

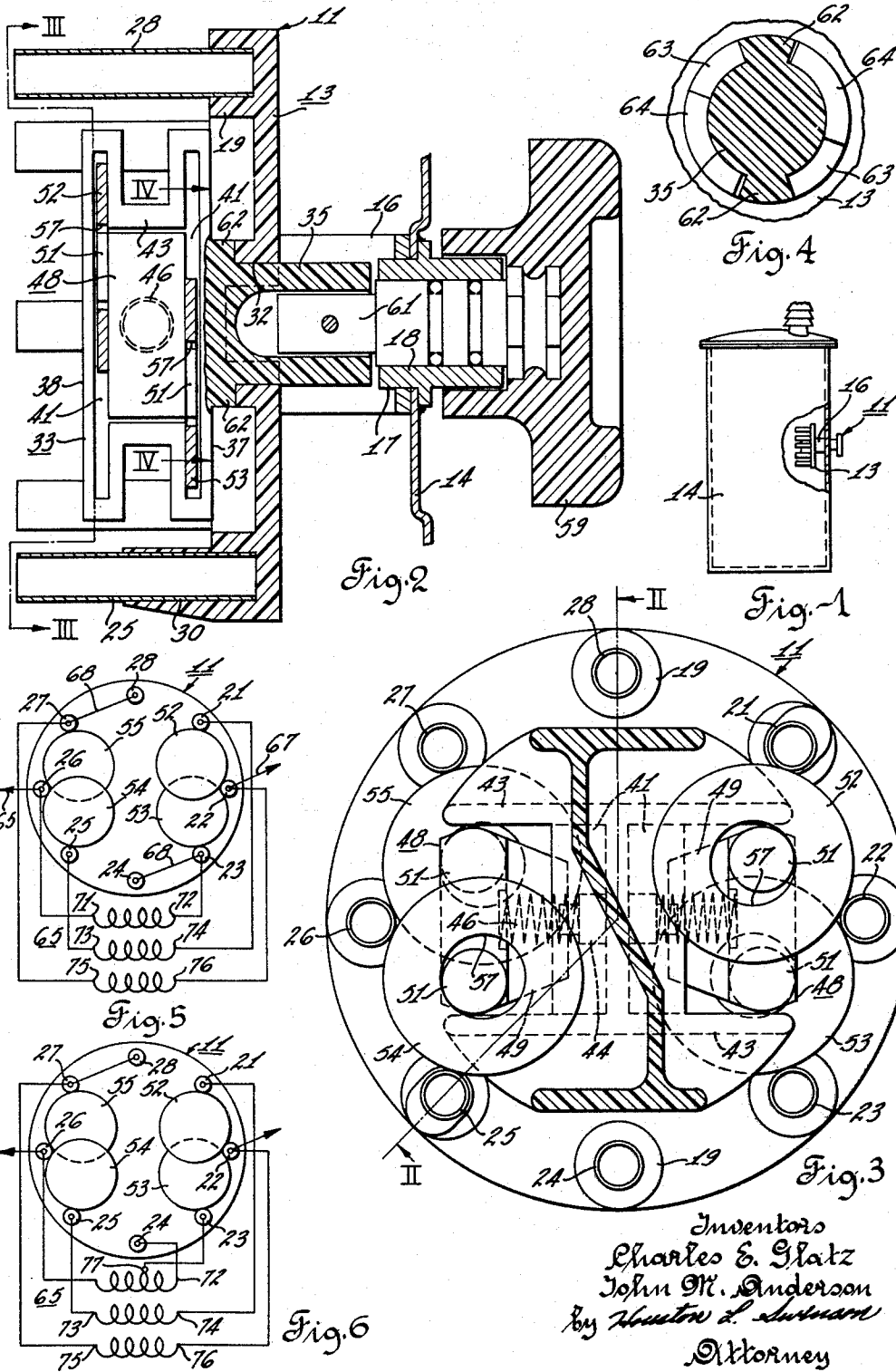
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MULTICONCONTACT NO LOAD ELECTRIC SWITCH

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MULTICONTACT NO LOAD ELECTRIC SWITCH
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This invention relates to multicontact switches and in particular to a no-load dual voltage switch for high voltage apparatus such as distribution transformers.

Distribution transformers are frequently provided with a dual voltage switch in order that the voltage ratios of the transformer windings may be adjustable. Such a dual voltage switch makes it possible for a quick and convenient system changeover to higher voltage for future load growth. A conventional arrangement is to connect the dual voltage switch to the high voltage winding of the transformer. The winding generally has several sections which are connected in parallel for a low voltage and in series for a higher voltage. The switch is externally operated and is moved under no-load conditions. Consequently, the normal problems which occur in interrupting a large current are not present in no-load dual voltage switches. However, the switch does carry a large current during operation of the transformer and must be accordingly designed. Consequently, there must be positive alignment between the switch parts. With the sizes of the transformer tanks having been considerably reduced in recent years, it is also essential that the dual voltage switch consume as little space within the tank as possible.

Switches of the prior art have included conventional point type stationary contacts with knife blade movable contacts. These sliding contacts were spring loaded and inasmuch as the contacts were quite large, high torques were required. Thus, the switch was necessarily larger than desired for present day transformer tanks. In addition, the springs which biased the contacts carried current during operation of the transformer and were subject to excessive deterioration. Alignment of the various contacts in the switch also was a problem. Spring loaded rolling contacts were also used in switches of the prior art. However, the rolling contacts were all placed in the same plane and consequently the overall diameter of the switch was excessively large.

The dual voltage switch of this invention utilizes a double deck arrangement of rolling contacts. Each pair of rolling contacts is biased by only one spring which is a noncurrent carrying member. The unique arrangement to be described herein provides for an extremely compact switch with relatively few parts. The contacts have a sharp snap action which assures positive alignment. The particular arrangement of contacts and contact posts in the switch of this invention is also adaptable for serving a variety of voltage change ratio combinations.

Thus, it is one object of this invention to provide for a new and improved dual voltage switch.

Another object of this invention is to provide a new and improved dual voltage switch which is extremely compact and has relatively few parts.

Another object of this invention is to provide for a new and improved no-load voltage ratio switch in which positive alignment is assured.

Objects and advantages other than those mentioned above will be apparent from the following description when read in connection with the drawing in which:

FIG. 1 is a view in elevation of a transformer partially broken away to show the dual voltage switch of this invention;

FIG. 2 is a partial sectional view taken along lines

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II—II of FIG. 3 with the contact housing shown in elevation;

FIG. 3 is a sectional view taken along lines III—III of FIG. 2;

FIG. 4 is a partial sectional view taken along lines IV—IV of FIG. 2;

FIG. 5 is a schematic showing of the switch connected to a high voltage winding having three sections; and

FIG. 6 is a schematic showing for the wiring of a three section winding where one section has a tap.

Referring to FIG. 1, the dual voltage switch 11 includes a stationary circular insulating plate 13 which may be mounted in the interior of a transformer tank 14 by a U-shaped bracket 16. The bracket 16 may be secured to the inside of the tank by any conventional manner such as by riveting or mounting it on a noncircular portion 17 of a bushing 18. As shown in FIGS. 2 and 3 the insulating plate 13 which is made of an electrical nonconductive material such as a hard fibrous substance or epoxy resin, contains eight symmetrically spaced contact posts 21 through 28 which may be made of brass, aluminum or another conductive material. In the particular embodiment, the contact posts are maintained in a rigid position by molding them in projecting shoulders 19 on the insulating plate. It is to be noted that for the particular electrical arrangement which the illustrated switch is to be used for, two contact posts 21 and 25 are partially insulated on their bottom portions 30.

The insulating plate 13 defines a centrally located bore 32 through which a contact housing 33 having a short shaft 35 is rotatably mounted. The contact housing comprises a pair of connected spaced faces 37 and 38 parallel to the insulating plate. A pair of diametrically disposed recessed seats 41 are defined between the two faces 37 and 38 and members 43 which also serve to connect the two faces. A small projection 44 in each of the recessed seats serves to position a spiral spring 46. The contact housing 33 may be made of the same insulating material as used for plate 13.

Each of the recessed seats 41 loosely contains an electric insulating contact holder 48. Each contact holder 48 has a shoulder member 49 for assisting in the positioning of the spring 46 mounted between the holder 48 and its respective housing seat 41. Each contact holder has means 51 for holding a pair of disk contacts 52 and 53 or 54 and 55 catercornered or on a diagonal line and parallel to the insulating plate 13. The means is preferably such that the disk contacts are able to freely rotate on a displaceable axis. As illustrated, this means 51 is a short circular projection which serves as an undersized shaft for supporting a disk contact having a centrally located aperture 57 of a greater diameter than the shaft.

The dimensions of the associated parts are such that when the assembled contact housing is mounted within the space defined by the eight stationary posts, the two springs 46 are partially compressed. Thus, the springs are continuously urging the contact holder 48 and their respective disk contacts against selected stationary posts for assuring positive alignment. Consequently, each disk contact is in physical contact with a pair of posts, with one of said posts being in physical contact with both disks on a holder.

Means for rotating the contact housing with respect to the insulating plate may be a conventional handle 59 and a shaft 61 connected to the housing shaft 35 which is mounted through the tank wall 14. Since the particular switch is always in either a low voltage or high voltage position, rotation of the contact housing 33 is limited. As shown in FIG. 4, this may be achieved by including a pair of projections or keys 62 on shaft 35 for limited

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rotation within slots 63 formed by extending members 64 on the insulating plate 13.

Referring to FIG. 5, a transformer high voltage winding 65 having three sections is connected to six terminal posts 21, 22, 23, 25, 26 and 27 of the dual voltage switch 11. Two of the contact posts 22 and 26 are connected to the power or ground leads 67. The two remaining contact posts 24 and 28 are each connected to an adjacent post 23 and 27 by jumpers 68 for reasons to be explained later. Each pair of disk contacts bridges across three contact posts with the middle post 22 and 26 of each three being in electrical contact with both of their respective disks. With the four disk contacts in their illustrated positions, the high voltage winding sections are connected in parallel for supplying a load voltage. Winding ends 72, 74 and 76 are connected together through posts 21 through 23 and disks 52 and 53. Likewise, winding ends 71, 73 and 75 are connected to each other.

Keeping in mind the fact that two of the contact posts 21 and 25 are insulated on their bottom portions to include at least a plane containing the lower disk contacts 53 and 55, a one position counterclockwise movement of the disk contacts changes the connection of the previously parallel connected winding sections into series connection, thus giving a higher voltage output. The disk 52 in the top plane is now resting in electrical contact against posts 28 and 21. Inasmuch as post 28 is connected to post 27, post 21 is also connected to post 27 and the two winding section ends 74 and 75 associated therewith are connected together. The lower disk contact 53 rests against post 21 and post 22, but since the lower portion of post 21 is electrically illustrated there is no bridging of the two winding ends 74 and 76 associated with these posts. In a like manner the other pair of contacts cooperate to connect winding ends 72 and 73 together to complete the series connection.

By a simple rearrangement of winding connections on the post the same switch is readily adaptable to provide two voltage combinations for a three section winding in which one section has a tap. In FIG. 6 the elements of the circuit and switch are referred to with the same reference numbers used for the corresponding elements in FIG. 5. Points of differences between the two figures are that in FIG. 6, posts 23 and 24 are unbridged and a tap 77 has been added to the tap winding section. The disk contacts in their illustrated position connect the winding sections in parallel with the right hand portion of the top winding being out of the circuit. After a one position rotation of the disk contacts, the whole of the winding sections are connected in series. A dual voltage combination is likewise readily available for a two section high voltage winding.

While only one embodiment of the present invention has been illustrated and described, it will be apparent to those skilled in the art that modifications other than those shown may be made without departing from the spirit of the invention or from the scope of the appended claims.

Having now particularly described and ascertained the nature of our said invention and the manner in which it is to be performed, we declare that what we claim is:

1. A multicontact switch comprising: a stationary insulating plate; a plurality of parallel and circular arranged contact posts extending axially from said plate; an electrical insulating contact housing rotatably mounted on said plate on an axis parallel to said posts and centrally located within the space defined by said posts, said housing having a pair of diametrically disposed electrical insulating contact holders; a pair of disk contacts mounted on each of said holders in axially spaced planes perpendicular to said posts and parallel to said plate and intersecting said posts, each said disk having a displaceable axis of rotation and being offset to each be in a bridging position with a common post and a different one of the two adjacent posts, spring means for urging said contacts

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against said posts; and handle means for rotating said housing.

2. A multicontact switch comprising: a stationary insulating plate; a plurality of parallel and circular arranged contact posts extending axially from said plate; an electrical insulating contact housing rotatably mounted on said plate on an axis parallel to said posts and centrally located within the space defined by said posts, said housing having a pair of diametrically disposed electrical insulating contact holders with spring means for urging said holders outwardly toward said posts; a pair of disk contacts mounted on each of said holders in axially spaced planes perpendicular to said posts and parallel to said plate and intersecting said posts, each said disk having a displaceable axis of rotation and being offset to each be in a biased bridging position with a common post and a different one of the two adjacent posts, and handle means for rotating said housing.

3. A multicontact switch comprising: a stationary insulating plate; a plurality of parallel and circular arranged contact posts extending axially from said plate; an electrical insulating contact housing rotatably mounted on said plate on an axis parallel to said posts and centrally located within the space defined by said posts, said housing having a pair of diametrically disposed electrical insulating contact holders with spring means for urging said holders outwardly toward said posts; a pair of disk contacts mounted on each of said holders and axially spaced planes perpendicular to said posts and parallel to said plate and intersecting said posts, each said disk having a displaceable axis of rotation and being offset to each be in a biased bridging position with a common post and a different one of the two adjacent posts, some of said posts being electrically insulated in the plane of only one layer of said disks; and handle means for rotating said housing.

4. A multicontact switch comprising: a stationary insulating plate; a plurality of parallel and circular arranged contact posts extending axially from said plate; an electrical insulating contact housing rotatably mounted on said plate on an axis parallel to said posts and centrally located within the space defined by said posts, said housing having a pair of diametrically disposed contact holder seats; each said seat loosely containing an electrical insulating contact holder with spring means disposed therebetween for urging said holder outwardly toward said posts; a pair of disk contacts mounted catercornered on said holder in axially spaced planes perpendicular to said posts and parallel to said plate and intersecting said posts, each said disk having a displaceable axis of rotation and being offset to each be in a biased bridging position with a common post and a different one of the two adjacent posts, and handle means for rotating said housing.

5. A multicontact switch comprising: a stationary insulating plate; a plurality of parallel and circular arranged contact posts extending axially from said plate; an electrical insulating contact housing rotatably mounted on said plate on an axis parallel to said posts and centrally located within the space defined by said posts, said housing having a pair of diametrically disposed contact holder seats; each said seat loosely containing an electrical insulating contact holder with spring means disposed therebetween for urging said holder outwardly toward said posts; a pair of disk contacts mounted catercornered on said holder in axially spaced planes perpendicular to said posts and parallel to said plate and intersecting said posts, each said disk having a displaceable axis of rotation and being offset to each be in a biased bridging position with a common post and a different one of the two adjacent posts, portions of some of said posts being electrically insulated from said disks; and handle means for rotating said housing.

6. A multicontact switch comprising: a stationary insulating plate; a plurality of parallel and circular arranged contact posts extending axially from said plate; an elec-

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trical insulating contact housing rotatably mounted on said plate on an axis parallel to said posts and centrally located within the space defined by said posts, said housing having a pair of connected spaced faces parallel to said plate with a pair of diametrically disposed recessed seats defined therebetween; each said seat loosely containing an electrical insulating contact holder with spring means disposed therebetween for urging said holder outwardly toward said posts; a pair of disk contacts mounted on a diagonal line on said holder adjacent and parallel to said faces, each said disk being rotatably mounted on an undersized member for providing a displaceable axis of rotation, each said disk being in a biased bridging position with a common post and a different one of the two adjacent posts, and handle means for partially rotating said housing.

7. In combination with a transformer enclosed in a tank a dual voltage switch comprising: a stationary insulating plate mounted on said tank; a plurality of parallel and circular arranged contact posts extending axially from said plate some of said posts being connected to a transformer winding; an electrical insulating contact housing rotatably mounted on said plate on an axis paral-

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lel to said posts and centrally located within the space defined by said posts, said housing having a pair of connected spaced faces parallel to said plate with a pair of diametrically disposed recessed seats defined therebetween; each said seat loosely containing an electrical insulating contact holder with spring means disposed therebetween for urging said holder outwardly toward said posts; a pair of disk contacts mounted on a diagonal line on said holder adjacent and parallel to said faces, each said disk being rotatably mounted on an undersized member for providing a displaceable axis of rotation, each said disk being in a biased bridging position with a common post and a different one of the two adjacent posts, and handle means for partially rotating said housing.

References Cited in the file of this patent

UNITED STATES PATENTS

2,231,627	Jansen	Feb. 11, 1941
2,753,432	Long et al.	July 3, 1956
2,847,522	Bernard	Aug. 12, 1958

FOREIGN PATENTS

859,044	Great Britain	Jan. 18, 1961
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