United States Patent

Hohloch

[15] **3,681,908**

[45] **Aug. 8, 1972**

[54] **SPINDLE BRAKE**

[72] Inventor: **Kurt Hohloch**, Ebersbach, Germany

[73] Assignee: **Zinser-Textilmaschinen Gesellschaft mit beschrankter Haftung**, Ebersbach, Germany

[22] Filed: **Aug. 7, 1970**

[21] Appl. No.: **62,082**

[30] **Foreign Application Priority Data**

Feb. 6, 1970 Germany.....P 20 05 463.1

[52] **U.S. Cl.**.....**57/88**, 242/129.8

[51] **Int. Cl.**.....**D01h 7/22**

[58] **Field of Search** 57/88, 34, 130, 61; 242/129.8

[56] **References Cited**

UNITED STATES PATENTS

3,226,923	1/1966	Maurer	57/88
2,449,773	9/1948	Hargreaves	57/88 UX
3,116,591	1/1964	Muller	57/88
3,122,875	3/1964	Swift et al.	57/88
3,269,103	8/1966	Franzen	57/88
3,406,512	10/1968	Stahlecker	57/88

FOREIGN PATENTS OR APPLICATIONS

948,584	9/1956	Germany	57/88
1,201,269	12/1959	France	57/88

Primary Examiner—Donald E. Watkins

Attorney—Edwin E. Greigg

[57] **ABSTRACT**

A manually operable brake assembly which straddles and, when actuated, frictionally engages a cylindrical rotating member, such as a spindle, and which comprises two identical brake components provided with friction faces and a resilient yoke having the function of holding said braking components together, supplying the braking force and ensuring that the brake assembly is stably maintained in both its operative and its inoperative positions.

16 Claims, 9 Drawing Figures

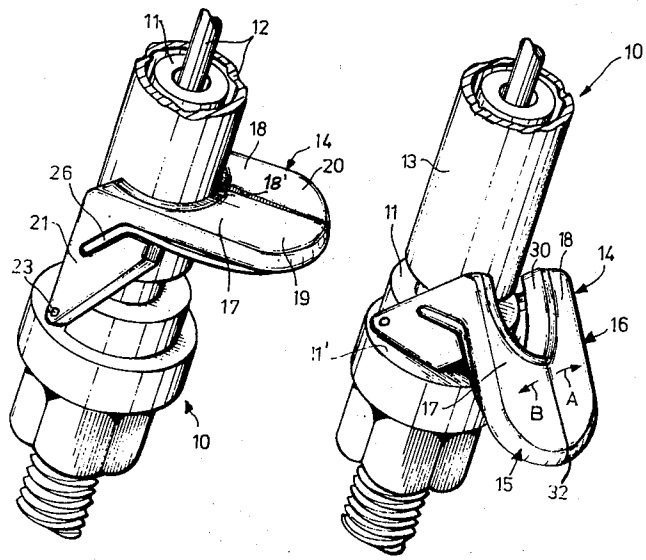
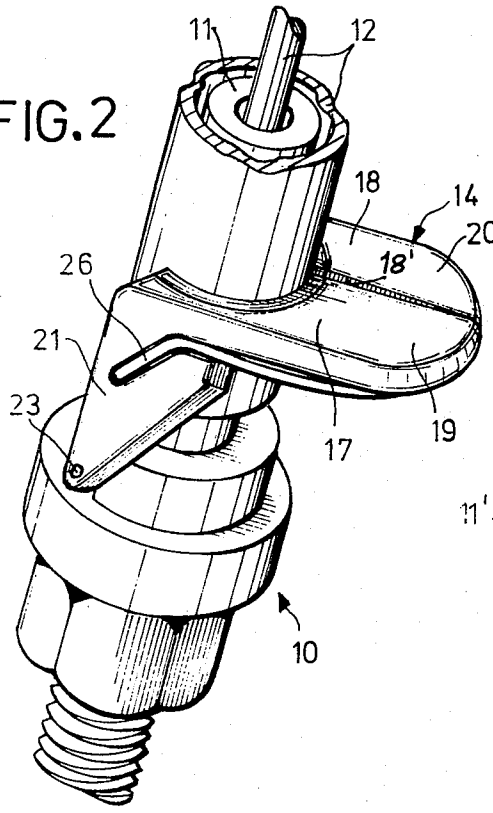


FIG.2



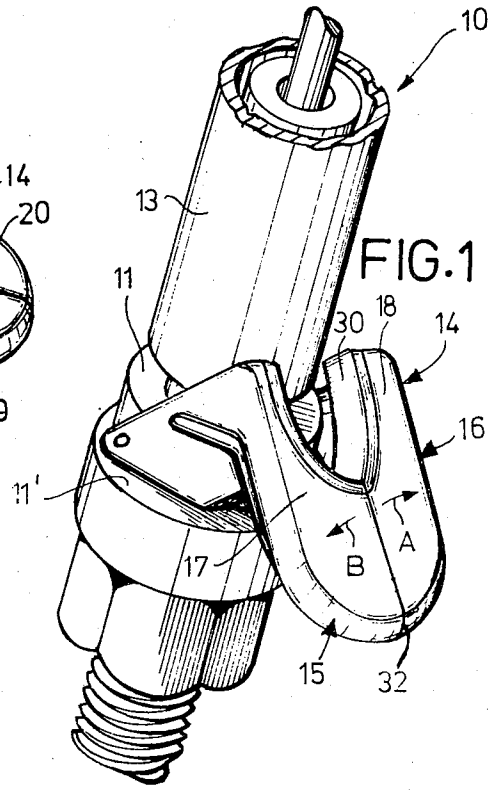


FIG.1

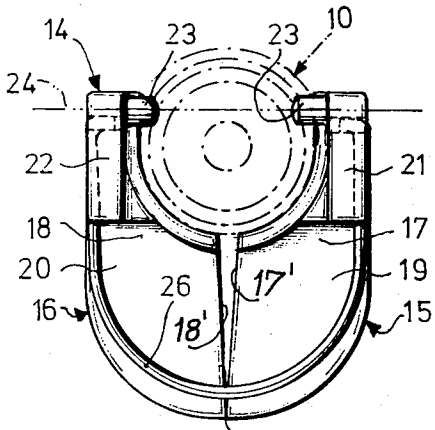


FIG.4

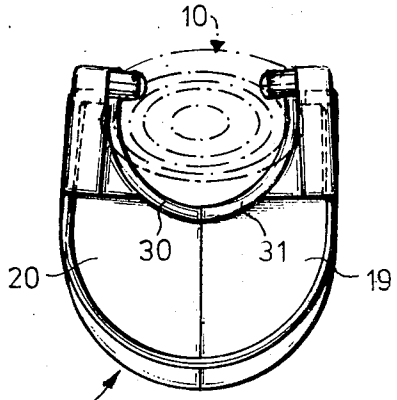


FIG.3

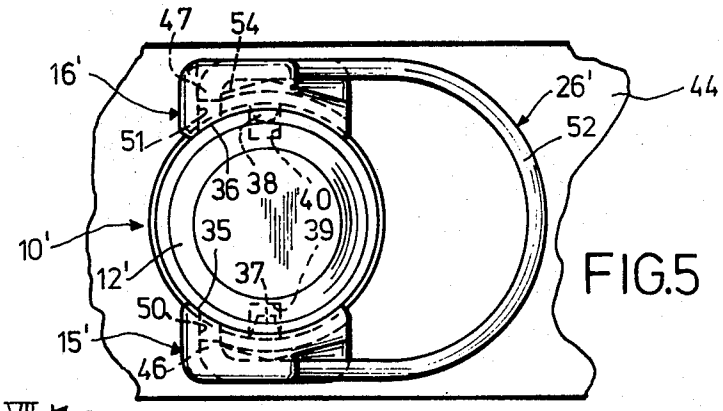


FIG.5

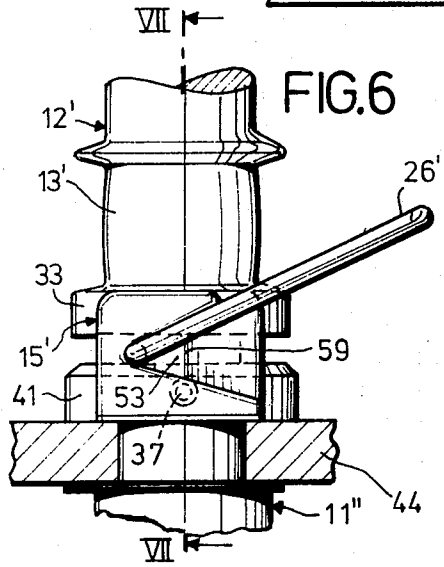


FIG.6

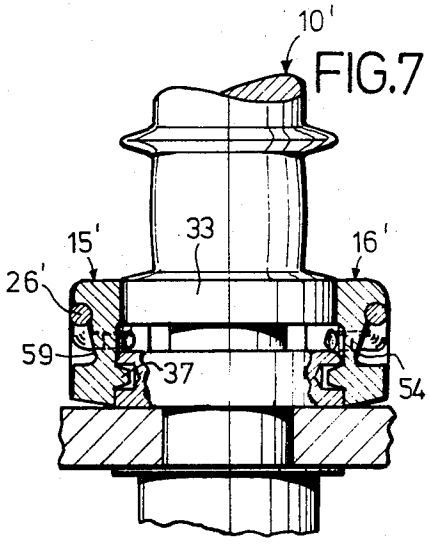


FIG.7

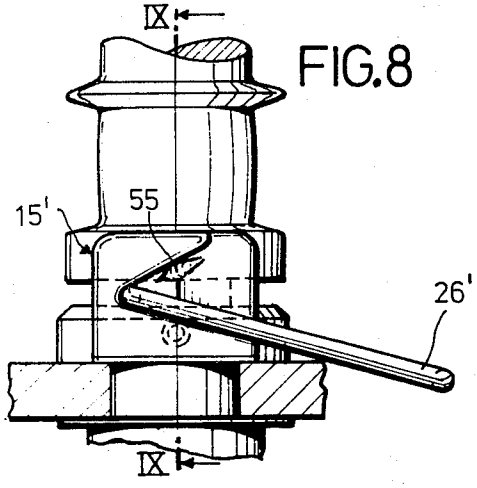


FIG.8

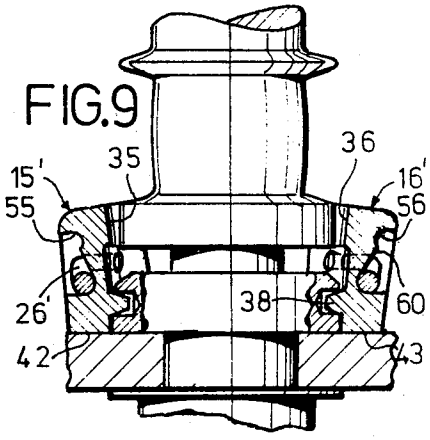


FIG.9

SPINDLE BRAKE

BACKGROUND OF THE INVENTION

This invention relates to a brake associated with a spinning or a twisting spindle and operable by an attendant manually or with his knee.

By spinning or twisting spindles there are meant spindles which are used in spinning or twisting machines, or similar textile machines, for the twisting and winding of elongated textile materials, particularly yarns. A spindle of this type comprises a bearing sleeve which is fixedly secured to a spindle rail, and on which there is rotatably held an upper spindle part. Textile machines usually have a very large number of such spindles which have to be braked individually and independently from one another, for example, in case of yarn breakage, or the like.

OBJECTS AND SUMMARY OF THE INVENTION

It is an object of the invention to provide an improved brake of the aforenoted type which may be operated by an attendant manually or with his knee and which is capable of maintaining a bistable position so that the attendant needs to exert force only to release or to actuate the brake.

It is a further object of the invention to provide an improved brake of the aforenoted type, which has a particularly simple, inexpensive and operationally safe structure consisting of few parts that may be easily manufactured and assembled.

It is still another object of this invention to provide an improved brake of the aforenoted type, the individual parts of which are easily replaceable and which may be assembled, mounted, or removed even by unskilled labor.

It is still another object of the invention to provide an improved brake of the aforenoted type, which may be subsequently mounted on spindle structures already in existence.

It is still a further object of the invention to provide an improved brake of the aforenoted type, which has relatively large work faces that wear evenly during operation so that a long lifetime is achieved during which a uniform braking moment is delivered.

Briefly stated, according to the invention, the spindle brake assembly is formed of two brake components pivotally secured to a stationary part of the spindle and movable into a braking or actuated position and into a released or withdrawn position. The brake components together form an arcuate, concave work face which frictionally engages the rotary upper spindle part in the braking position. The brake assembly further includes a resilient yoke which has three functions: it holds the brake components together, it supplies the braking force and it stably maintains the brake components in a withdrawn and in an actuated position.

The invention will be better understood, as well as further objects and advantages of the invention will become more apparent, from the ensuing detailed specification of two exemplary embodiments taken in conjunction with the drawing.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a perspective fragmentary view of a spindle incorporating a first embodiment of a brake assembly according to the invention, shown in a withdrawn or released position;

FIG. 2 is a view similar to FIG. 1 showing the first embodiment in an actuated or braking position;

FIG. 3 is a bottom plan view of the first embodiment in a released position;

FIG. 4 is a bottom plan view of the first embodiment in an actuated position;

FIG. 5 is a top plan view of a spindle incorporating a second embodiment of a brake assembly according to the invention;

FIG. 6 is a partially sectional side elevational view of the second embodiment shown in a braking or actuated position;

FIG. 7 is a sectional view along lines VII—VII of FIG. 6;

FIG. 8 is a partially sectional side elevational view of the second embodiment shown in a withdrawn or released position; and

FIG. 9 is a sectional view along lines IX—IX of FIG. 8.

DESCRIPTION OF THE FIRST EMBODIMENT

Turning now to FIGS. 1 and 2, there is illustrated a spinning or twisting spindle 10 which, with the exception of the associated brake assembly later to be described, may be of any known structure. It comprises a bearing sleeve 11 and an upper spindle part 12 rotatably held on said sleeve. The upper spindle part 12 includes a cylindrical whorl 13, which is in contact with a tangential drive belt, or the like, to supply, in a known manner, the necessary torque to rotate the upper spindle part. A lower portion of the whorl forms a rotationally symmetrical frictional face of the upper spindle part against which the brake shoes of a brake assembly 14 may be pressed. The brake assembly 14 includes two brake components 15 and 16 which together form a brake lever and which are the mirror images of each other with respect to a plane of symmetry containing the spindle axis. The components 15 and 16 may be made entirely or partially of synthetic material and may be prepared, for example, by injection molding. The brake components 15 and 16 include a respective brake shoe 17 and 18 and a respective extension 19 and 20. The latter are planar and constitute the operating handle of the brake assembly. Each brake component 15, 16 further includes a respective arm 21 and 22 which extend approximately at right angles to the plane of extensions 19, 20. In the free end of each arm 21, 22 there are inserted inwardly extending and mutually axially aligned pivot pins 23 which nest in depressions provided in the bearing sleeve 11 for pivotally supporting the brake components 15 and 16.

Turning now to FIG. 4, it may be observed that the pivotal axis 24 of the brake assembly 14 is defined by the two pivot pins 23 and depressions in which they nest, and it extends normal to the spindle axis at a distance therefrom. The brake shoes 17, 18 in the released condition of the brake and the pivotal axis 24 are disposed at opposite sides of a plane containing the spindle axis and extending parallel to the pivotal axis 24.

The brake components 15 and 16 are elastically pressed to one another and held together by means of a resilient yoke 26 formed of a bent wire spring. It ex-

tends in a preloaded condition from the outer side of one arm **21** and then proceeds arcuately along the underside of the extensions **19, 20** to the outer side of the arm **22**. By arranging the terminals of the yoke **26** between the brake shoes **17, 18** and the support points of the brake members **15, 16**, the pivot pins **23**, too, are pressed into the depressions associated therewith. The central arcuate portion of the yoke **26** extends immediately under the two extensions **19, 20** in the vicinity of the outer edges of their undersides. To ensure a positive positioning of the yoke **26**, the free end portions thereof nest in grooves provided in the outer face of arms **21** and **22**, as best seen in FIGS. **3** and **4**. As it may be further observed in these figures, the free ends of the yoke **26** are bent at right angles inwardly and extend into properly aligned bores provided in the arms **21, 22**.

Each brake shoe **17** and **18** is provided with a respective bonded brake lining **31, 30**, the concave cylindrical work face of which has a radius of curvature identical to that of the outer face of the cylindrical whorl **13**. In this manner the entire inner face of the brake lining serves as the work face of the associated brake component. Each individual brake lining **30, 31** extends over an angle of approximately 90°. In the braking position of the brake assembly **14**, as shown in FIGS. **2** and **4**, the brake shoes **17, 18** straddle the whorl **13** over an angle of more than 180°. Thus, when operative, the brake assembly is securely supported by the whorl **13** in a snapped-in, over-the-center position.

In the withdrawn position of the brake assembly **14**, as seen in FIGS. **1** and **3**, the opposing edge faces of the brake components **15** and **16** are in planar contact along edge faces **17', 18'**, pressed together by the yoke **26**. In this position a lower edge of each arm **21, 22** engages an upper radial face of a collar **11'** of the bearing sleeve **11**, serving as an abutment for the withdrawn position of the brake.

When the brake is actuated, that is, it is swung from its withdrawn position (FIGS. **1, 3**) towards its braking position (FIGS. **2, 4**), the brake components **15, 16**, under the wedging effect of whorl **13** and against the resilient force of the yoke **26**, separate slightly from one another in the direction of arrows A and B in a pivotal movement about the continuous contact point **32**. The maximum separation between the brake components **15, 16** occurs when the free ends of the brake linings **30, 31** are in a diametrically opposed position on whorl **13**. To reach the braking position, in which the whorl **13** and the linings **30, 31** are in a face-to-face overall contact, the brake assembly is swung further about the pivotal axis **24**. Upon this occurrence, the brake components **15, 16** move slightly closer from their maximum separated position and thus, the aforenoted over-the-center, snapped-in condition of the brake assembly takes effect.

When the brake is moved from its operative position (FIGS. **2, 4**) to its withdrawn position (FIGS. **1, 3**), the aforedescribed steps occur in a reversed order.

For removing the brake assembly **14** from the spindle **10**, the two arms **21, 22** are manually separated from one another to an extent that the pivot pins **23** move out of their respective support bores. The brake **14** may then be pulled off entirely. For a further disassembly of the brake it is sufficient to pull out the yoke **26** from the bore holes provided in the arms **21, 22**. This structure permits a replacement of a damaged part without the necessity of replacing the entire brake **14**. Such assembly and disassembly may be performed rapidly even by unskilled labor.

DESCRIPTION OF THE SECOND EMBODIMENT

In FIGS. **5–9** there is shown a second embodiment of the invention. The bearing sleeve **11''** of the spindle **10'** is fixedly secured to a conventional spindle rail **44**. The upper spindle part **12'** is rotatably held on the bearing sleeve **11''** and has a whorl **13'** which is engaged by a driving belt (not shown) for rotating the part **12'**. The whorl **13'** is provided with an integral lower collar **33**, the outer periphery of which serves as a friction face engageable by the cylindrical brake faces **35, 36** of two diametrically opposed brake components **15', 16'** for braking the rotary spindle part **12'**. The brake components **15', 16'** are mirror images of one another with respect to a plane containing the spindle axis. The brake components **15'** and **16'** are held together, urged to one another and maintained in a bistable position by a resilient yoke **26'**. Each brake component **15', 16'** may be a single part made of plastic material or any other material which has good braking properties and a satisfactory strength.

The two brake components **15'** and **16'** have a block-like configuration; their braking faces **35** and **36** extend in the upper part of their inner sides. Under the brake faces **35, 36** at a distance therefrom, each brake component **15', 16'** is provided with a pin **37, 38**, respectively, extending inwardly and tapering towards it free end. The pins **37** and **38** extend into a respective cylindrical support bore **39, 40**, both provided in an upper collar **41** of the bearing sleeve **11''**. The axes of the support bores **39, 40** are in alignment with one another and intersect the spindle axis at 90°. The respective underside **42, 43** of the brake components **15', 16'** is planar and so designed that each engages the top face of the spindle rail **44** face-to-face when the brake assembly is in its withdrawn position as illustrated in FIG. **9**. The conically tapering pins **37, 38** permit the brake components **15', 16'** to tilt inwardly from their position shown in FIG. **9** into a position shown in FIG. **7** in which the brake faces **35, 36** frictionally engage the periphery of the collar **33** to brake the upper spindle part **12'**.

The two brake components **15', 16'** are held together by a resilient yoke **26'** which also serves as a brake actuating lever pivotally movable by an attendant. For the latter purpose, the yoke **26'** has rounded free ends **46, 47** which engage with a small play into respective bores **50, 51** provided in the brake components **15', 16'**. The bores **50, 51** are aligned with respect to one another in such a manner that the pivotal axis of yoke **26'** extends at a distance from the spindle axis and is normal thereto. Further, the pivotal axis of yoke **26'** is disposed on that side of the spindle axis which is remote from the central arc **52** of the yoke **26'**.

The external lateral face of each brake component **15', 16'** is provided with a respective flat triangular depression **53, 54**, one corner of each coincides with the respective bore holes **50, 51**. The upper and lower edges of the triangular depressions serve as abutments

for the two extreme positions of yoke **26'** as shown in FIGS. **6** and **8**. At the upper edge of each triangular depression there is provided a groove-like notch **55, 56** into which the yoke **26'** may snap when moved into its upper position (FIG. **6**) in which the brake components **15', 16'** are maintained in a stable manner in their braking position (FIG. **7**). The respective base **59, 60** of each triangular depression **53, 54** has a convex curvature extending upwardly and outwardly. Thus, when the yoke **26'** is pivoted from its upper stable position (FIG. **6**) downwardly, its parallel extending portions first separate as it leaves the notches **55, 56** and thereafter, as the downward pivotal motion continues, the said portions are drawn closer together. As a result, the inwardly directed force of yoke **26'** gradually decreases during the downward pivotal movement. The yoke **26** is designed in such a manner that in its lower position (FIG. **8**), it is not spread by the brake components **15', 16'** and thus lies without preload on the lower edges of the triangular depressions **53, 54**. Consequently, when in its lower position shown in FIG. **8**, the yoke **26'** does not press together the brake components **15', 16'**, so that the latter may assume their withdrawn position shown in FIG. **9** in which they fully (i.e., face-to-face) and in a stable manner, engage the spindle rail **44** with their base edges **42, 43**. In its lower position, the yoke **26'**, although without tension, ensures, nevertheless, a continuous positive engagement between the pins **37, 38** and their respective support bores **39, 40**, so that the brake components **15', 16'** are maintained by the yoke **26'** in a position shown in FIG. **9**.

The brake faces **35, 36** of the individual brake components **15', 16'** extend approximately over an angle of 90° in the circumferential direction of the spindle axis. It may be observed in FIGS. **7** and **9** that each brake component **15', 16'** has a pivotal axis which is substantially normal to the axis of its associated, respective bore hole in which tapered pivot pins **37, 38** nest.

The removal of the three-part brake assembly according to FIGS. **5–9** may be manually effected by spreading the yoke **26'** and pulling it off the brake components **15', 16'**. Thereafter, the brake components may be removed from the spindle **10'**.

In both embodiments the brake components **15, 16** (first embodiment) and **15', 16'** (second embodiment) are so arranged that they form mirror images of one another with respect to a plane of symmetry containing the spindle axis. When the brake is in an operative (i.e., braking) position, each individual brake face passes through a plane that contains the spindle axis and is normal to the aforedefined plane of symmetry. Further, when the brake assembly is in its braking position, each brake work face engages the rotationally symmetrical outer face of the rotary upper spindle part along a circumferential distance which, expressed in angles, amounts preferably to approximately 50° – 100°.

That which is claimed is:

1. A manually operable brake assembly for braking a rotary member, such as a spindle, by frictionally engaging at will a rotationally symmetrical surface thereof, comprising

A. two brake components pivotable in unison into a braking position and into a withdrawn position, each brake component having

1. an arm portion,

2. an extension integral with said arm portion and arranged at an angle with respect thereto, said extension having an upper face, an underside and a longitudinal edge face, said brake components being so arranged that the upper face of said extensions are coplanar and are engageable by an attendant to cause pivotal movement thereof,

3. a brake work face frictionally engaging one part of said rotationally symmetrical surface of said rotary member in a circumferential direction in the braking position of said brake components,

B. securing means associated with said arm portion for pivotally attaching each brake component to a stationary part,

C. resilient means securing said brake components together and maintaining them secured to said stationary part, said resilient means urging said brake components towards one another in said braking position to furnish a braking force and urging said longitudinal edge faces towards one another along their entire length, said brake components, during and in addition to their pivotal movement into either position, being moved away from one another against the force of said resilient means by a wedging effect resulting from the engagement between said brake work faces and said rotationally symmetrical surface and

D. means to stably maintain said brake components in at least said braking position in which said brake work faces assume a snapped-on, over-the-center, stable position with respect to said rotationally symmetrical surface.

2. A brake assembly as defined in claim **1**, wherein said resilient means is formed of a yoke straddling said brake components.

3. A brake assembly as defined in claim **1**, wherein said brake components are of identical structure and are arranged as mirror images of one another with respect to a plane containing the axis of said rotary member.

4. A brake assembly as defined in claim **1**, wherein each brake work face, when said brake components are in said braking position, engages said rotationally symmetrical surface over an angle of approximately 50° – 100°.

5. A brake assembly as defined in claim **1**, wherein said brake components are so arranged in said braking position, that each brake work face extends from both sides of a single plane containing the axis of said rotary member.

6. A brake assembly as defined in claim **1**, wherein said brake components are pivotable about a common axis.

7. A brake assembly as defined in claim **6**, wherein said common axis is spaced from, and is normal to, the axis of said rotary member.

8. A brake assembly as defined in claim **5**, wherein both brake work faces extend at one and the same side of said single plane when said brake components are in said withdrawn position.

9. A brake assembly as defined in claim **1**, including a point of contact between the longitudinal edge faces of said extensions, said point of contact serves as a fulcrum for a pivotal motion of said brake components with respect to one another.

10. A brake assembly as defined in claim 1, wherein each said arm includes edge portions which abut against a stationary surface when said brake components are in said withdrawn position.

11. A manually operable brake assembly for braking a rotary member, such as a spindle, by frictionally engaging at will a rotationally symmetrical surface thereof, comprising

A. two brake components pivotable in unison into a braking position and into a withdrawn position, each brake component including a camming face, each camming face having a notch,

B. securing means for pivotally attaching each brake component to a stationary part, said securing means including

1. two bore holes provided in said stationary part,

2. two pivot pins, one carried by each brake component, each pivot pin being received in an associated bore hole with a play, each brake component being pivotable into said braking position and into said withdrawn position about an axis normal to the axis of the associated bore hole,

C. a resilient yoke straddling said brake components for securing them together and maintaining each said pivot pin in its associated bore hole, said resilient yoke urging said brake components towards one another in said braking position to furnish a braking force, opposed portions of said yoke riding on each said camming face during a pivotal motion of said yoke with respect to said brake components, the camming faces causing said yoke to spread and said brake components to pivot into said braking position when said yoke is moved into an actuated position, portions of said yoke snapping into each said notch in the actuated position of said yoke to stably maintain said brake components in their braking position.

12. A brake assembly as defined in claim 11, wherein said yoke includes a central portion; said brake components are pivotable about a common axis spaced from and normal to the axis of said rotary member; said common axis and said central portion of said yoke are situated at opposite sides of a plane containing the axis of said rotary member and extending parallel with said common axis.

13. A brake assembly as defined in claim 11, wherein brake component each arm is provided on its outside with a groove to receive, in a nested manner, portions of said yoke for immobilizing the same.

14. A brake assembly as defined in claim 11, wherein said yoke straddles said brake components over an angle of more than 180° measured from the axis of said rotary member.

15. A brake assembly as defined in claim 11, wherein the axes of said bore holes coincide with one another and intersect the axis of said rotary member at right angles.

16. A brake assembly as defined in claim 11, wherein each camming face is provided with two abutment edges, one serving as a stop for said yoke in said actuated position, the other serving as a stop for said yoke in a released position in which said brake components are in their withdrawn position.

* * * * *