

[54] **ARRANGEMENT FOR THE OPERATION OF SWITCHING DEVICES IN TELEPHONE EQUIPMENT**

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[75] Inventors: **Karl-Jan Breu; Herbert Hoher**, both of Munich; **Hans-Joachim Schinke**, Bocholt, all of Germany

Primary Examiner—G. Harris

[73] Assignee: **Siemens Aktiengesellschaft**, Berlin and Munich, Germany

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[58] Field of Search ..... 200/153 R, 153 E, 153 G, 200/153 H, 153 LA, 153 T; 179/159, 164, 165

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**UNITED STATES PATENTS**

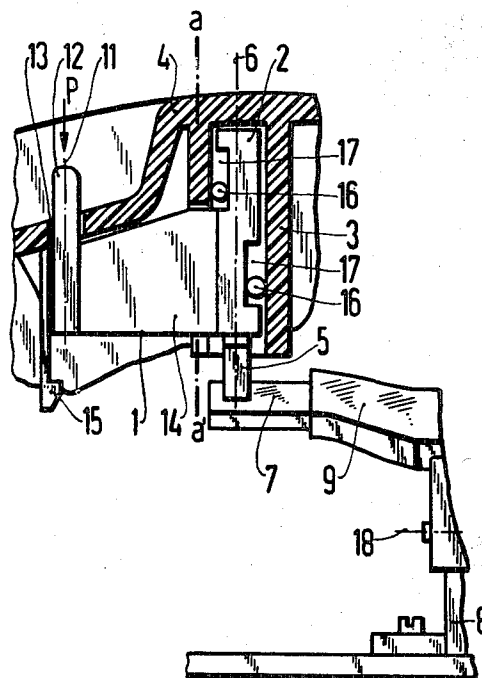
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**ABSTRACT**

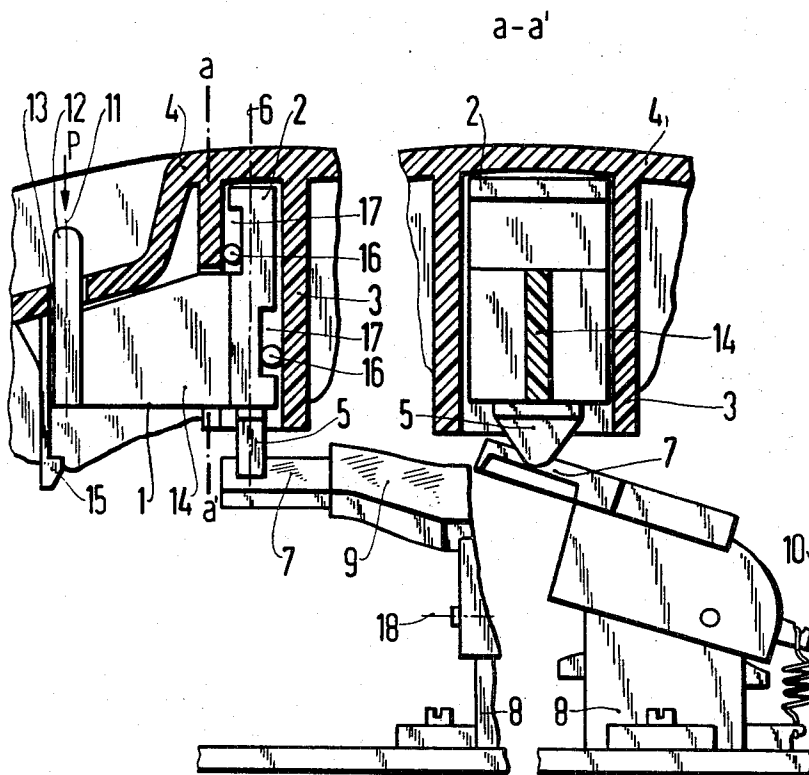
An arrangement for the mechanical transfer of an operating force from the outside to a switching mechanism in the interior of a housing or the like, by means of mechanical intermediate members provided in pairs and guided rectilinearly. The intermediate members are provided with physically separated areas for absorbing and transmitting the operating force and have laterally staggered axes of rotation. One of the areas interacts with fixed guide means in the device and may be arranged on rollers. The area absorbing the operating force penetrates the wall of the housing and is accessible from the outside.

**2 Claims, 2 Drawing Figures**



**Fig.1**

**Fig.2**



## ARRANGEMENT FOR THE OPERATION OF SWITCHING DEVICES IN TELEPHONE EQUIPMENT

### BACKGROUND OF THE INVENTION

The invention relates to an arrangement for the mechanical transfer of an operating force to a switching mechanism disposed within a housing. The invention has particular application in the operation of switching devices in telephone subscriber sets.

In such arrangements, the prior art devices generally employ mechanical intermediate members which penetrate the housing of the switching device and as movable rectilinearly between two extreme positions in a guide and accessible from the outside. The switching devices disposed in the interior of a telephone set are operated by such intermediate members. To this end, the intermediate members are operated through specified areas of a telephone handset replaced on the device, such that the force of gravity is utilized.

In arrangements of known construction (e.g., West German Unexamined Patent Application No. 1,762,864) the mechanical intermediate members provided in pairs are easily movable and extend through openings of the housing of the device. In their parallel axes of rotation they interact within the device with a control mechanism which is a part of the switching device.

For convenient hand-holding of the telephone handset activating the intermediate members, for constant operating conditions, and in the case of unilaterally overweighted handsets, the intermediate members are separated a great distance from one another, depending on the length of the handset. By means of a power transmission means, the control mechanism of the switching device extends into the paths of travel of the two intermediate members at the same time. Hence, such a power transmission means is usually a bulky member requiring a great deal of space.

The guide openings in the housing of the device in which the intermediate members move should be adequately large to enable a low-friction movement. The possibility, however, of dust and other foreign matter entering such openings limits the use of the friction preventing arrangement. The usual construction, in spite of this, does provide a proportioning such that ample play of the intermediate members in the housing openings is possible. However, as stated, amply proportioned housing openings promote the penetration of dust and impurities into the interior of the device. In the prior art arrangements both the penetrating dust and liquid cleansers used to remove the dust can be deposited on the working surfaces of the aforementioned power transmission means interacting with the intermediate members.

The power transmission means normally perform an apparently rectilinear movement. In reality, however, they are seated on an axis of rotation, and the movement of their working surfaces interacting with the intermediate members is part of a circular orbit. Hence, between the rectilinearly guided intermediate members and the working surfaces of the power transmission means, there also occurs a lateral displacement during the activating movement. In the course of the lateral displacement the two parts slide on one another. Dust deposited on the working surface increases the friction thereon. The penetrating liquid cleansers can also

cause the activating means to stick together. The dust can also act as an abrasive accelerating the wear on the working surfaces. However, in view of the tendency toward increasingly lighter telephone handsets and in the interest of a perfect switching operation, the increased friction and/or the sticking together is highly undesirable.

It is, therefore, an object of the invention to provide a structural arrangement for transmitting an activating force to a switching mechanism disposed within a housing of a device wherein the force must be transmitted through openings in a housing and wherein the depositing of dust in the openings in the interior of the housing increases friction and accelerates wear of the mechanism in which such effects are prevented.

It is a further object of the invention to provide a force transmitting construction which keeps to a minimum the size of the aforementioned power transmitting member in comparison with prior art constructions.

### SUMMARY OF THE INVENTION

In accordance with the invention, the foregoing and other objects are achieved in that the mechanical intermediate members have two physically separated areas for absorbing the activating force and for transmitting the same. The parallel axes of rotation of these two areas are laterally staggered.

Axes of rotation are understood to mean the axes determined by the paths of travel described by the centers of gravity of the areas considered separately of an intermediate member.

In the arrangement according to the invention, the opening in the wall of the housing renders possible the passage of the area of the mechanical intermediate member absorbing the activating force into the area of influence of the activating force. The guideway for the mechanical member can be laid in the path of travel of its area absorbing the activating force as well as transmitting the same.

Because the axes of rotation of the two functional areas are staggered, the opening in the wall of the housing through which the mechanical intermediate member extends outwardly does not lie directly above the area employed for the transmission of the activating force. Hence, the arrangement above described has the advantage that dust getting into the device through the opening of the housing does not fall directly on the working surfaces of the power transmitting member and cannot increase the friction and accelerate the wear.

In a corresponding arrangement of a pair of such mechanical intermediate members (for example, such that the axes of rotation of the two areas of the two intermediate members lies in one plane, whereby the axes of the areas absorbing the activating force shall have the greater distance from one another), the arrangement according to the invention also has the advantage that the size of the power transmitting member of the switching device, heretofore determined by the distance, can be reduced to the smaller distance (determined by this arrangement) of the areas transmitting the force and interacting with the power transmitting member.

However, the lateral displacement according to the invention between an axis absorbing an activating force and an axis parallel thereto and transmitting the activating force leads in the guideway to a resolution of the

activating force. The shearing force occurring exercises a torque thereat and may cause an unwanted increase of the friction in the guideway. This can be equalized by the transition from sliding friction to rolling friction by virtue of the fact that the guide is constructed as a rolling element guide.

#### BRIEF DESCRIPTION OF THE DRAWINGS

The principles of the invention will be more readily understood by reference to the description of a preferred embodiment given hereinbelow in conjunction with the drawings.

FIG. 1 is a partial view of an arrangement according to the invention viewed in horizontal direction and partially in section.

FIG. 2 is a side elevation of the FIG. 1 arrangement, likewise partially in section.

#### DETAILED DESCRIPTION OF THE DRAWINGS

An area 12 of a mechanical intermediate member 1, constructed according to the invention, absorbs the activating force and extends outwardly in any amply dimensioned opening 13 through the wall of the housing 4 into the area of influence of the activating force P (arrow). Area 5 of the intermediate member transmits the activating force and has an axis of rotation 6, as center of gravity of the intermediate member which extends through the axis. This member includes a projection 2 used as a guide into a channel 3 formed in the housing and it extends as far as the working surface 7 of a power transferring arm 9 associated with a switching device 8. The power transferring arm 9 is capable of operating in a pivoting motion in the form of a circular arc about an axis 18 and being held in its rest position by a restoring spring 10. Both areas of the mechanical intermediate member are rigidly connected with one another by a cross member 14.

The mechanical intermediate member is capable of

being inserted into the housing of the device from the bottom and is prevented, by a spring-loaded barb 15, from falling out of the housing, particularly during the assembly. The means employed for receiving and guiding an intermediate member can, as well, be part of the housing frame.

To avoid unwanted friction, the guide 2 of the mechanical intermediate member is constructed to be a rolling element, by means of rollers 16 received in recesses 17 of the channel area.

The description of a preferred embodiment of the invention given hereinabove is only exemplary of the principles of the invention and does not define the scope of the invention. The scope of the invention is defined by the appended claims.

We claim:

1. In apparatus for mechanically transmitting an externally applied force to switching means placed within a housing or the like through intermediate member means connecting the point of application of said force to said switching means and moving rectilinearly in a guideway between two extreme positions, said intermediate member means extending through at least one opening in said housing, the improvement comprising:

first and second areas on said intermediate member means for absorbing said externally applied force, and transmitting it, said first and second areas being physically separated from each other, said first and second areas having axes of rotation, respectively in a laterally staggered spatial relationship with respect to each other.

2. The improved apparatus defined in claim 1 further comprising channel means for receiving a portion of said intermediate member means and roller means for carrying said portion through said channel means.

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