

Jan. 19, 1965

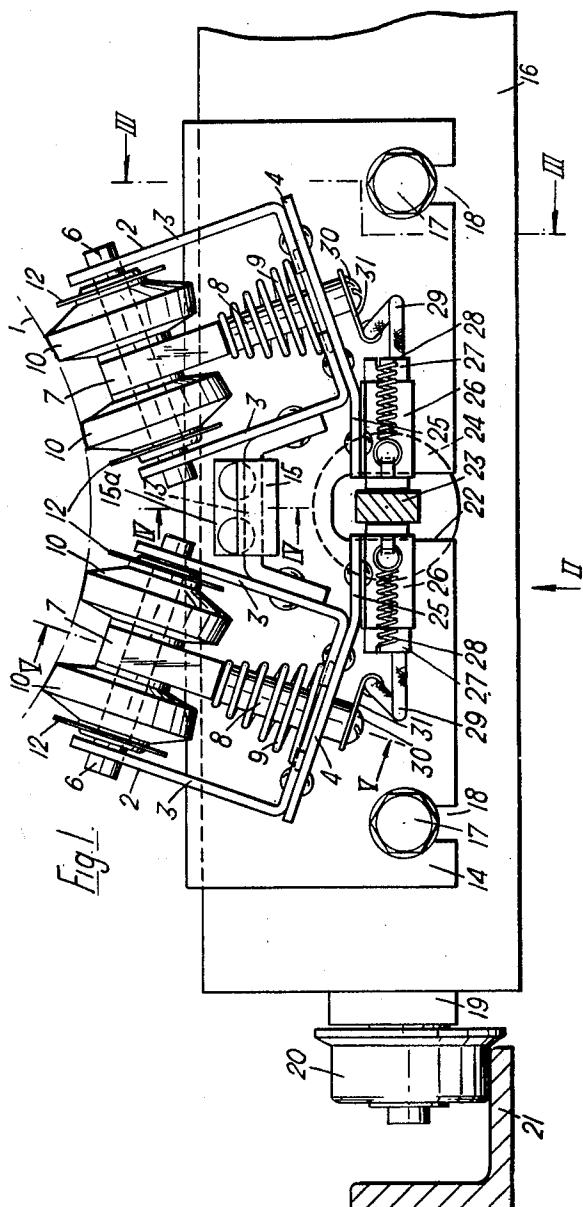
E. C. HIGGINS ET AL

3,166,368

ROLLER CONTACT DEVICE FOR ELECTRICAL COIL

Filed Dec. 4, 1962

4 Sheets-Sheet 1



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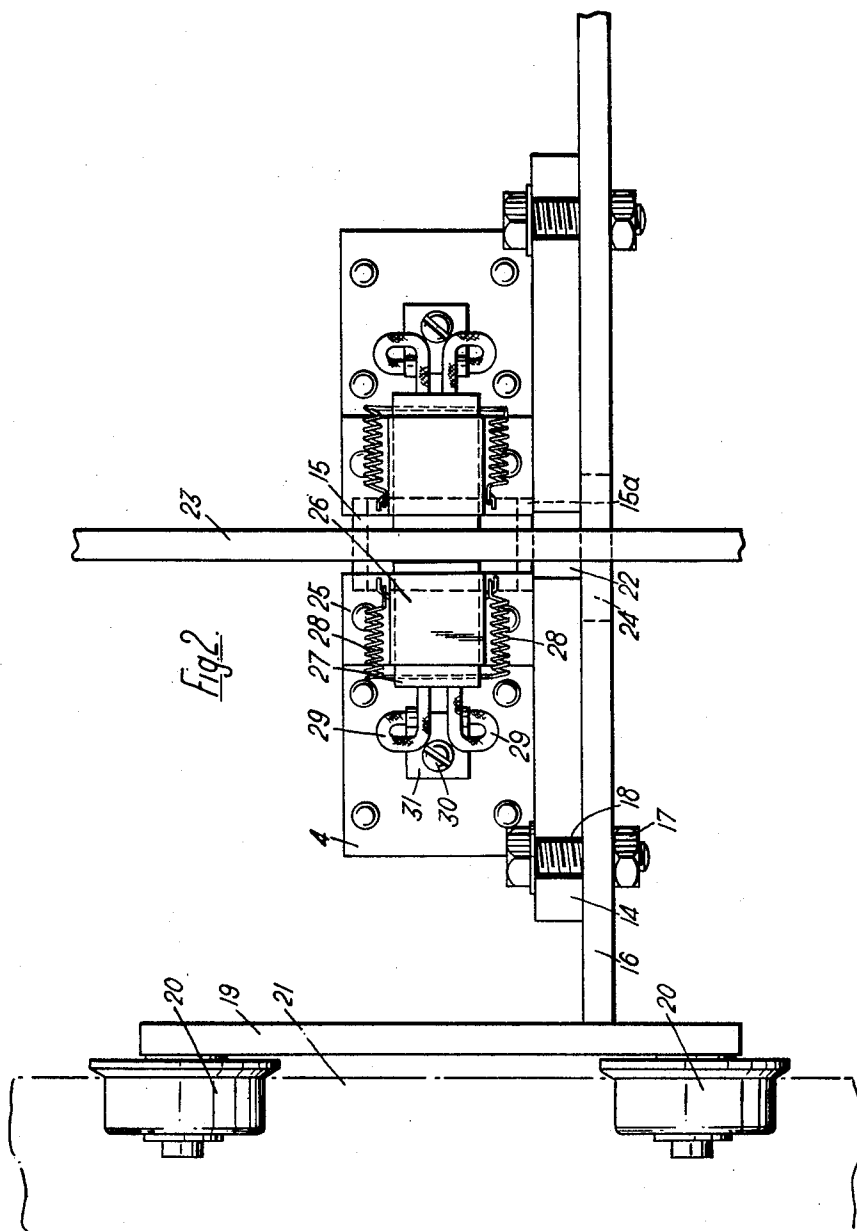
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ROLLER CONTACT DEVICE FOR ELECTRICAL COIL

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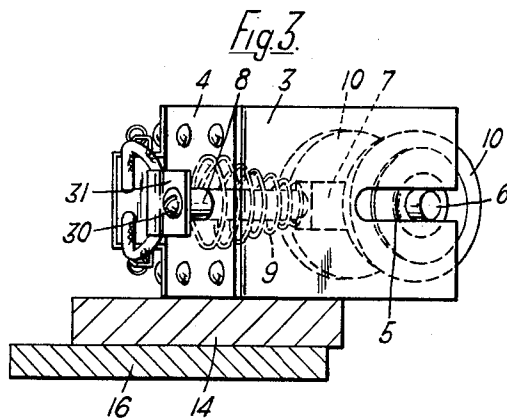
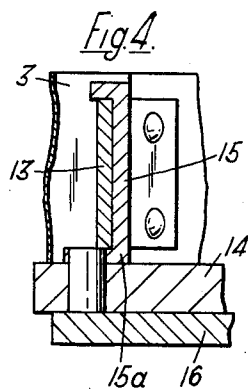
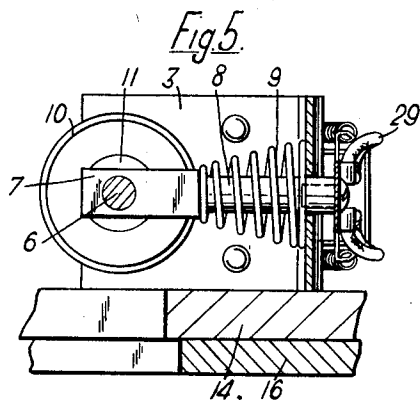
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ROLLER CONTACT DEVICE FOR ELECTRICAL COIL

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4 Sheets-Sheet 3



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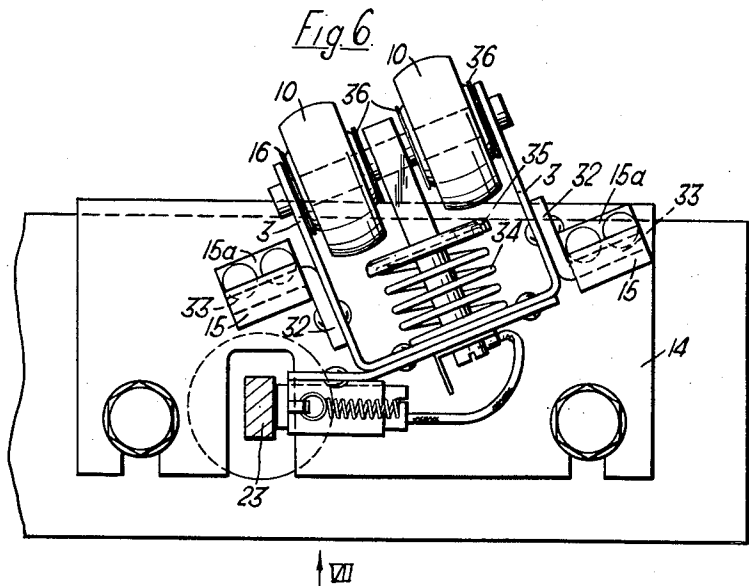
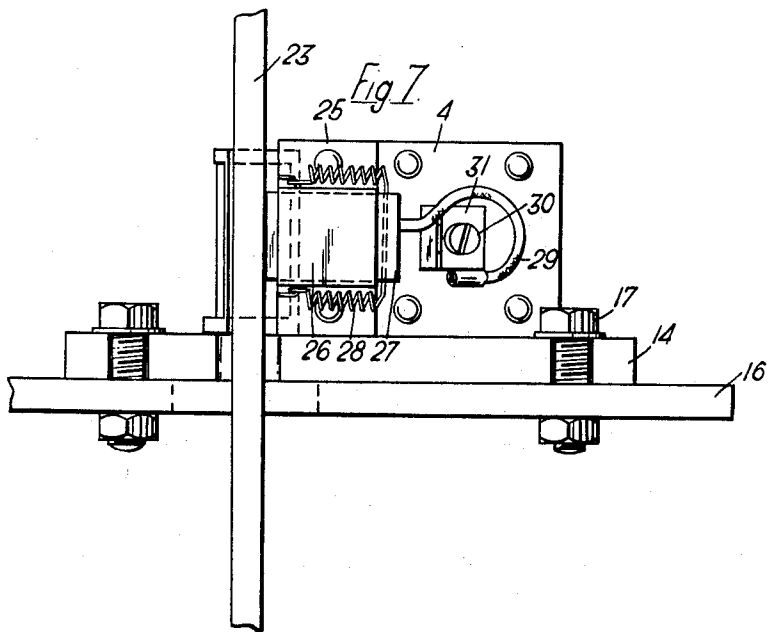
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ROLLER CONTACT DEVICE FOR ELECTRICAL COIL

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4 Sheets-Sheet 4



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3,166,368

ROLLER CONTACT DEVICE FOR ELECTRICAL COIL

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6 Claims. (Cl. 339-9)

The invention is concerned with electrical contact devices for use with variable transformers and other coils and of the kind comprising one or more contacts adapted to be moved in a path parallel to the axis of a transformer winding or other coil while being maintained in conductive contact with the turns of the coil. Such devices are generally described as voltage regulators or simply regulators.

The contact members are usually made of carbon, being commonly rollers, associated with resilient means for maintaining the required contact pressure. Also each contact device usually comprises a pair of such rollers which are co-axially arranged and so mounted that they will automatically adjust themselves so as to lie symmetrically with respect to a plane which contains the axis of the coil, the common axis of the rollers being substantially normal to that plane.

It is desirable that such contact devices be mounted in such a manner that the contact rollers or other members will remain positioned positively and accurately with reference to the surface of the coil as they move over that surface and will also be readily removable for the purpose of inspection and general maintenance. The object of the invention is to provide such a contact device which will be of comparatively simple construction and will possess the abovementioned desirable qualities.

The invention will now be further described with reference to two examples which are illustrated in the accompanying drawings wherein:

FIGURE 1 is a plan of a contact device incorporating two pairs of roller contacts.

FIGURE 2 is a view in elevation as seen in the direction of the arrow II in FIGURE 1.

FIGURE 3 is a sectional view on the line III—III in FIGURE 1.

FIGURE 4 is a sectional view on the line IV—IV in FIGURE 1.

FIGURE 5 is a sectional view on the line V—V in FIGURE 1.

FIGURE 6 is a plan view of another arrangement incorporating a single pair of roller contacts and,

FIGURE 7 is a view in elevation as seen in the direction of the arrow VII in FIGURE 6.

Referring first of all to FIGURES 1 to 5, the apparatus shown comprises two pairs of roller contacts adapted to engage the cylindrical exterior of a transformer winding, represented by the broken line 1 having its axis perpendicular to the paper in the case of FIGURE 1. The roller contact assembly will be movable, by means which is not shown and forms no part of this invention, in a direction parallel to the axis of the winding.

The arrangement incorporates two U-shaped contact-carrying frames 2, each comprising two side arms 3 riveted to a base member 4. Parts 3 and 4 are formed out of flat metal strip and the frames are so mounted, in the manner described below, that the major transverse dimension of the strips extends in a direction parallel with the axis of the winding 1. The forward end of each side arm 3 is formed with a slot 5 which is parallel-sided and is adapted to receive the end of a circular-section contact-carrying spindle 6. Mid-way along its length each spindle 6 is mounted in a metal block 7 having a

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rear rod-like extension 8, the end of the rod being slidable in an aperture located centrally in the base 4 of the U-shaped member 2. The spindle 6 is held against rotation relatively to the block 7 with which it makes a conductive joint, for instance a soldered joint. The coiled spring 9 surrounds the rod-like extension 8 and bears at its forward end against the abutment provided by the end of the metal block 7 and at its rear against the inside of the base member 4 of the U-shaped frame 2. The diameter of the spring 9 is greater at its rear end than at its forward end so that the unit structure comprising the contact-carrying spindle 6 and its mounting is permitted to have a certain degree of pivotal movement while at the same time the larger end of the spring 9 in contact with the base member 4 of the bracket 2 provides a desirable stability of the support. The rear end of the spring is conveniently located in a shallow recess in the base of the U-shaped frame.

The U-shaped frames 2 are so mounted by means described below that they are inclined to one another with their axes of symmetry extending radially with respect to the axis of the transformer winding 1.

On each spindle 6 there are rotatably mounted two carbon contact rollers 10, located one on each side of the block 7 and each formed with a central bushing 11, FIG. 5, of brass or other wear-resisting conductive metal. The outer ends of the bushings 11 are formed with relatively thin radial fins 12 which provide cooling surfaces. The blocks 7 may each also be formed with external ribs and/or recesses extending in plane normal to the axis of the spindle 6 and also serving to assist cooling. The two nearest of the sides 3 of the U-shaped brackets 2 are fastened to a locating member 13 which is in the form of a transverse web which rigidly joins the two frames 2 together and extends in a plane which is substantially parallel with the axis of the coil 1. As indicated in FIGURE 1 this locating member 13 is of an appropriate shape to maintain the frames 2 mutually inclined to one another as described above.

The contact device is mounted on an insulating flat base plate 14 by means of U-shaped bracket 15 consisting of an elongated generally U-shaped member of which one arm 15a is fixed to the base plate 14. The base of the bracket extends normal to the base plate in a plane parallel with both the coil axis and with a tangent to the coil. The bracket 15 is so arranged that the mouth of the U-shaped formation faces the forward edge of the insulating base plate 14, that is the edge which in use is nearest to the transformer winding 1. The arms or limbs of the bracket lie in parallel planes normal to the axis of the coil.

The device is attached to the base plate 14 by inserting the aforementioned locating member 13 inside the bracket 15 so that it will abut against the base of the U-shaped formation of the bracket 15 as indicated in FIGURES 1 and 4. The springs 9 tend to maintain the roller contacts 10 in engagement with the winding 1 and at the same time to press the locating member 13 firmly into place in the bracket 15. To release the device from the base plate 14 it is first necessary to displace the locating member 13 towards the transformer 11 against the spring pressure and into a position in which it is clear of the bracket 15 and can be lifted off the base plate 14.

The insulating base plate is mounted on the upper surface of a metal carrier plate 16 which constitutes part of a supporting frame. The carrier plate is associated at both ends, only one of which is shown, with a carriage 19 on which are mounted guide rollers in engagement with fixed guide rails 21 to enable the whole device to be moved in a direction parallel with the axis of the transformer winding 1 by any appropriate mechanical driving

arrangement. The base plate 14 is adjustably mounted on the carrier plate 16 by means of bolts 17 extended through open ended slots 18 in the base plate 14, the bolts serving as clamping members.

In a central position behind the bracket 15 the insulating base 14 is provided with an open-ended slot 22 through which freely extends a substantially rectangular section conductive terminal bar 23. This bar 23 also extends freely through an opening 24 in the lower carrier plate 16. The bar 23 will be supported by means which are not shown and which do not constitute part of this invention. The base members 4 of the U-shaped roller-supporting frames 2 are formed with extensions 25 which project towards one another and in mutual alignment behind the bracket 15. Each extension 25 has mounted on its rear face and has conductive engagement with a short open-ended rectangular-section tubular brush holder 26 adapted to receive a corresponding rectangular-section brush 27. Tension springs 28 anchored to the brush holders 26 and engaging the outer ends of the brushes 27 urge the brushes into conductive contact with opposite faces of the terminal bar 23. To the rear end of each of the rod-like extensions 8 there is attached by means of a screw 30 a terminal tag 31 and the terminal tags are connected to the appropriate brushes by means of flexible conductive leads 29. Alternatively the flexible leads can be connected to the actual brush holders 26. The terminal tags 31 are also adapted to prevent the rod-like members 8 from being completely forced out of their engagement with the base members 4 of the frames 2 by the springs 9 and also, as is apparent in FIGURE 1, to prevent the brushes 27 from being moved completely out of engagement with the brush holders 26.

Referring now to FIGURES 6 and 7, the contact assembly thereshown comprises only a single pair of rollers. Such parts of the arrangement shown in these figures which are substantially similar to those already described are for convenience indicated by the same reference numbers. In this arrangement the U-shaped roller-carrying frame is provided with two L-section locating members fixed to the outsides of the side arms 3. Each locating member comprises one arm 32 which is fixed to and lies in close engagement with the side arm and a locating arm 33 extending at right angles to the side arm and engaging in a locating bracket 15. The locating brackets 15 are substantially the same as those already described, being fixed on the insulating base plate, one on each side of the contact-carrying frame. In this arrangement the spring 34 which controls the pressure of the roller contacts on the transformer winding and also the engagement of the locating members with the brackets 15, is of uniform diameter and at its forward end seats in a shallow dish washer 35 which itself abuts against the back of the block 7. There is in this arrangement only one brush assembly in engagement with one face of the contact bar 23. There are in association with the contact rollers 10 no cooling means such as the devices 12 previously described although such cooling devices may be incorporated in this arrangement. The washers 36 indicated in FIGURE 6 are frictionless devices. It will be appreciated that more than one device described with reference to FIGURES 1 to 5 or with reference to FIGURES 6 and 7 there may be mounted on a common carrying plate for engagement with a corresponding member of transformer windings.

The invention has a number of advantageous features. For instance it permits of a limited but appropriate degree of lateral movement of the contact assemblies to suit individual transformer winding positions. Each contact assembly is readily disengageable from the insulating base 14 without it being necessary to manipulate screws or the like, the quick-release feature permitting easy removal for such purposes as inspection, renewal, and general maintenance.

It will be appreciated that a comparatively direct con-

ductive path is provided for the passage of current from each roller contact to the terminal bar 23. Other advantageous features will be evident from the above description of the invention.

What we claim then is:

1. An electric contact device for traversing a path parallel with the axis of a coil and including a frame; a contact member movably mounted in the frame for contact with the exterior of the coil, a spring interposed between the frame and the contact member to bias the latter towards said axis, an insulating base plate lying in a plane normal to said axis to support the frame, and mounting means for supporting and locating the frame on the plate; the mounting means comprising U-shaped bracket means mounted on the plate and opening towards said axis, the bracket means having opposed spaced limbs and a base joining the limbs, the limbs lying in parallel planes normal to the axis and the base lying in a plane which is parallel both to the axis and to a tangent to the coil, the mounting means also comprising a locating member on the frame received in the bracket means and forced into contact with said base by said spring when the contact member engages the coil thus limiting outward movement of the frame relative to the axis, the locating member also engaging between said limbs to provide location of the frame axially of the coil, movement of the frame against the spring permitting disengagement of the locating member from the bracket means and dismounting of the frame from the base plate.

2. An electric contact device for traversing a path parallel with the axis of a coil and including two frames, two contact members each movably mounted in one of the frames for contact with the exterior of the coil, a spring interposed between each frame and the contact member mounted therein to bias the latter towards said axis, an insulating base plate lying in a plane normal to said axis to support the frames, and mounting means for supporting and locating the frames on the plate; the mounting means comprising U-shaped bracket means mounted on the plate and opening towards said axis, the bracket means having opposed spaced limbs and a base joining the limbs, the limbs lying in parallel planes normal to the axis and the base lying in a plane which is parallel both to the axis and to a tangent to the coil, the mounting means also comprising a locating member extending between, and uniting the frames, the locating member being received in the bracket means and forced into contact with said base by said springs when the contact members engage the coil thus limiting outward movement of the frames relative to the axis, the locating member also engaging between said limbs to provide location of the frames axially of the coil, movement of frames against the springs permitting disengagement of the locating member from the bracket means and dismounting of the frame from the base plate.

3. An electric contact device as claimed in claim 2 in which the frames have axes of symmetry which are mutually convergent so as to extend radially with respect to said axis, and each of said springs is a coiled compressed spring located with its axis coincident with the axis of symmetry of the frame in which it is incorporated.

4. A device according to claim 2, wherein each frame is U-shaped having slots in the end portions of the arms of the U and wherein each contact member comprises two contact rollers, there being associated with each frame supporting spindle means having its ends received in said slots and supporting said rollers, an electrically conductive member providing at one end a mounting for the spindle and extending therefrom centrally between and parallel to the arms of the U-shaped frame to the other end of the member which is slidable in an aperture in the base of the U-shaped frame, an abutment on the member adjacent the mounting and a compression spring surrounding said member and interposed between the abutment and the base of the frame.

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5. An electric contact device for traversing a path parallel with the axis of a coil and including a frame; a contact member movably mounted in the frame for contact with the exterior of the coil, a spring interposed between the frame and the contact member to bias the latter towards said axis, an insulating base plate lying in a plane normal to said axis to support the frame, and mounting means for supporting and locating the frame on the plate; the mounting means comprising two U-shaped bracket means mounted in spaced relation on the base plate and each opening towards said axis, each bracket means having opposed spaced limbs and a base joining the limbs, the limbs of each bracket means lying in parallel planes normal to the axis and the bases of the bracket means lying in parallel planes each of which is parallel both to the axis and to a tangent to the coil, the mounting means also comprising two locating members secured to opposite sides of the frame and each received in one of the bracket means and forced against the base of its associated bracket means by said spring when the contact member engages the coil thus limiting outward movement of the frame relative to the axis, each locating member also engaging between the limbs of its associated bracket means to provide location of the frame axially of the coil, movement of the frame against the spring permitting disengagement of the locating member from

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the bracket means and dismounting of the frame from the base plate.

6. A device according to claim 5, wherein the frame is U-shaped having slots in the end portions of the arms of the U and wherein the contact member comprises two contact rollers, there being associated with the frame supporting spindle means having its ends received in said slots and supporting said rollers, an electrically conductive member providing at one end a mounting for the spindle and extending therefrom centrally between and parallel to the arms of the U-shaped frame to the other end of the member which is slidable in an aperture in the base of the U-shaped frame, an abutment on the member adjacent the mounting and a compression spring surrounding said member and interposed between the abutment and the base of the frame.

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