受験番号：22IPM022

問１

[0002]

The most required property of a golf club (herein after referred to as “club”) is that a path of the ball hit by the club does not curve (or hardly curves). Although it is important to pursue such property of the club, a golfer also has great interest in finding a club that matches to him or her.　Conventionally, the club is produced by taking static characteristics such as the length of the club shaft (herein after referred to as “shaft”), balance, the weight of the club and hardness of the shaft, into account, and the golfer has to select the club by judging or guessing these characteristic values based on his or her past experience, or completely based on his or her intuition.

[0003]

On the other hand, golf swing is dynamic behavior, so that attention has been drawn to selection of the club taking a dynamic characteristic, i.e. the natural frequency (which means the primary natural frequency of bending vibration) of the club into account. The natural frequency is a value controlled by the bending rigidity of the shaft, the weight of the shaft, the length of the shaft, and the weight of the club head (herein after referred to as “head”), as outlined below.　Namely, during a down swing, the shaft is bent and restores its shape.　It is considered that the head speed reaches the maximal speed when the shaft restores its shape and becomes straight.　Accordingly, by hitting the ball at this moment, the maximum flying distance by the swing can be obtained (provided that the face of the head is directed toward a proper direction).　It is said that the natural frequency of the golf club has relation to such swing behavior.　If the natural frequency of the club is smaller than the most preferable frequency, the club reaches the hitting point before the maximal head speed is obtained.　On the other hand, if the natural frequency of the club is larger than the most preferable frequency, the ball will be hit after the head speed reached the maximal speed, resulting in reduction of the flying distance and deterioration of controllability of the flying direction.

問２

[0025]

As shown in Fig. 3, when the flange 10 of the holder 7 is held in pressing contact with the side face of the outer ring 2, a friction force acting on the contact surface becomes a rotational resistance of the holder 7.　When the friction force exceeds an elastic force of the elastic body 11, the inner ring 1 and the holder 7 are relatively rotated, and the roller 6 engages the cylindrical surface 3 and the cam surface 5, whereby the rotation of the inner ring 1 is transmitted to the outer ring 2 via the roller 6. Also, the elastic body 11 is elastically deformed by the relative rotation of the inner ring 1 and the holder 7.

[0026]

In the state where a rotary torque is transmitted between the inner ring 1 and the outer ring 2, when a load of an axial force with respect to the flange 10 is released, the holder 7 is rotated toward a neutral position by elastic restoration of the elastic body 11. By this rotation of the holder 7, the engagement of the roller 6 with the cylindrical surface 3 and the cam surface 5 is released, and the inner ring 1 is idly rotated. Further, since the elastic body 11 is provided between the inner ring 1 and the holder 7, the roller 6 revolves together with the holder 7.

[0027]

At this time, the roller 6 is biased toward the inner circumference of the outer ring 2 by the elastic piece 9, and prevented from moving in a radially inner direction of the holder 7. Therefore, behavior of the roller 6 during a low-speed rotation of the inner ring 1 is stabilized, and a dragging torque applied to the holder 7 is small. Also, the roller 6 is prevented from being mistakenly engaged with the cylindrical surface 3 and the cam surface 5.

[0028]

Further, the roller 6 is prevented by the elastic piece 9 from moving in the radial direction of the holder 7, so that the roller 6 does not repeatedly collide with the cylindrical surface 3 and the cam surface 5, and vibration due to the collision of the roller 6 is hardly generated. Thus, a two-way roller clutch having excellent vibration properties can be obtained.

問 3

An electromagnetic bearing (10) for an axial force member (11) comprising a rotation axis (12) and a distal region outwardly extending from the rotation axis (12), the electromagnetic bearing (10) comprising:

an annular magnetic iron member (14) comprising a single coil (15) and a pair of extrusions (20, 21), the magnetic iron member (14) striding the distal region of the axial force member (11), the pair of extrusions (20, 21) having opposite surfaces facing the axial force member (11), the opposite surfaces defining a magnetic flux control gap on the respective opposite sides in the axial direction of the axial force member (11), and the coil (15) generating an electromagnetic control magnetic flux route (22) through the magnetic flux control gap, whereby the axial force member (11) is positioned with respect to the magnetic iron member (14) in the axial direction; and

a pair of annular permanent magnets (16, 17) attached to the magnetic iron member (14) and having opposite surfaces facing the axial force member (11), the pair of permanent magnets (16, 17) defining a pair of magnetic gaps at a position radially spaced from the magnetic flux control gap, and the pair of permanent magnets (16, 17) generating bias flux routes (18, 19) through the pair of magnetic gaps, each of the bias flux routes (18, 19) being parallel to the electromagnetic control magnetic flux route (22), and more than a half of the length of each bias flux route differs from the electromagnetic control magnetic flux route (22).