April 27, 1965 H. V. DORN ETAL 3,180,583

SLIDERS FOR TOROIDAL COIL WINDING MACHINES

Filed March 20, 1963 3 Sheets-Sheet 1

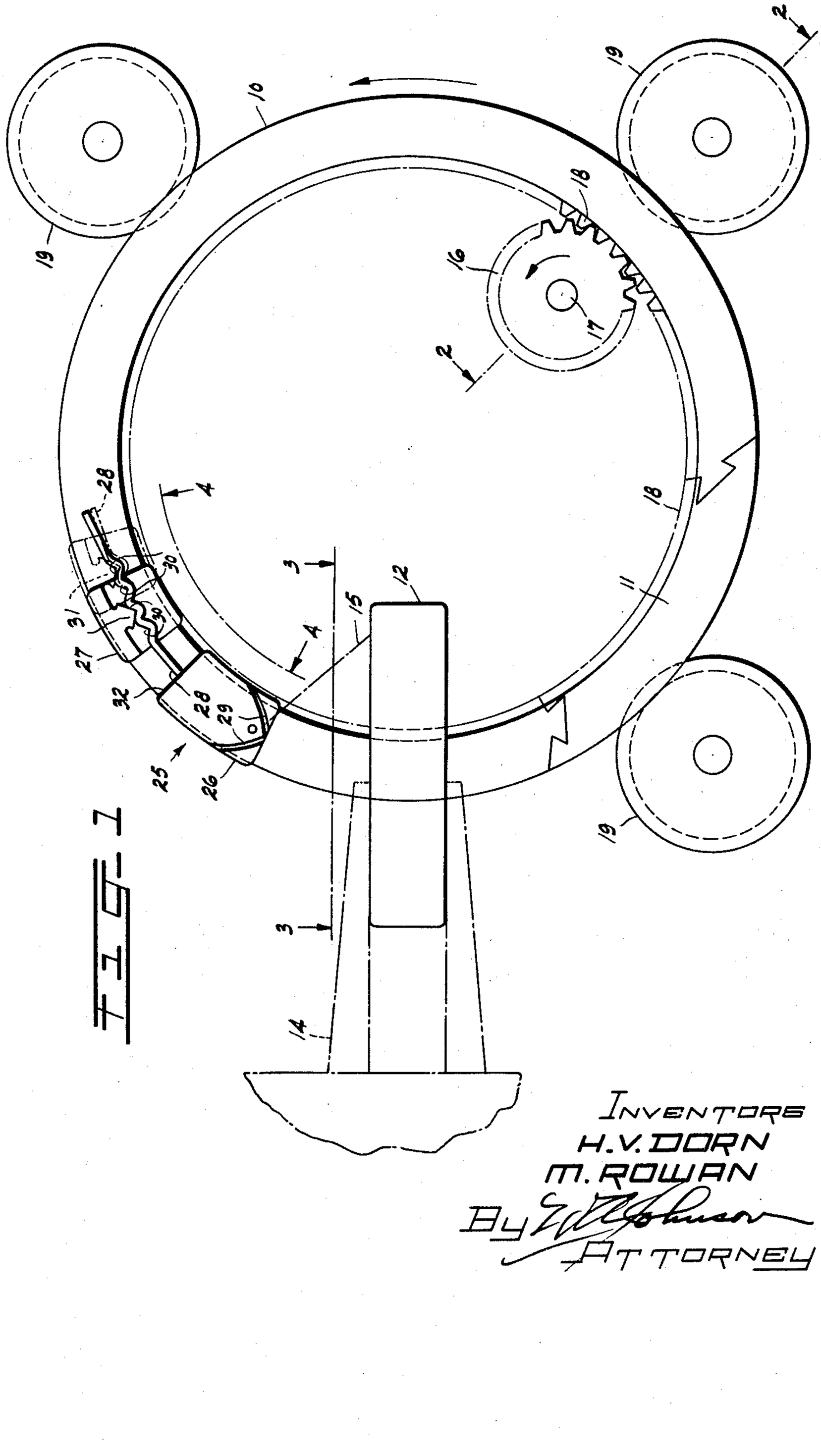

FIG. 1

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FIG 2

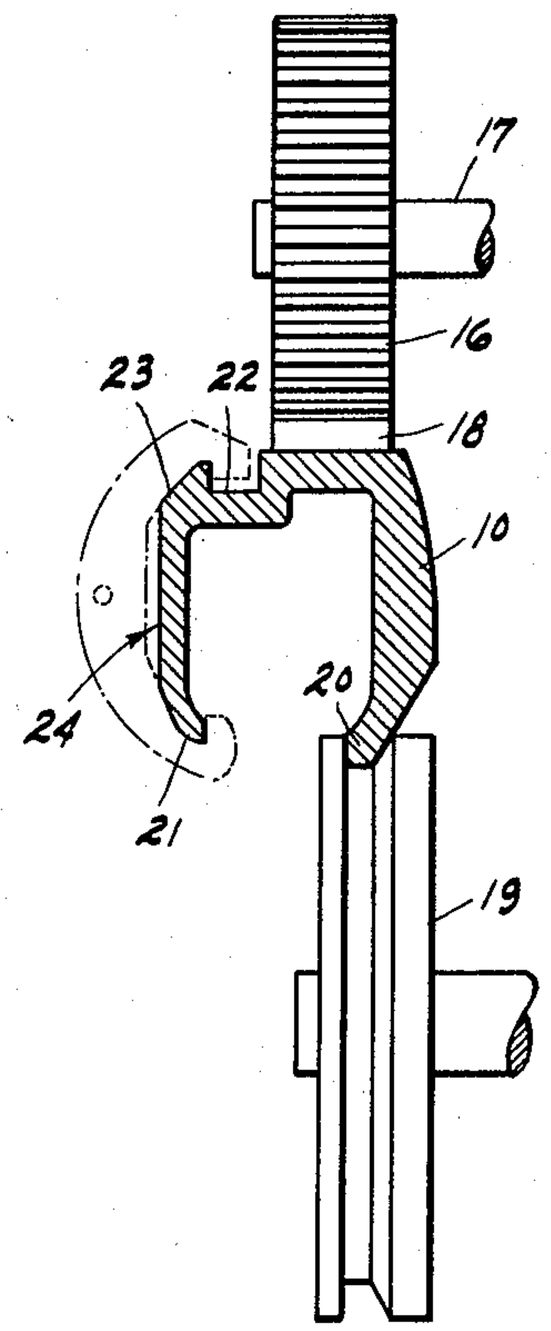
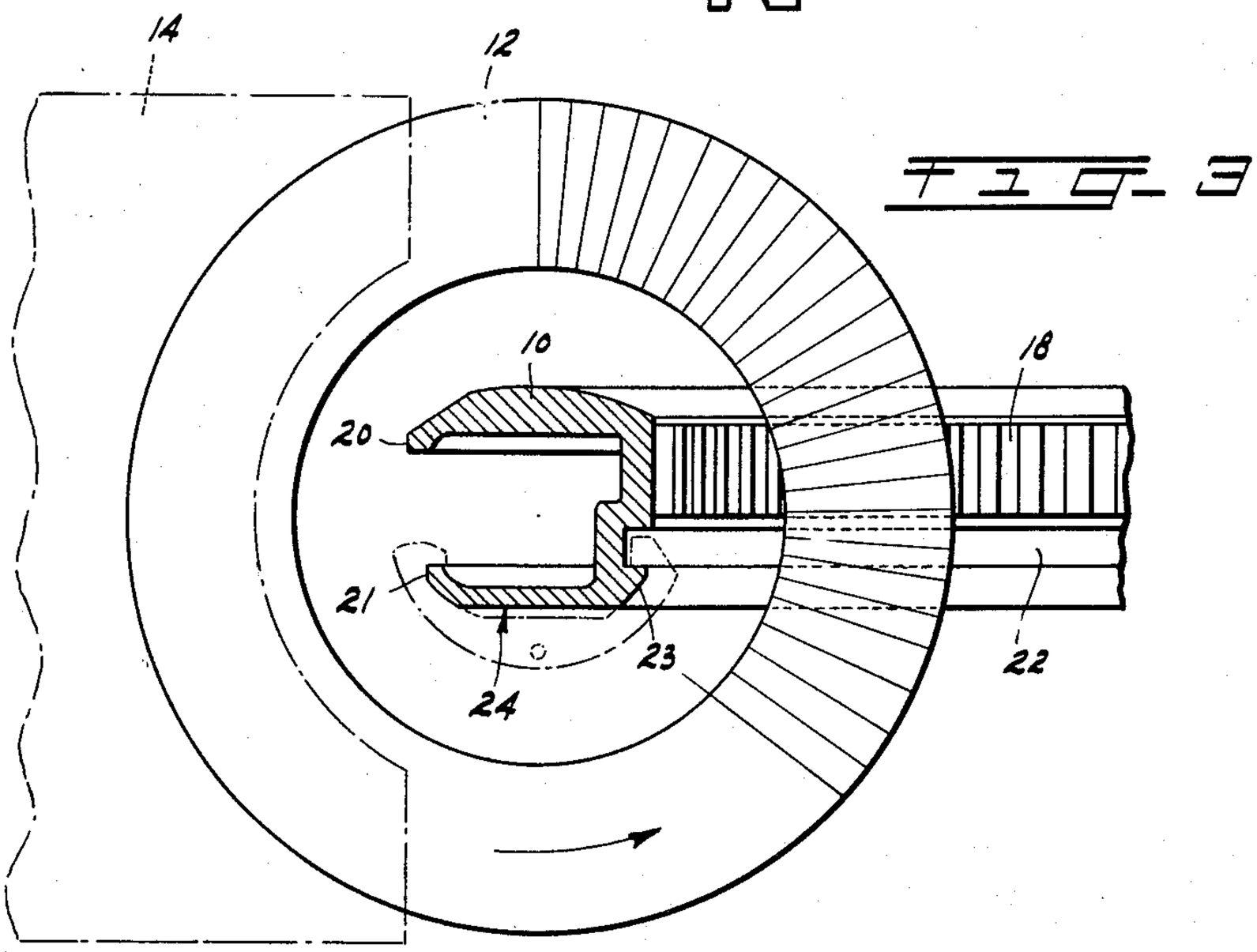


FIG 3



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SLIDERS FOR TOROIDAL COIL WINDING MACHINES

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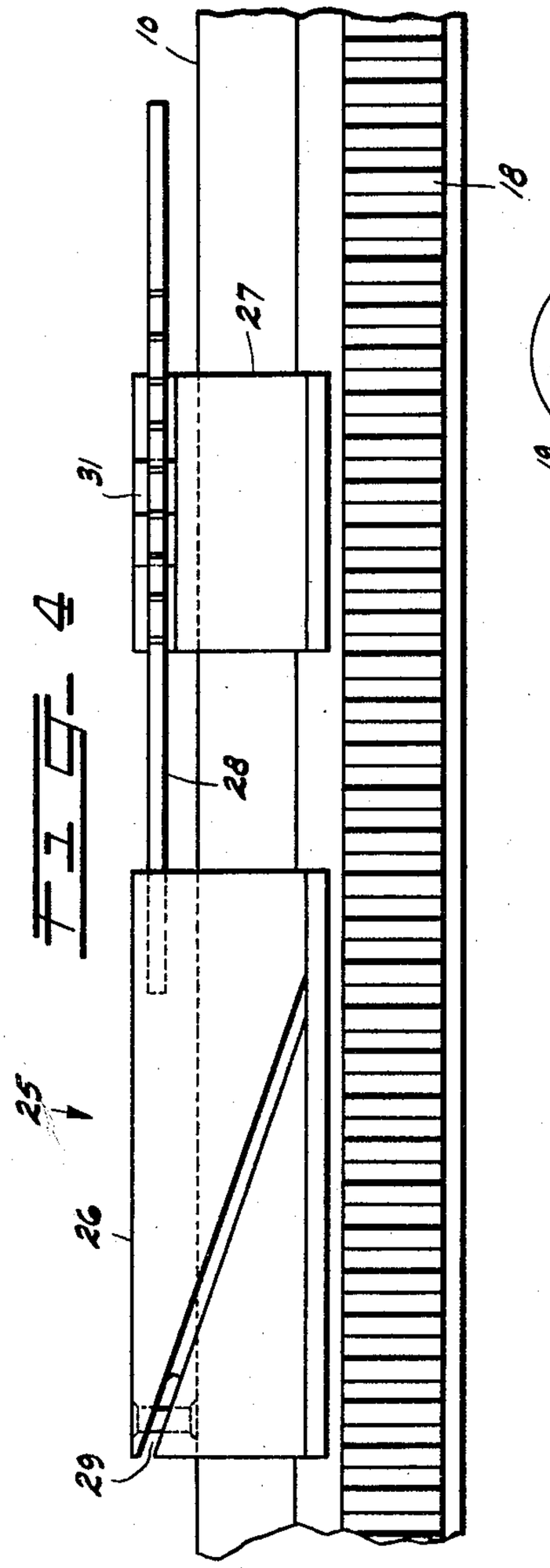

FIG. 4

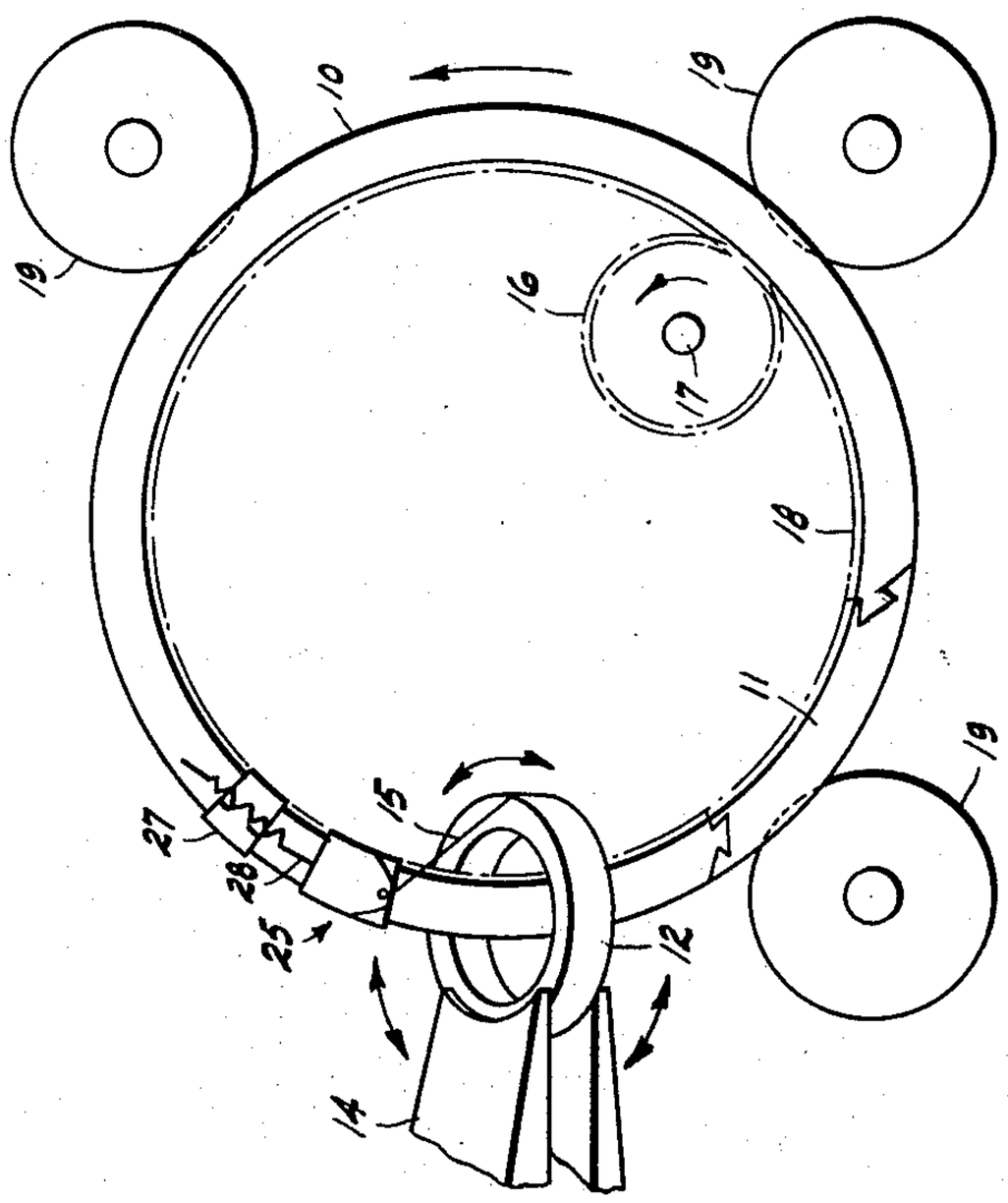

FIG. 5

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SLIDERS FOR TOROIDAL COIL WINDING MACHINES

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Filed Mar. 20, 1963, Ser. No. 266,686
3 Claims. (Cl. 242—4)

This invention relates to sliders for toroidal coil winding imachines, particularly sliders of the wire tension control type.

In toroidal coil winding machines, annular shuttles preloaded with wire to be wound on toroidal cores are provided with sliders mounted thereon which are movable on tracks in the shuttles for guiding the wires on to the cores during the winding operation. In machines of this type, there have been problems in controlling tension on the wires as they are being guided by the sliders moving with and relative to the shuttles to wind uniform lays of wire on the toroidal cores.

An object of the present invention is to provide a slider for a toroidal coil winding machine which is highly efficient in controlling the tension of wires of various sizes being wound about toroidal cores.

In accordance with the object, the invention comprises a shuttle for a toroidal coil winding machine having an annular track with a slider assembly mounted on the track. The slider assembly includes a wire guide, a following element, and resilient means for connecting the wire guide to the following element in one of a plurality of positions for imparting forces of varying magnitudes to the wire guide in order to control the tension on the wire being wound by changing the frictional engagement of the wire guide with the track.

Other objects and advantages will be apparent from the following detailed description when taken in conjunction with the following drawings wherein:

FIG. 1 is a side elevational view of portions of a toroidal coil winding machine illustrating the slider;

FIG. 2 is an enlarged fragmentary sectional view taken along the line 2—2 of FIG. 1;

FIG. 3 is an enlarged sectional view taken along the line 3—3 of FIG. 1;

FIG. 4 is an enlarged fragmentary sectional view taken along the line 4—4 of FIG. 1; and

FIG. 5 is a schematic illustration of the structure shown in FIG. 1 illustrating with arrows the direction of movements of certain parts.

The toroidal coil winding machine selected to illustrate the invention includes an annular shuttle **10** of the cross-sectional contour shown in FIGS. 2 and 3, the shuttle having a removable segment **11** whereby the shuttle may be opened to permit the removal of a wound core **12** from its clamp **14** and the insertion of a new core therein in a conventional manner. After the new core is mounted in the clamp **14**, a supply of wire **15** is wound on shuttle **10** by attaching one end of the wire to the shuttle and then rotating drive gear **16** until the supply of wire is completely taken up on the shuttle. Drive gear **16** is mounted on a drive shaft **17** and inter-engages ring gear teeth **18** on the inner periphery of the shuttle **10**. The shuttle **10** is supported on grooved rollers **19**, which receive a first lip **20** on the periphery of shuttle **10**. Shuttle **10** also includes a second lip **21** on the outer periphery thereof which in conjunction with an annular groove **22** and a third lip **23**, disposed at the inner periphery of the shuttle, provides an annular track **24** which forms a continuous support for a slider assembly indicated generally at **25**.

The slider assembly **25** includes a wire guide **26** formed to ride on the track **24**, a follower **27** also formed to ride

on the track and a connecting element **28** therebetween. The wire guide **26** has grooves **29** therein through which the wire **15** is fed from the shuttle **10** to the core **12**. Both guide **26** and follower **27** have arcuate longitudinal contours that are similar to the contour of shuttle **10**, so that there would be a minimum of frictional drag therebetween if the guide and follower were allowed to slide independently of each other on track **24**.

The connecting element **28** is provided with a plurality of pockets **30** formed by an undulated path in a portion of the element, the pockets being operable to selectively receive a locating member **31**, which is integral with the follower **27**. Prior to the connection of the follower **27** with the element **28**, the element in general is disposed perpendicularly to surface **32** of the guide **26**. Furthermore, the connecting element **28** is formed of a suitable material, such as spring steel, which has a predetermined degree of resiliency to create variable forces tending to twist the guide **26** from its natural path on the track with a force that is dependent upon the pocket **30** in which the member **31** is disposed to vary the frictional drag of the guide **26** on the track of the shuttle.

Operation

In winding wire coils on toroidal cores such as the core **12**, the tension on each wire depends largely upon the size of the wire being wound and when the same machine is utilized to wind coils of various types with wires of various sizes, it is important that the slider assembly **25** be readily adapted to vary the tensions on the wires. Although only four positions have been shown for connecting the follower **27** through pockets **30** with the connecting element **28**, it is apparent that element **28** may be equipped with a large number of pockets, providing for a large number of variable connections. This will enable an operator to choose from a wide range of frictional engagements between guide **26** of slider assembly **25** and track **24** of shuttle **10**. The lightest tension will be created by locating the follower in the outermost pocket away from the guide **26**. As the follower **27** is moved closer to the guide **26** by selecting a pocket closer thereto, the connecting element between the follower **27** and the guide **26** becomes stiffer and causes stronger twisting on the guide **26** to increase its frictional engagement with the track. This will result in a greater force being required on the wire **15** to remove it from the shuttle and wind it on the core. The slider assembly, therefore, with its three members, the guide **26**, the follower **27** and the connecting element **28** provides a variable tension control for the wire **15** regardless of the size of the wire being wound on the core. With member **31** located as shown in FIG. 1 at the center of the follower, there will be no twisting action on the follower **27**. There is, however, a force applied to the follower through the connecting element which varies the frictional engagement of the inner portion of the follower with the inner periphery or lip **23** of the track **24**. This, coupled with the twisting action applied to the guide **26**, assists in creating varying tensions on the wire **15** depending on the connection between the follower **27** and the connecting member **28**.

It is to be understood that the above described arrangements are simply illustrative of the application of the principles of the invention. Numerous other arrangements may be readily devised by those skilled in the art which will embody the principles of the invention and fall within the spirit and scope thereof.

What is claimed is:

1. In a toroidal coil winding machine having a shuttle adapted to be loaded with wire and driven about its axis through a toroidal core, the shuttle having a circular track on one side thereof, a sliding assembly for controlling the wire tension comprising:

a wire guide supported for movement on the track and adapted to receive wire from the shuttle for winding about the core,

a resilient element with one end thereof affixed to the wire guide,

a following element supported for movement on the track in engagement with said resilient elements and operable to flex the resilient element for controlling the frictional engagement between the wire guide and the track,

a connecting member mounted on said follower, and a plurality of spaced recesses in the resilient element operable to selectively receive said connecting member so as to enable, by selection of recesses, the choice of varying degrees of flexing of said resilient element, resulting in varying braking forces on the guide by varying the frictional engagement of the guide with the track.

2. In a toroidal coil winding machine which includes a shuttle having annular track on one side thereof, and a slider assembly mounted on said track for controlling the tension of a wire being payed off said shuttle and wound about a core, which slider assembly comprises:

a wire guide mounted to freely slide along said annular track,

a following element mounted to freely slide along said annular track,

a separate resilient means extending between said wire guide and following element and biased to urge said wire guide and following element against said annular track, and

means selectively connecting said resilient means to said wire guide and following element to selectively interconnect said wire guide and said following element at predetermined spaced apart positions along said annular track for selectively imparting different predetermined frictional drags to said wire guide and the following element against said track.

3. A toroidal coil winding machine according to claim 2 wherein:

the connecting means comprises a wire having an undulated section, and

means for selectively engaging different portions of the undulated section.

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MERVIN STEIN, *Primary Examiner*.