Oct. 18, 1960 P. E. BESSIERE 2,957,093

EDDY CURRENT BRAKING APPARATUS

Filed June 9, 1958

Fig. 2

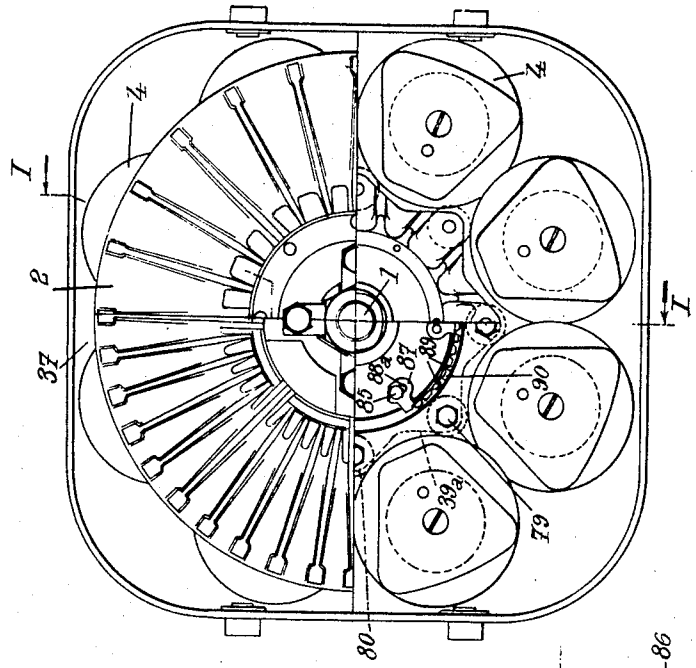


Fig. 3.

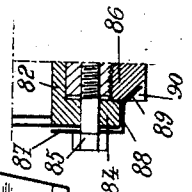
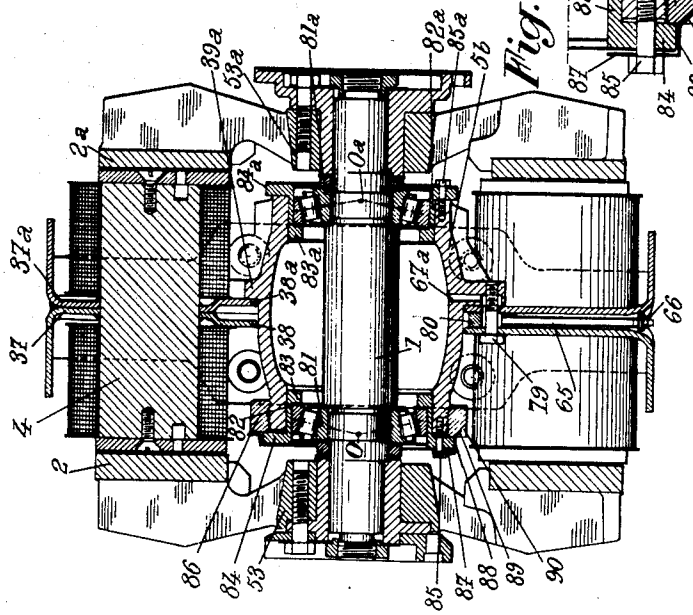


Fig. 1



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EDDY CURRENT BRAKING APPARATUS

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7 Claims. (Cl. 310—93)

The present invention relates to eddy current braking apparatus, in particular for use on road or railway vehicles, on hoisting devices, mining apparatus, and so on.

The apparatus according to the present invention is of the type including a rotor acting as armature and constituted by two parallel annular discs located at a distance from each other and carried by the shaft to be braked and a stator acting as inductor, disposed in the space between said two discs and including a support on which are mounted on the one hand a central sleeve in which said shaft is journalled and on the other hand the cores of the inductor electromagnets, said cores projecting on either side of said support, between it and said armature discs.

The object of this invention is to provide an apparatus of this kind which is better adapted to meet the requirements of practice than those used for the same purposes up to this time, in particular from the point of view of its mounting and its upkeep.

For this purpose, according to the present invention, the central sleeve is provided at its periphery with a flange and said support is provided with a central aperture slipped on said sleeve and applied in a removable manner against one face of said flange.

Other features of the invention will become apparent in the course of the following detailed description of some specific embodiments thereof with reference to the accompanying drawings, given merely by way of example and in which:

Fig. 1 shows an embodiment of my invention in sectional view on the line I—I of Fig. 2.

Fig. 2 is an end view of this apparatus with parts cut away.

Fig. 3 shows, on an enlarged scale, a detail of the apparatus of Fig. 1.

The apparatus includes:

(*a*) A rotor acting as the armature of said apparatus and including two parallel annular discs **2** and **2***a* located at a distance from each other and carried by hubs **53** and **53***a* fixed to shaft **1**; and

(*b*) A stator acting as the inductor, disposed between these discs **2**, **2***a* and including a support, constituted by two opposed cup-shaped elements **37** and **37***a* the flat portions of which are applied against each other, a plurality of electro-magnets the cores **4** of which extend through said flat portions to which they are welded, at right angles thereto, and a central sleeve **5***b* carried by support **37**, **37***a* and in which shaft **1** is journalled.

According to my invention, support **37—37***a* is detachably assembled with central sleeve **5***b*.

For this purpose, sleeve **5***b* carries, preferably integral therewith, a flange **39***a* projecting outwardly from the periphery thereof. Support **37—37***a* is provided with a central aperture **38—38***a* adapted to fit around sleeve **5***b* against one face of flange **39***a*. Easily removable means, such as screw-bolts **79** provided at places along the edge of aperture **38—38***a*, are provided for securing said edge to face of flange **39***a*.

Preferably, sleeve **5***b* is made by molding of malleable cast iron and each of the support cup-shaped elements is obtained by stamping of a steel sheet. Said elements **37** and **37***a* are provided with respective radial grooves located opposite each other so as to form a housing adapted to accommodate a lubrication tube **65**, and also to stiffen support **37—37***a*.

At the places where screw-bolts **79** pass therethrough, members **37** and **37***a*, which are spaced apart, are held at the desired distance from each other by thick washers **80** which may be secured, for instance by welding, to one of the parts **37** and **37***a*.

Tube **65** opens into the central hole of one of said washers **80**. The outer diameter of the corresponding screw-bolt **79** is substantially smaller than the diameter of the central hole of said washer **80** and of a coaxial cylindrical housing formed in flange **39***a*. Flange **39***a* is further provided with a radial conduit **67***a* extending between said cylindrical housing and the inner wall of sleeve **5***b*. Thus, grease supplied by a lubricator **66** can be fed through tube **65**, the space around screw **79** and conduit **67***a* to the inside of sleeve **5***b*.

According to another feature of the present invention, shaft **1** is journalled in two roller bearings mounted in the ends of sleeve **5***b*. The inner races **81** and **81***a* of said rollers constitute conical rolling surfaces the generatrices of which converge toward the axis of shaft **1** in the direction going from the outside of sleeve **5***b* toward the inside thereof. Thus, the centers of thrust O and O*a* of these bearings are at a greater distance from each other than the middle plane of the bearings, as shown by Fig. 1.

As stability increases with the distance between centers O and O*a*, the arrangement above described is very advantageous, especially in view of the fact that the distance between the bearings is necessarily smaller than that between the hubs **53** and **53***a* of the rotor discs **2** and **2***a*.

Advantageously, between the outer race of each of the above mentioned bearings and the central sleeve **5***b*, there is inserted a mounting ring **82**, **82***a* provided at its inner edge with an inward flange **83**, **83***a* against which is applied the inner edge of the outer race of the corresponding roller bearing, the outer edge of mounting ring **82**, **82***a* being provided with an outward flange **84**, **84***a* adapted to fit against the corresponding edge of central sleeve **5***b*.

Screw-bolts **85**, **85***a* passing through flanges **84**, **84***a* and screwed in central sleeve **5***b* keep rings **82**, **82***a* in position with respect to said sleeve. These rings **82** and **82***a* have the advantage that they can easily be replaced in case of wear and tear.

In order to permit of adjusting the play in the roller bearings, there is provided, at least at one of the ends of sleeve **5***b*, a screw-threaded adjustment ring **86** screwed in the periphery of sleeve **5***b* and bearing against flange **84**. When this adjustment ring **86** is screwed more or less, ring **82** is positioned as desired with respect to sleeve **5***b*, which permits of adjusting the play in the roller bearings.

Means are provided for fixing said adjustment ring in the desired position. For this purpose, a sheet metal element **88** of cylindrical shape surrounding flange **84** is provided on one of its edges with radial projections **87** provided with holes **88***a* through which screw-bolts **85** pass. The other edge of cylindrical piece **88** is provided with teeth **89** bent at right angles to part **88**, so as to be located in a plane perpendicular to the axis of shaft **1** along one end face of ring **86**. Ring **86** is provided at its periphery located opposite teeth **89** with at least one notch **90** adapted to accommodate one of these teeth which has been bent obliquely for this purpose.

In order to adjust the play in the roller bearings, screw-bolts **85** are loosened and ring **86** is unscrewed with respect to sleeve **5***b* until the play has the desired value. Then, bolts **85** are screwed tight and the tooth **89** located opposite notch **90** is bent so as to be engaged into said notch, as shown by the drawings.

Bolts **88** may be prevented from unscrewing, as shown by Fig. 2, by bending against one of the sides thereof a portion of the projection **87** through which they pass.

In order further to increase the accuracy of adjustment, the holes **88***a* provided in projections **87** may be made in the form of circular arcs, whereby, for any angular position of ring **86**, it is possible to bring one of the teeth **89** opposite notch **90**.

In a general manner, while I have, in the above description, disclosed what I deem to be practical and efficient embodiments of my invention, it should be well understood that I do not wish to be limited thereto as there might be changes made in the arrangement, disposition and form of the parts without departing from the principle of the present invention as comprehended within the scope of the accompanying claims.

What I claim is:

1. For use to slow down the movement of rotation of a shaft, an eddy current braking apparatus which comprises, in combination, a rotor including said shaft and two metal discs parallel to each other fixed on said shaft coaxially therewith and at a distance from each other, and a stator including a sleeve coaxially surrounding a portion of said shaft located between said rotor discs, bearings for said shaft mounted in said sleeve, a flange carried by the outer periphery of said sleeve extending transversely to said shaft, said flange being located to one side of a plane transverse to the shaft axis and equidistant from the bearings, a support having a central aperture slipped on said sleeve, the face of said support around the edge of said aperture being applied against one face of said flange, means for detachably securing said support to said flange, a plurality of electro-magnet cores of elongated shape having each its longer dimension parallel to the axis of said shaft, said cores being fixed directly on said support and regularly distributed about said axis, each of said cores extending throughout said support and on opposite sides thereof to short distances from the inner faces of said rotor discs respectively, and a plurality of electro-magnet windings surrounding said cores.

2. For use to slow down the movement of rotation of a shaft, an eddy current braking apparatus which comprises, in combination, a rotor including said shaft and two metal discs parallel to each other fixed on said shaft coaxially therewith and at a distance from each other, and a stator including a sleeve coaxially surrounding a portion of said shaft located between said rotor discs, bearings for said shaft mounted in said sleeve, a flange integral with said sleeve projecting outwardly therefrom transversely to said shaft, said flange being located to one side of a plane transverse to the shaft axis and equidistant from the bearings, a support constituted by two cup-shaped metal elements having flat portions applied against each other along a common plane perpendicular to said shaft and located between said discs, the respective outer peripheral portions of said elements extending away from each other on either side of said plane, said elements being provided with registering respective central circular apertures, said central apertures fitting on the outer wall of said sleeve, both on the same side of said flange, the face of said support around the edge of one of said apertures being applied against one face of said flange, the edges of said central apertures being spaced apart from each other, at least at some places, annular washers interposed between said edges at said places, screw bolts extending through said edges, the central holes of said washers and said flange for detachably securing said support elements to said flange, a plurality of electro-magnet cores of elongated shape having each its longer dimensions parallel to the axis of said shaft, said cores being fixed directly on said support and regularly distributed about said axis, each of said cores extending throughout said flat portions of said support elements and on opposite sides thereof to short distances from the inner faces of said rotor discs respectively, and a plurality of electro-magnet windings surrounding said cores.

3. An apparatus according to claim 2 in which said two flat portions are provided with respective radial grooves facing each other and passing through the center of one of said washers, further including a lubrication tube housed in said grooves and extending from the outer periphery of said support elements to the central hole of said washer, said central hole being of a diameter greater than the outer diameter of that of said screw bolts which extends through said washer, said sleeve being provided with a conduit starting from the central hole of said washer and opening into the inner wall of said sleeve, whereby lubricating grease can be fed into said sleeve.

4. For use to slow down the movement of rotation of a shaft, an eddy current braking apparatus which comprises, in combination, a rotor including said shaft and two metal discs parallel to each other fixed on said shaft coaxially therewith and at a distance from each other, a stator including a support having a portion thereof located between said rotor discs, a plurality of electro-magnet cores of elongated shape having each its longer dimensions parallel to the axis of said shaft, said cores being fixed on said support and regularly distributed about said axis, each of said cores extending from said support to short distances from the inner faces of said rotor discs respectively, a plurality of electro-magnet windings surrounding said cores, and a sleeve carried by said support and coaxially surrounding a portion of said shaft located between said rotor discs, and thrust roller bearings for said shaft mounted in said sleeve at the respective ends thereof, each of said thrust bearings including an outer race mounted in one end of said sleeve, an inner race mounted on said shaft and rollers interposed between said races, the rollers of each of said roller bearings having their axes located along the generatrices of a cone coaxial with said shaft, said cones flaring in opposed directions respectively so that the centers of thrust of said bearings, located on the axis of said shaft, are at a distance from each other greater than the distance between the respective middle planes of said bearings.

5. For use to slow down the movement of rotation of a shaft, an eddy current braking apparatus which comprises, in combination, a rotor including said shaft and two metal discs parallel to each other fixed on said shaft coaxially therewith and at a distance from each other, a stator including a support having a portion thereof located between said rotor discs, a plurality of electro-magnet cores of elongated shape having each its longer dimensions parallel to the axis of said shaft, said cores being fixed on said support and regularly distributed about said axis, each of said cores extending from said support to short distances from the inner faces of said rotor discs respectively, a plurality of electro-magnet windings surrounding said cores, a sleeve carried by said support and coaxially surrounding a portion of said shaft located between said rotor discs, and two mounting rings each fitted in one of the ends of said sleeve, each of said rings including, at one edge thereof, an outward flange applied against the corresponding edge of said sleeve and, at the other edge thereof, an inward flange located inside said sleeve, and thrust roller bearings for said shaft mounted in said sleeve at the respective ends thereof, each of said thrust bearings including an outer race fitted in one of said rings respectively against the inward flange thereof, an inner race mounted on said shaft and rollers interposed between said races, the rollers of each

of said roller bearings having their axes located along the generatrices of a cone coaxial with said shaft, said cones flaring in opposed directions respectively so that the centers of thrust of said bearings, located on the axis of said shaft, are at a distance from each other greater than the distance between the respective middle planes of said bearings.

6. An apparatus according to claim 5 further comprising an adjustment ring coaxial with said sleeve and screwed on one end thereof, said adjustment ring being in contact with the outward flange of the corresponding mounting ring whereby the position of said last mentioned mounting ring axially with respect to said sleeve can be adjusted by screwing more or less said adjustment ring on said sleeve.

7. An apparatus according to claim 6 further including means operatively associated with said sleeve and engageable with said ring for locking said adjustment ring in desired position with respect to said sleeve.

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