No. 876,543.

PATENTED JAN. 14, 1908.

B. M. W. HANSON.

FRICTION CLUTCH.

APPLICATION FILED APR 25, 1906.

2 SHEETS—SHEET 1.

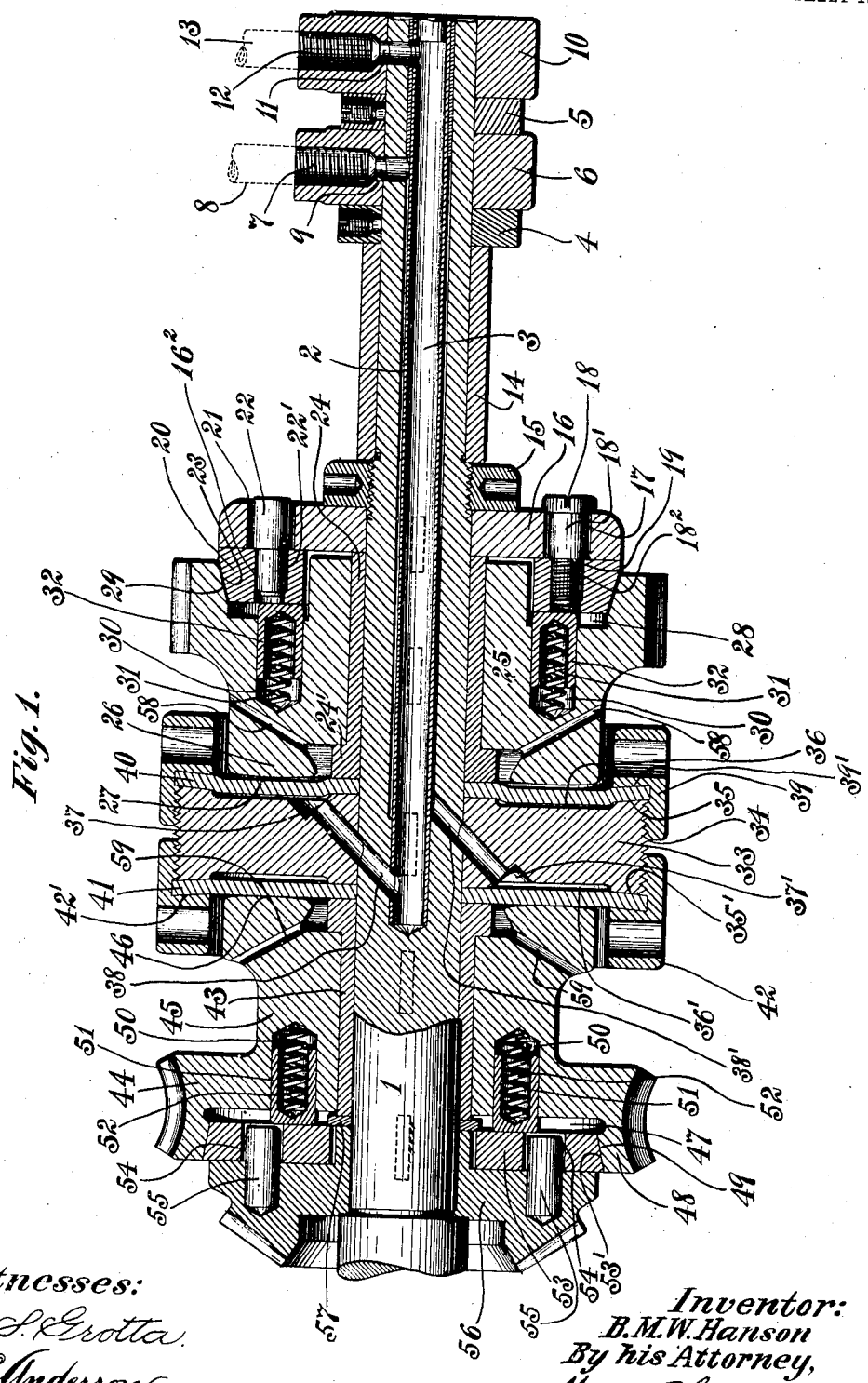

Fig. 1.

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2 SHEETS—SHEET 2.

Fig.2

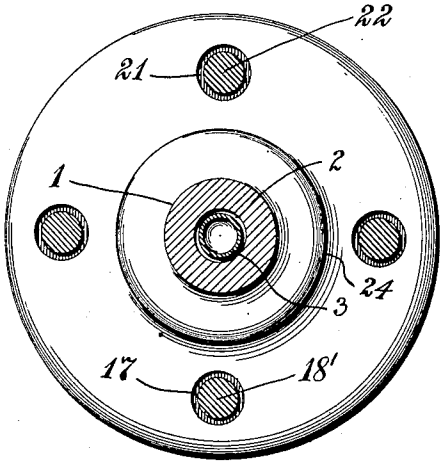


Fig.3.

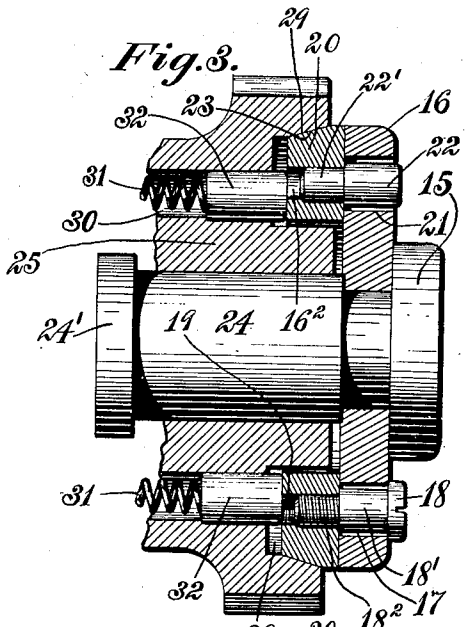


Fig.4.

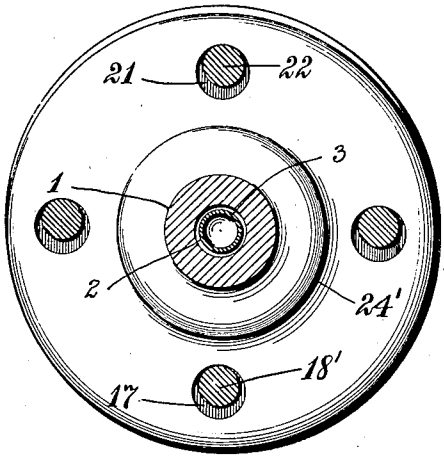
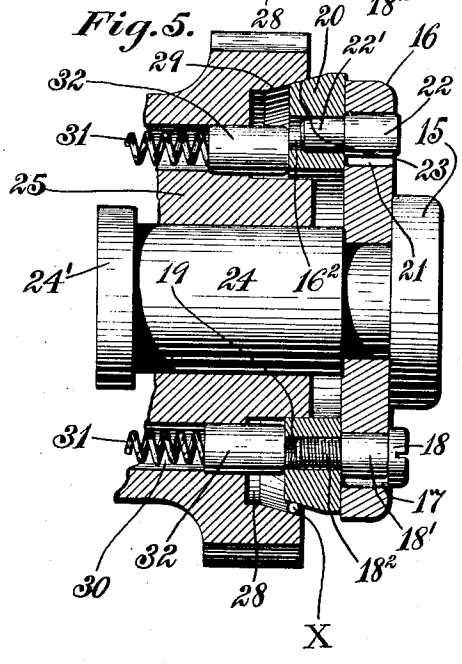


Fig.5.



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UNITED STATES PATENT OFFICE.

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FRICTION-CLUTCH.

No. 876,543. Specification of Letters Patent. Patented Jan. 14, 1908.

Application filed April 25, 1906. Serial No. 313,536.

To all whom it may concern:

Be it known that I, BENGT M. W. HANSON, a citizen of Sweden, having declared my intention of becoming a citizen of the United States, residing at Hartford, in the county of Hartford and State of Connecticut, have invented certain new and useful Improvements in Friction-Clutches, of which the following is a specification.

This invention relates to clutches, and more particularly to that class of such devices known as "friction-clutches."

In one form these clutches consist of an external member having an inclined internal wall adapted to receive an inner member having an oppositely inclined external periphery. When brought forcibly together by any suitable means either member may act as a drive, as the case may be, to cause the other member and the element connected thereto to rotate. Heretofore in the ordinary constructions it has been found necessary to make the included angle between the inclined or beveled friction-surfaces of each member at least thirty degrees, to prevent such binding against release as would occur if a smaller angle were provided, and consequently force greater than that usually provided for the intended operation of the clutch is required to separate the two members. Half the included angle, or that occurring between the shaft and friction-surface of each member would be fifteen degrees, which is the least angle safe to rely upon readily to disengage the surfaces. From the above statement it will be obvious that should chips or particles of dust or dirt become lodged between the friction-surfaces at any point the binding-action would occur in the small angle between the shaft and said friction-surface, and if this angle were less than fifteen degrees objectionable adherence would take place.

Primarily the object of the invention is to provide a friction-clutch constructed to admit of its engaging-surfaces being formed at a much more efficient angle than has been practical in clutches of ordinary design.

A further object of the invention is the provision of a clutch having one member so mounted that no binding-action can take place except between the friction-surfaces.

Other objects of the invention will be set forth in the detailed description.

In the accompanying drawings, Figure 1 represents a longitudinal vertical section of one form of mechanism with which the improvement may be employed. Figs. 2 and 3 are end and sectional views of one form of the clutch; and Figs. 4 and 5 are similar views, illustrating how adherence is prevented when foreign matter works its way between the engaging-surfaces.

Like numerals designate like parts throughout the several views.

Referring to the drawings, the numeral 1 designates a shaft having a bore 2 in which is inserted a tube 3 of less diameter than said bore, said shaft to be rotatably mounted in any suitable frame or support. (Not shown.)

Rigid with the shaft are collars 4 and 5 and on said shaft is loosely mounted a fluid-connection collar 6 threaded at 7 to receive a stationary conduit 8, and having a port 9, communicating with the bore 2 of shaft 1. Exterior to the collar 5 is another loose fluid-connection collar 10, ported at 11 to communicate with tube 3, and having an internally threaded socket 12 to receive the end of a stationary conduit 13, the conduits 8 and 13 leading to a suitable source of fluid-supply and being controlled by valve-mechanism constituting no part of the present invention.

Fitted on the shaft 1 with its outer end against the collar 4 is a bushing 14, while threaded on said shaft is a thrust-collar 15 against which the end of said bushing abuts.

Keyed to the shaft 1 adjacent to the inner side of the thrust-collar 15 is a disk 16 having openings 17 for the reception of the barrels 18′ of screw-bolts 18, the threaded shanks 18^2 of which are inserted in internally-threaded sockets 19 of a friction-disk 20. But one of these screw-bolts is shown in Fig. 1 and the barrel 18′ of each bolt will be of slightly greater length than that of the bore in the disk 16, so that there will be no lateral binding of the friction-disk 20 against the disk 16. Fitted in other bores 21 of the disk 16 are pins 22 the heads of which are of slightly less diameter than said bores, while the shanks 22′ are driven into openings 16^2 in said disk.

On its peripheral surface the friction-disk 20 is inclined at 23 to an angle of about fifteen degrees (15°) which is found in practice to be one of the best holding or gripping angles capable of use in a high-speed gear of this class of devices.

Keyed to the shaft 1 is a bushing 24

flanged at its outer end at 24′ and abutting at its other extremity against the friction-disk 16, and on said bushing is loosely mounted a sliding driven element 25 (shown as a gear) of less width than the length of the bushing, and having an overhanging inner side 26 provided with a slightly convex clutch-surface 27. In the body of this gear at its end opposite the overhang 26 is a chamber 28, the wall of which is inclined at 29 to receive the clutch-surface 23 of disk 16, and in said body are also formed pockets 30 for the reception of springs 31 and hollow plungers 32 bearing at their closed ends against the side of the friction-disk 20.

Designated by 33 is a disk keyed to the shaft, and provided with a threaded periphery 34 inclined clutch-surfaces 35, 35′ and a chamber 36, 36′ at each side and with inclined passages 37 and 37′, one communicating with a passage 38, leading to the tube 3, and the other with a passage 38′ leading to the bore 2 of said shaft.

Threaded upon one side of the disk 33 is a collar 39 having an inclined circumferential inner wall 39′ located opposite the inclined clutch-surface 35 of the disk 33, and clamped between these inclined surfaces is the edge of a flexible diaphragm 40 mounted at its axis on the shaft 1 between the flange 24′ of bushing 24, and the side of the disk 33. A like flexible diaphragm 41 is mounted in the same manner upon the shaft 1 at the other side of the disk 33, and it is clamped at its edge to said disk by a collar 42 having an inclined-surface 42′ located opposite the inclined clutch-surface 35′ of said disk.

A flanged bushing 43 is keyed to the shaft 1, and upon this bushing is loosely mounted a driven element 44 (shown as a worm-wheel) having a hub 45 provided at its inner end with a slightly-rounded or convex clutch-surface 46. A chamber 47 is formed in the element 44, thus producing an overhanging rim 48 provided with an inclined inner wall or clutch-surface 49 having an angle of about eleven degrees (11°) or thereabouts, which will be efficient in a slow speed-gear. In this element 44 are sockets 50 for the reception of hollow plungers 51 and springs 52, and beneath the overhanging clutch-surface 48 is a disk 53 having an inclined-surface 53′ of the same angle as the complemental surface 49. Holes 54 are formed in the disk 53 for the reception of pins 55 projecting from an element 56 (shown as a bevel-gear-wheel) keyed to the shaft 1, said pins being of slightly less diameter than the holes 54 in the disk so that a limited amount of play of the disk may take place. A washer 57 is placed on the shaft 1 between the end of the hub of the element 56 and the extremity of the bushing 43.

Passages 58 in part 25, and 59 in part 45 permit of the escape of air when the diaphragms are distended.

In the operation of the invention the diaphragms at the sides of the disk 33 normally assume a buckled form as illustrated by the right-hand diaphragm shown, this being due to the mode of clamping said diaphragms at their edges to the disk by the inclined surfaces described.

Supposing the motive-fluid to be turned into the bore 2 of shaft 1 it will enter the passage 37′—38′ and will distend the diaphragm 41, forcing it against the side of the overhanging clutch surface 46′ and crowding the element 44 along the shaft, thus engaging the same with the clutch-disk 53 in the manner described, locking said element to the rotary shaft 1, and compressing the springs 52, so that when pressure is cut off from said diaphragm the springs will force the element 44 slightly backward and will release the clutch-surfaces 49 and 53′. When said clutch surfaces are in full engagement the lost-motion between the pins 55 and the walls of the apertures 54, is ineffective, but when said surfaces recede from each other, and should foreign matter become lodged between them, the disk 53 will move slightly toward the shaft 1, the disengagement being readily accomplished by the springs in the manner described, or by other suitable means unnecessary to mention.

By employing clutch-engaging surfaces inclined at the low angle described or thereabouts, full holding power of said surfaces is assured, and should dirt or extraneous matter collect between said surfaces, as at x in the enlarged view Fig. 5, provision is made for this contingency by the slight play of one part with relation to the other part, so that there will be no danger of adherence when it is desired to release the clutch-elements, as the pressure against the diaphragm is withdrawn. On the side opposite the element 44 the same result is accomplished when pressure is cut off from the diaphragm on said side.

While shown applied to special mechanism it is distinctly to be understood that the invention is generic and, therefore, unlimited in scope. Any means may be employed as substitutes for the diaphragms and fluid connections shown for actuating the sliding-member of the clutch, the invention not being limited in this respect. Furthermore the invention is not limited to a clutch having inclined engaging-surfaces of any particular angle.

Having thus described my invention, what I claim is—

1. The combination, with a shaft, of an element keyed thereto, and having projections; a clutch-device having perforations of greater diameter than said projections whereby, play

of the projections in said perforations may take place, and a driven member having a clutch-surface adapted to be engaged by said clutch-device.

2. The combination, with clutch-members, one of which is movable toward and from the other, and one of which is provided with perforations, of another member having projections of less diameter than said perforations; and means for actuating one of said clutch-members toward and from the other clutch-member.

3. A clutch comprising a device having an inclined engaging-surface, said device provided with sockets; spring actuated plungers in said sockets; a disk having a complemental inclined engaging surface, and provided with perforations; and a carrier for said disk having projections fitted in, and of less diameter than said perforations, whereby the disk may yield bodily substantially as set forth.

4. The combination, with a clutch-member having an inclined engaging-surface, of a support for said member; a second clutch-member having perforations; and a complemental inclined engaging-surface; a carrier for said second clutch-member and yieldable bodily in a line away from the axis of said member; projections on the carrier, and of less diameter than the perforations of the second clutch-member; spring-actuated plungers carried by one of the clutch-members; and means for causing a clutch engagement between the members.

5. The combination, with a shaft, of a device keyed thereto; projections carried by said device; a clutch-member having openings of greater diameter than said projections; and a clutch-member adapted to engage the other clutch-member, one of said clutch-members being movable bodily in a line perpendicular to the clutch-axis.

6. The combination, with a shaft, of a clutch-member slidable with relation thereto, fluid-pressure devices for actuating said clutch-member in one direction; spring-controlled devices for actuating the clutch-member in the opposite direction; a second clutch-member; and means, whereby said second clutch-member may be afforded a yielding movement "bodily" in a line perpendicular to the axis of the clutch when the clutch-engaging surfaces are released.

7. The combination, with a shaft, and with an element keyed thereto, of pins projecting from said element; a clutch-device having perforations of greater diameter than the pins, and adapted to receive said pins and to yield thereon; a second clutch-device; means for causing the engagement of the two clutch-devices; and means for releasing said clutch-devices.

8. The combination, with a shaft, of a device rigid therewith; clutch-elements carried by said device; a disk having perforations for the reception of said elements, said disk being yieldable in a line perpendicular to the axis of the clutch; a movable clutch-member; and means for advancing and retracting said movable clutch-member.

9. The combination, with a tubular shaft, and with a disk carried thereby; a shaft having passages communicating with each other, of a tube within the shaft; means whereby motive-fluid may be supplied to the tube and shaft; a pair of flexible diaphragms, one secured to each side of the disk; clutch-devices actuated by said diaphragms, one member of each clutch device being movable in a plane perpendicular to the axis of the shaft; means for causing an engagement of the clutch-devices; and means for releasing said clutch-devices when the supply of motive-fluid is withdrawn.

In testimony whereof I affix my signature in presence of two witnesses, at Hartford, Conn., this 12th day of April, 1906.

BENGT M. W. HANSON.

Witnesses:
E. C. BENEDICT,
S. E. DAVIS.