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MULTIPLE TAP DEVICE FOR TRANSFORMERS

Filed April 19, 1968

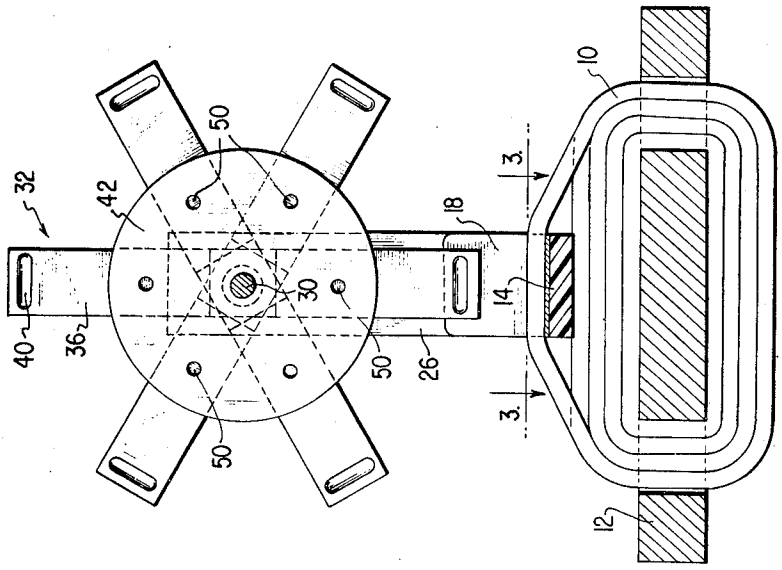



FIG. 2

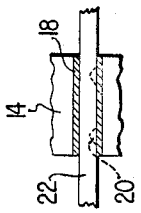



FIG. 3

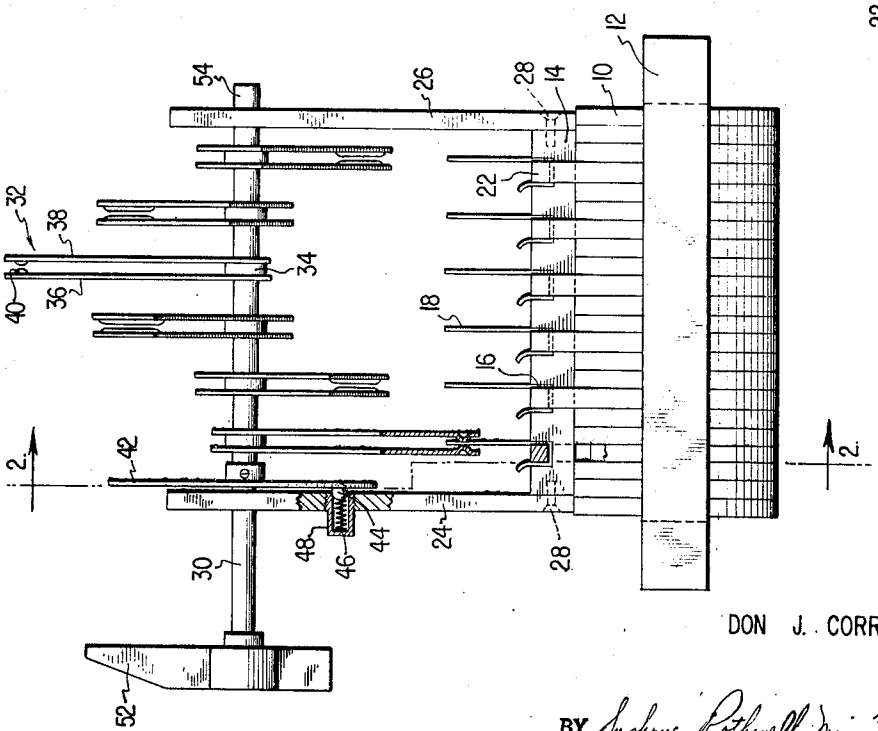



FIG. 1

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# MULTIPLE TAP DEVICE FOR TRANSFORMERS

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U.S. Cl. 336—150 2 Claims

## ABSTRACT OF THE DISCLOSURE

An arrangement for tapping a multiturn conductor wound on a core such as used for arc welding transformers in order to make an adjustable voltage transformer includes a coil with multiple turns wound in a package on a core with selected ones of the turns wound also over a grooved insulator block extending axially of the core so that a portion extends outwardly of the package. Conductive clips are positioned in the grooves so as to be affixed to the insulator blocks and under the conductors so as to be in conductive contact therewith. The clips extend outwardly. A rotary connector member includes a contact assembly with connector arms for engaging the clips as the connector assembly is rotated and thereby selecting desired turns of the coil for a connection.

## BACKGROUND OF THE INVENTION

### Field of the invention

This invention relates to multiple tap devices for tapping into a coil of wire at selected points along the length thereof.

### Prior art

The acceptable prior art method of making adjustable voltage transformers at the present time is by either using brushes which are slidable along a carefully prepared winding or by physically bringing wires out of the transformer coil at the desired tap points.

The former method, above, requires that the transformer be carefully wound with the individual turns of the conductor lying in a very uniform manner with respect to each other. The turns of the conductor are then cleaned of any insulation and smoothed to eliminate any unevenness. A brush assembly having a slider operated by a lead screw is then constructed and arranged relative to the transformer coil so that the brushes which are similar to carbon electric motor brushes make a sliding and continuous contact along the transformer winding. While this form of variable voltage transformer is very good in that a continuous control is obtained, such an arrangement has several disadvantages. The brushes usually represent a high resistance and there is appreciable heat which places limitations on the capacity as well as producing a loss of efficiency. This type of construction must also accommodate for the possibility of circulating current when the brushes are in contact with two turns of the winding simultaneously. The whole process is quite critical and a great deal of care is needed in the construction of the coil.

The second method of making a tapped transformer is to bring out taps from the coil at the desired location. This involves much work and wiring if a selector switch is to be used. When making many taps, the procedure become costly. It is common practice with heavy currents, such as in welding transformers, to braze the transformer taps to the winding conductor. A second way is to make multiple windings and externally connect these to produce the equivalent of tap points. In either case, a considerable expenditure of time and money is required.

## SUMMARY OF THE INVENTION

The multiple tap device for transformers, according



to the present invention, provides an easy and economical manner of making taps for a transformer coil and at the same time provides simple and efficient tap changing means.

The present invention is especially suited to handling high currents and applications where a large number of consecutive or nearly consecutive taps are required, such as in the welding art.

The present inventon provides a coil having a plurality of taps without having to treat the turns of the coil in any special manner or to braze taps at specific locations to the winding conductor. The taps, according to the present invention, are formed concurrently with the winding of the coil and are sufficiently isolated from each other so that successive taps can be made without overlapping.

Other features of the invention will be pointed out in the following description and claims and illustrated in the accompanying drawings, which disclose by way of example, the principles of the invention and the best mode which has been contemplated of applying those principles.

## BRIEF DESCRIPTION OF THE DRAWINGS

FIGURE 1 is a side elevational view, partly in section, showing the multiple tap device for a transformer;

FIGURE 2 is a sectional view along the line 2—2 in FIGURE 1 and

FIGURE 3 is a sectional view along the line 3—3 in FIGURE 2.

## DETAILED DESCRIPTION OF THE INVENTION

A transformer coil **10** having a plurality of turns is wound about a core member **12**. An elongated insulating block member **14** is provided with a plurality of notches **16** in the upper surface thereof in each of which is mounted a J-shaped contact clip **18**. The clips **18** may be molded or pressed into their respective notches **16** or may be merely secured thereto by rivets, screws or the like. Each of the clips **18** is constructed from a hard conductive material such as beryllium copper and may be provided with dimples or other suitable projections **20** in the bight portion thereof to bite into a wire for good contact.

In constructing the coil **10** the block **14** is placed in position on a winding machine and selected winding turns **22** of the coil **10** on which a tap is to be made are then brought over the block **14** and positioned over a specific clip **18** in the block. If the selected turn of wire **22** is insulated, it is best to strip the insulation from the wire and thereafter press or dirve the wire into the bight of the J-shaped clip **18**. Each consecutive tap on the transformer winding is made in the same manner.

After the coil **10** is completely wound about the core **12** and the block **14**, a pair of shaft supporting end plates **24** and **26** are secured to the ends of the insulating block **14** by any suitable means such as screws **28** or the like. A shaft **30** is rotatably journaled through the openings in the plates **24** and **26** and is disposed parallel to the insulating block **14** and the axis of the coil **12**. A plurality of contact assemblies, one of which is generally indicated at **32** in FIGURE 1, are secured to the shaft **30** at spaced locations along the length thereof. The number of contact assemblies **32** correspond in number to the number of contact clips **18** secured to the insulating block **14**. Each assembly **32** is comprised of a hub **34** and and a pair of resilient contact arms **36** and **38** secured thereto. The resilient contact arms **36** and **38** of each assembly extend radially outwardly from the shaft and each assembly is angularly spaced from each and every other contact assembly so that only one contact assembly **32** will contact a clip **18** at a time. In the present example, six contact assemblies **32** are mounted on the shaft **30** and are angularly

spaced from the adjacent contact assembly by an angle of 60° in a progressive relationship so that upon rotation of the shaft **30** each contact assembly **32** will engage its respective clip **18** in sequence from left to right as viewed in FIGURE 1. Each contact arm **36** and **38** is provided with a projection or dimple **40** to aid in making a positive contact with the clip **18**.

An indexing plate **42** may be secured to the shaft **30** adjacent the support plate **24**. A spring bias ball detent assembly comprised of a ball **44**, a spring **46** and a socket member **48** is mounted in the support plate **24**. The ball **44** is biased into engagement with the indexing plate **42** for locking engagement with detents **50** arranged in a circle on said plate. Each detent **50** is positioned angularly relative to the shaft **30** corresponding to the angular position of a respective contact assembly **32**.

A handle **52** is secured to one end of the shaft **30** to provide for manual rotation of the shaft **30** to sequentially engage the contact assemblies **32** with their respective contact clips **18**. A suitably programmed power driven arrangement could also be substituted for the handle **52** to automatically index the shaft **30** to the predetermined connection. A common switch terminal **54** may be connected to the end plate **26** in common conducting relation to each of the contact assemblies **32** through their respective hubs **34** and the common shaft **30**.

Thus, it is seen that the method of making the present tapped transformer is very fast and efficient. On large coils of heavy conductors, it is nearly as fast as winding a coil alone. The clips **18** provide a heat sink for the windings and there are no circulating currents since each position can be made non-shorting. There is no special coil preparation necessary such as smoothing and polishing and the contact elements **36**, **38** and **18** can all be of low resistance, making the tapping arrangement efficient and capable of high currents. No leads come out of the transformer which require a multitude of connections at each tap. There are many uses for a multiple tap arrangement such as that shown in the present application, including tapped reactors, tapped stabilizers, tapped slope reactors, tapped transformers, battery chargers and the like.



What is claimed is:

**1.** A multiple tap arrangement for tapping a multiturn coil conductor wound on a core such as used as in arc welding transformer by tapping selected turns of the coil to provide a variable voltage transformer, the arrangement comprising: a coil having multiple turns wound in a package on a core with selected turns also wound over an insulator block extending axially of the coil so that a portion of each such selected turn protrudes from the outline of the package along one surface thereof, a plurality of conductive clips, each clip affixed to the insulator block and in conductive contact with the protruding portion of each selected turn, a connector member mounted adjacent the package and including a contact assembly rotatably mounted on an axis parallel to the coil, axially spaced connector arms extending from the rotatable contact assembly and extending outwardly, the rotatable contact assembly being radially outward of the coil package at the protruding surface portion thereof so that the connector arms may selectively contact and electrically connect the conductive clips on rotation of the contact assembly.

**2.** A multiple tap arrangement as in claim **1** wherein the insulating block has transverse grooves therein for positioning the selected turns, and the conductive clips are positioned in the transverse grooves with a portion of each clip underneath the corresponding protruding turn and another portion of each conductive clip extending outwardly of the coil radially toward the contact assembly.

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