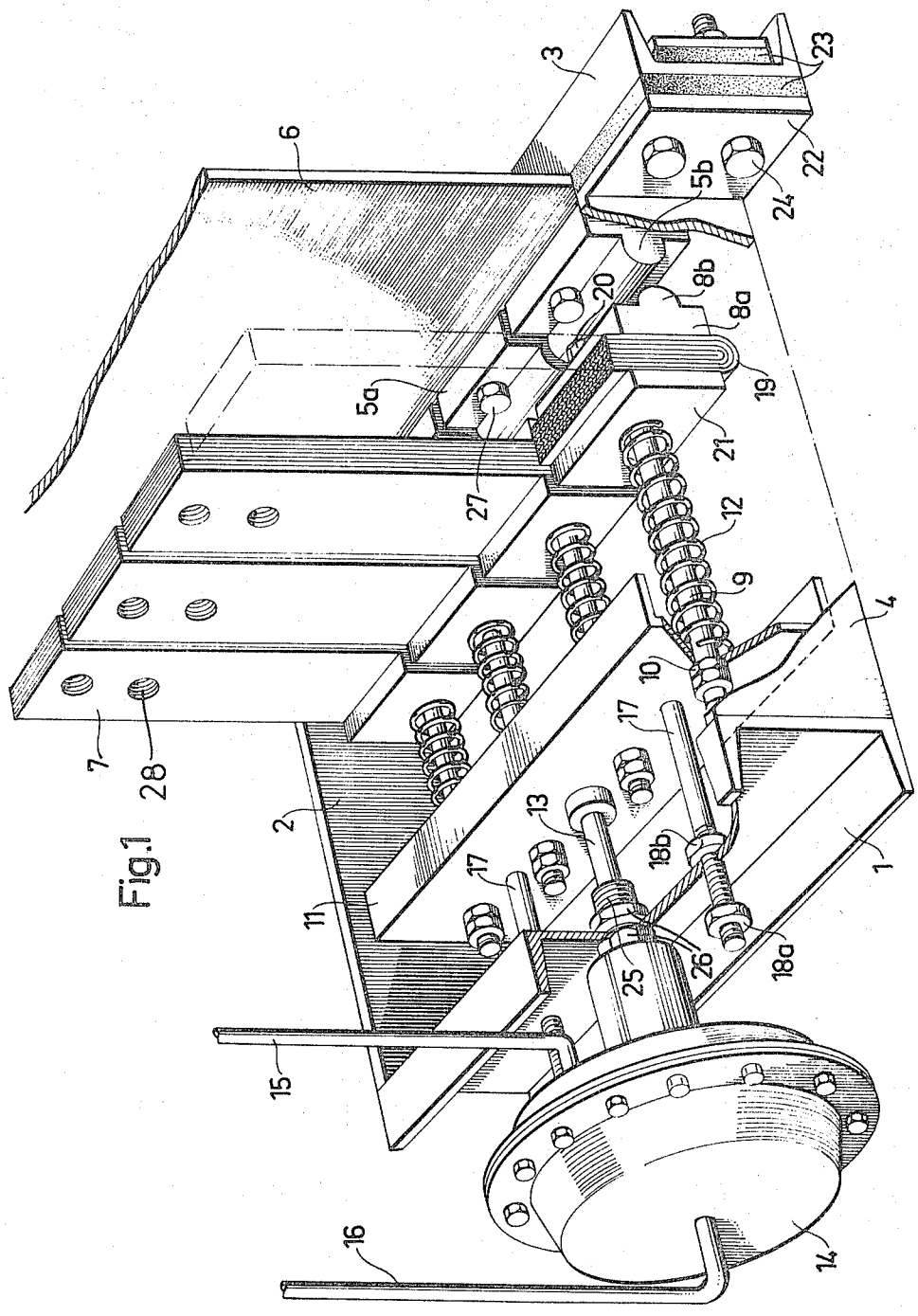

Fig.1

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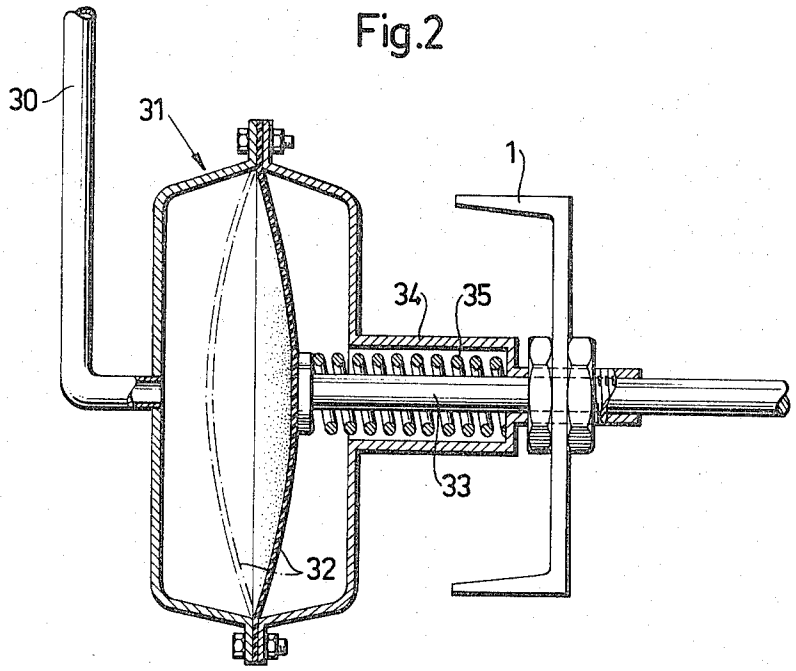
Fig.2



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SWITCH FOR HIGH AMPERAGE CURRENT

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U.S. Cl. 200—170 4 Claims

ABSTRACT OF THE DISCLOSURE

A switch for high current operation contains a stationary contact and a movable contact. The movable contact is operated by an operating member actuated by a pressurized fluid. Locking means are provided for maintaining the contacts into engagement whenever desired.

The invention is concerned with a switch for high amperage current, and particularly with a switch for direct current supplied to electrolytic processes, such as the manufacture of chlorine and alkali in a mercury cell.

The switch of the invention is of the known type comprising a stationary contact, a movable contact, and operating means for moving the movable contact into and out of engagement with the stationary contact. Known switches of this type utilize a complicated system of levers, for instance, to engage the movable contact with the stationary contact at a sufficient pressure. It is the object of the invention to provide an inexpensive and uncomplicated switch, in which the movable contact can engage and disengage the stationary contact in a reliable way and using a minimal number of moving parts only.

The switch of the invention comprises a base, a stationary contact mounted in said base, a first current conductor connected to said stationary contact, a movable contact mounted in said base, a second, flexible, current conductor connected to said movable contact, operating means for engaging and disengaging the movable contact with the stationary contact, said operating means being actuated by a pressurized fluid at least in bringing the movable contact to engage the stationary contact, and locking means for holding the movable contact in engagement with the stationary contact. The operating means may be a cylinder-piston means, or it may consist of a box containing a membrane which is actuated by the pressurized fluid, as will be disclosed on the drawing. The operating means is preferably double-acting, i.e. the piston or the membrane is actuated by the pressurized fluid in two directions. Alternatively, the operating member can be designed so as to be actuated by the pressurized fluid in engaging the contacts, and to be actuated by a spring in disengaging the contacts.

The invention will now be explained with reference to the accompanying drawing, disclosing an embodiment to be used in a cell for the manufacture of chlorine and alkali. FIG. 1 represents a view of the switch, and FIG. 2 discloses an alternative embodiment of the operating means.

The illustrated switch contains a rectangular base or frame 1–4. One end of the frame portions 2 and 4 is welded to the frame portions 1. The other end of the frame portions 2 and 4 is provided with flange portions 22. The frame portion 3 is fastened to said flange portions 22 by means of bolts 24. Insulating members 23 provide an electric insulation between the frame portion 3 and the other frame portions.

Four contact members 5*a* are fastened to the frame portion 3 by means of screws 27. The contact members

5*a* consist of copper and have a rounded contact surface 5*b*. The four contact members 5*a* constitute the stationary contact of the switch. A rigid current conductor 6 is jammed between the contact members 5*a* and the frame portion 3.

The movable contact of the switch consists of four copper contact members 8*a*, having rounded contact surfaces 8*b*, each of them being fastened to a steel plate 21 by means of screws 20. A flexible current conductor 7 is jammed between each contact member 8*a* and its steel plate 21. The top of each current conductor 7 is provided with holes 28 for fastening the conductor to a stationary current supply member. The current conductors 7 consist of a plurality of copper strips which are bent in their lower portion 19. Thus, each copper strip has the double length of the conductor 7. This provides a guarantee for a minimum of loss due to electrical resistance, if the conductivity between two adjacent copper strips should be reduced due to a coating on the copper strips, for instance an oxide coating.

Each steel plate 21 is provided on one end of a rod 9 extending horizontally through an opening in a support member 11. The other end of the rod 9 is threaded and carries double nuts 10. The rod supports a coil spring 12 having one end abutting on the steel plate 21, and the other end abutting on the support member 11, thus urging said parts to move apart. The position of the contact members 8*a* is adjusted by means of the nuts 10. If desired, the two extreme contact members 8*a* may be situated slightly closer to the corresponding contact members 5*a* than are the two middle contact members 8*a*. This reduces the formation of sparks in the switch-off operation.

The support member 11 is fastened to one end of a rod 13. The other end of the rod 13 is fastened to the membrane of a double-acting operating member 14 which is actuated by pressurized air supplied through tubes 15, 16. The operating member 14 has a threaded portion 25 extending through an opening in the frame portion 1. The threaded portion 25 supports two nuts 26 screwed tightly against the frame portion 1. The supporting member 11 also supports two rods 17 extending through openings in the frame portion 1 and having nuts 18*a*, 18*b* on their threaded end portions, the nuts 18*b* serving as an optionally usable locking device to lock the contacts in the engaged position, whenever desired.

For switching on the illustrated switch pressurized air is supplied through the tube 16. The supporting member 11 moves the stationary contact members 8*a* by way of the springs 9 to engage the contact members 5*a* in a resilient manner. The nuts 18*b* can now be rotated so as to engage the frame portion 1. The switch is now locked in the switch-on position. The two sets of contact members are pressed against each other with a force defined by the operating member 14. The rounded contact surfaces 8*b* and 5*b* ensure a high contact pressure per unit area. When it is desired to switch off, the nuts 18*b* are released, and pressurized air is supplied through the tube 15. The supporting member 11 now pulls the contact members 8*a* out of engagement with the contact members 5*a*.

FIG. 2 illustrates an alternative embodiment of the operating means. It consists of a housing 31 divided into two chambers by means of a flexible membrane 32 consisting of rubber, for instance. The end of the rod 33, which has the function of rod 13 in the FIG. 1 embodiment, is fastened to said membrane 32. Pressurized air can be supplied to the left-hand chamber through a tube 30, for producing the switch-on stroke. So far, the operating means is similar to that disclosed in FIG. 1. The difference is that the switch-off stroke is produced by

means of a coil spring **35** urging to press the membrane **32** in the left-hand direction. The advantage of this embodiment is that a failure of the pressurized air always results in the switch being brought into the switch-off position, i.e. the position indicated in dotted lines in FIG. 2, provided of course that the contacts *8a*, *5a* have not been locked in their engaged position by the locking nuts *18b*.

What is claimed is:

1. In an electrical switch adapted particularly for low voltage high amperage current applications the combination comprising a base, a stationary contact member mounted on said base, a first current conductor connected to said stationary contact, a support member located on said base and arranged for movement relative thereto, a plurality of movable contacts, a plurality of flexible current conductors each of which is connected to one of said movable contacts, means individually and resiliently mounting said movable contacts on said support member such that said movable contacts are movable relative to said support member in a resilient manner, operating means secured to said base and coupled to said support member for actuating said support member and said resiliently mounted movable contacts thereon towards and away from said stationary contact to effect engagement and disengagement respectively of said contacts, said operating means including a fluid pressure responsive actuator connected to said support member and means for supplying a pressurized fluid to said actuator to urge the latter and hence also said support member and said movable contacts at least in the direction in which said movable contacts effect engagement with said stationary contact, and an optionally usable locking device for locking said support member to said base in the position which said support member occupies when said movable contacts are engaged with said stationary contact.

2. An electrical switch as defined in claim **1** wherein said actuator is arranged for actuation in both directions by the pressurized fluid thereby to effect movement of said support member and the movable contacts resiliently mounted thereon in one direction to effect engagement of said contacts as well as in the opposite direction to effect disengagement of said contacts.

3. An electrical switch as defined in claim **1** wherein said actuator is arranged for actuation in only one direction by the pressurized fluid thereby to effect movement of said support member and the movable contacts resiliently mounted thereon in the direction to effect engagement of said contacts, and wherein said operating means includes a spring member effecting movement of said support member in the opposite direction whenever the fluid pressure is removed from said actuator.

4. An electrical switch as defined in claim **1** wherein said locking device includes at least one rod secured at one end thereof to said support member, the other end of said rod threaded and extending through an aligned opening in said base, and a locking nut on said threaded end and which is turnable into engagement with said base when said support member has been moved into the contact engaging position thereby preventing any return movement of said support member and movable contacts in the opposite direction.

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