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TAP CHANGING APPARATUS WITH WAVE-SHAPED CONTROL MEANS AND ROLLER SELECTOR ARM STRUCTURE

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Fig. 1

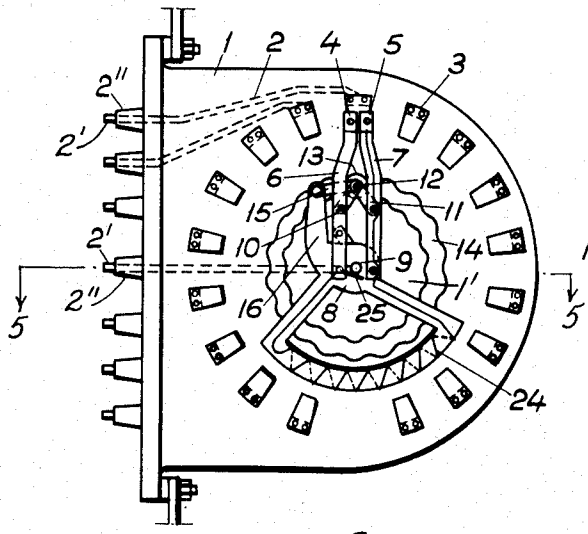


Fig. 2

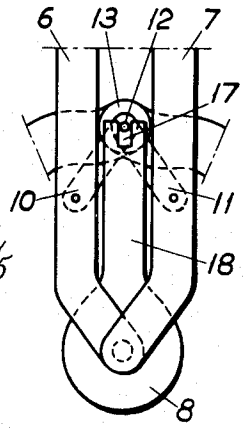


Fig. 3

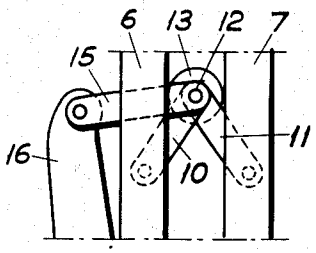
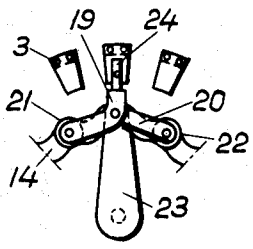


Fig. 4



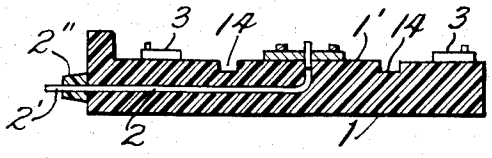


Fig. 5

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TAP CHANGING APPARATUS WITH WAVE-SHAPED CONTROL MEANS AND ROLLER SELECTOR ARM STRUCTURE

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2 Claims. (Cl. 200—11)

On-load tap-changers for example for tapped transformers are used to switch directly under load to the transformer taps, for which is used either a tap selector in combination with a diverter switch or a tap selector arranged to also manage the breaking function, a so-called selector switch.

It is previously known to build one-axle selector switches, in which both the selector arms are displaced a certain angle in order to be able to make a switch from one position to another with simultaneous movement without interruption and without short-circuiting of neighbouring outlets. It is also known to make two-axle selector switches, in which both the selector arms move alternately, each maneuvered by its own axle. It is well known that the normal one-axle selector switch requires a relatively large space as it must be supplied with at least two parallel-connected fixed contact paths. The two-axle selector switch does not require so large a space as the one-axle one but on the other hand is mechanically very complicated. By means of the present invention an on-load selector switch is obtained which from the point of view of performance and space is comparable with a two-axle selector switch even though it has only one axle. This depends, inter alia, on one being able to decrease the contact width of a selector switch according to the invention considerably in relation to previously known selector switches.

The selector switch according to the invention contains fixed contacts arranged along a path, electrically insulated from each other and preferably intended for connection to terminals of a tapped transformer. Along this fixed contact path a contact is movable. The invention is characterised in that the movable contact is composed of two parts movable in relation to each other, which, during a change over movement without current break of the movable contact from one fixed contact to another, are arranged to carry out simultaneously in counter-phase to each other a to-and-fro movement superimposed on the change over movement.

According to a suitable embodiment of the invention, each respective contact section is supported by a selector arm which is pivotally arranged on a carrier or on the driving axle of the carrier. Between the contact section and the point of connection to the carrier, the selector arms in a preferred form are joined to each other by means of two movable links connected together, their connection point being joined to a roller moving with the carrier. The roller is, during a change-over movement, driven by the carrier along a wave-shaped control means, the roller thereby being given a wave-shaped movement which is transferred over the links to the selector arms which thereby obtain the to-and-fro movement superimposed on the rotating movement.

According to a specially suitable embodiment the fixed contacts are arranged in a circular path on a selector board and the carrier is mounted in the centre of this path. The roller attached to the selector arms is arranged so that, when the carrier turns round the center, the roller is moved along a wave-shaped control slot arranged concentrically with the circular path. The selector board is

manufactured by casting, e.g., of araldite, the control slot being shaped directly in the selector board.

The invention is best understood by reference to the attached figures.

FIGURE 1 shows a complete selector switch according to the invention.

FIGURES 2 and 3 are detail drawings which show how the axle of the roller is influenced by the carrier. FIGURE 4 is another embodiment of the invention, where each selector arm is supplied with its own control roller.

FIGURE 5 is a cross-section on the line 5—5 of FIGURE 1.

In FIGURES 1 and 5, 1 indicates the selector board cast for example of araldite, in which conduits 2, terminal connections 2' and leading-through insulators 2'' are directly cast. On the selector board 1 the fixed contacts 3 are arranged in a circular path. The contacts 3 are electrically insulated from each other and arranged at substantially equal distances from each other. Each connection 2 is connected to a corresponding contact 3 with the exception of connection 2c which is connected by the center axle 9 to the movable contact. The movable contact is divided into two sections, namely 4 and 5. The section 4 is supported by a selector arm 6 of metal and the section 5 by a selector arm 7 of insulating material. In the centre of the circular path is a carrier 8, also of insulating material, mounted on centre axle 9. The selector arms 6 and 7 are pivotally arranged in the carrier on each side of the centre axle 9 and connected by means of two movable links 10 and 11. The links are joined by an axle 12 on which a roller 13 is mounted. The roller runs in a wave-shaped slot 14 arranged concentrically with the circular path which is formed by the fixed contacts 3. The centre part of the selector board inside said slot 14 is indicated as 1. The axle 12 of the roller is connected by a link 15 to an arm 16 forming part of the carrier 8. The carrier 8 also supports a changeover resistance 24, which is connected by conductors between contacts 4 and 5. The selector section 6 is provided with a slip contact 25 which rests against the centre axle 9 and thereby connects contact 4 to the centre axle 9 and the connection 2'. FIGURE 3 shows this part of FIGURE 1 enlarged. FIGURE 2 shows a somewhat different design of this detail. Here the link 15 has been replaced by a slot 17 in the carrier arm 18. The axle 12 is movable in the slot 17 in the radial direction. The selector arms here are mounted on the driving axle of the carrier.

When the carrier 8 is turned for achieving a changeover without a current break from fixed contact 3 to another, roller 13, running in the slot 14, gets a radial movement in addition to its circular movement. In the initial position for change-over movement both the contact sections 4 and 5 lie against the same fixed contact 3 and at the same time they are as near each other as possible because the roller 13 is resting against a wave-top, that is to say is situated as far as possible from the centre axle 9. If the carrier 8 is now turned, e.g., in a counterclockwise direction, the roller 13 is moved down into a wave trough in the slot 14 and approaches the centre axle 9. Since the links 10 and 11 are rigid the selector arms 6 and 7 are thereby pushed away from each other, i.e., the distance between the contact sections 4 and 5 increases. The turning speed of the contact section 4 increases in this way by a certain amount while the turning speed of the contact section 5 decreases by the same amount. The control slot 14 is so formed that this increase or decrease in the speed of the contact sections has the results in that the contact section 4 reaches the fixed contact lying nearest to the left before the contact section 5 has left the fixed contact 3 from which changeover started. When the contact section 4 has reached this position its turning speed

has decreased, while at the same time the turning speed of contact section **5** has increased. The contact **4** will in this way have been caught up to by the contact section **5** when the change-over is completed and the contact sections again make contact with the same fixed contact.

FIGURE 4 again shows another embodiment of the selector switch. Here the selector arms **19** and **20** are each provided with a roller **21** and **22**. The selector arms are bent at an angle and at the bending point are pivotally supported on both sides of the carrier **23**. The selector arm **19** carries the contact section **24** and the selector arm **20** carries a contact section not shown. The rollers **21** and **22** run in the slot **14** on both sides of the carrier arm **23**. If the carrier arm **23** is now turned in one direction or another for completion of a change over movement the same phenomenon is obtained as described earlier for the embodiment shown in FIGURE 1, i.e., the one contact section is given an increased turning speed in relation to the other, by means of which this contact section reaches the next fixed contact before the other contact section has left the first contact from which changeover starts.

I claim:

1. A transformer tap changing structure, comprising a selector board, a plurality of fixed contacts arranged along a circular path on said selector board and electrically insulated from each other to be connected to terminals of a tapped transformer, a carrier mounted to turn about the centre of said circular path, two selector arms pivoted on said carrier, two contact sections, one carried by each of said two selector arms, engageable with said fixed contacts, said selector board having a wave-shaped control means arranged concentrically to said circular path, roller means, said roller means engaging said wave-shaped control means, means operatively connecting said carrier to said roller means to cause said roller means to move around the center of the circular path with the carrier, and links connected to each of said selector arms and to the axis of said roller means.

2. A transformer tap changing structure, comprising a selector board, a plurality of fixed contacts arranged along a circular path on said selector board and electrically insulated from each other to be connected to terminals of a tapped transformer, a carrier mounted to turn about a shaft in the centre of said circular path, two adapter arms pivoted on said carrier, two contact sections, one carried by each of said two selector arms, engageable with said fixed contacts, said selector board having a wave-shaped control means arranged concentrically to said circular path, roller means, said roller means engaging said wave-shaped control means, each of said movable contact parts being arranged on one end of each of said selector arms, said roller means including rollers, one mounted on the other end of each of said selector arms, said rollers being arranged to move along said wave shaped control means when said carrier is moved about its shaft.

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