SURFING WAVE GENERATION

Field of invention

This invention relates to wave pools and more particularly to the generation of artificial waves and creation of surfing wave breaks.

Background

Artificial surfing wave facilities, typically called wave pools exist. Some are linear, in that they are generally rectangular and a wave travels from one end to the other. Other wave pools have a wave generating device located within the body pf water, with waves radiating outwards toward the edges of the wave pool.

The present invention aims to provide novel apparatus for generation of waves and also novel structures for the generation of wave breaks.

Summary

In a first aspect, a surfing wave system is provided, comprising a wave pool defining a body of water having a water surface and a shoreline; a wave generating apparatus in the wave pool for generating concentric waves that radiate outwards in a generally radial manner, comprising a wave generating object and a drive mechanism for causing the wave generating object to oscillate at a natural frequency of the system along a path, with the wave generating object in contact with the body of water for at least some of the time, the path including a component perpendicular to the water surface when the wave generating object is in contact with the body of water; an array of main reefs in the wave pool, the main reefs comprising angled apex units; and an array of secondary reefs that are set back from the main reefs and away

from the shoreline in the wave pool.

An embodiment provides wave generating apparatus for generating at least one wave in a surface of a body of water, comprising at least one wave generating object, means for causing the wave generating object to oscillate vertically relative to the surface, with the wave generating object in contact with the body of water for at least some of the time,

wherein the at least one wave generating object has at least one wave generating surface and

wherein where there is a single wave generating object, the wave extends away from the wave generating object and

wherein where there are multiple wave generating objects, the wave

toward the water or further into the water, with buoyancy causing movement in the opposite direction. Alternatively, the drive mechanism may move the wave generating object away from the water or out of the water with gravity being utilised to cause movement in the opposite direction. Alternatively, the drive mechanism may drive the wave generating object in both directions.

The drive mechanism may comprise a pneumatic or hydraulic ram. The ram may be double acting. Electromagnets may be used to drive the wave generating object in one or both directions. Other drive mechanisms are within the scope of the invention.

Another embodiment provides an artificial wave generating reef for causing a wave generated by at least one wave generator to break, the reef having a submerged break generating surface that extends underneath the water surface, a portion of the break generating surface nearer the at least one wave generator being further away from the water surface than a portion further away from the at least one wave generator.

Preferably the break generating surface extends at an angle to the travel of waves generated by the at least one wave generator, such that a wave breaks progressively along the length of the break generating surface.

The break generating surface may follow one or more linear or curved paths.

An artificial wave pool may have multiple artificial wave generating reefs located about one or more artificial wave sources. These may be arranged so that a wave breaks over one artificial wave generating reef and then breaks over another.

Another embodiment provides a reef module for an artificial wave generating reef, the reef module including a movable body that includes at least one break generating surface. The body is movable relative so as to

adjust the height and or angle of the at least one break generating surface.

In one embodiment the body is mounted for rotation about a first axis, whereby the at least one break generating surface is adjustable by rotation of the body about the first axis.

The first axis itself may be movable, such as rotatable about another axis, such as an axis perpendicular to the first axis. The height of the first axis may be adjustable.

Preferably, in use, the body is positioned above a base of a pool, such that water may flow between the body and the pool base.

In one embodiment the reef module comprises at least one support leg and a body mounted for rotation on the at least one support leg. Optionally the at least one support leg is telescopic.

These and other features of various embodiment will be more apparent form the following non-limiting description of the following representations.

Brief Description of the Drawings

Figure 1 is a side view of a wave generating arrangement according to a first implementation of the invention.

Figure 2 is a side view of a wave generating arrangement according to a second implementation of the invention.

Figure 3 is a side view of a plunger used in the first or second implementation of the invention at a first position.

Figure 4 is a side view of the plunger of figure 3 at an equilibrium position.

Figure 5 is a side view of the plunger of figure 3 at a depressed position

What is claimed:

1. A surfing wave system, comprising:

a wave pool defining a body of water having a water surface and a shoreline;

a wave generating apparatus in the wave pool for generating concentric waves that radiate outwards in a generally radial manner, comprising a wave generating object and a drive mechanism for causing the wave generating object to oscillate at a natural frequency of the system along a path, with the wave generating object in contact with the body of water for at least some of the time, the path including a component perpendicular to the water surface when the wave generating object is in contact with the body of water;

an array of main reefs in the wave pool, the main reefs comprising angled apex units; and

an array of secondary reefs that are set back from the main reefs and away from the shoreline in the wave pool.

2. The surfing wave system of claim 1 wherein a wave generating surface includes a surface angled to the direction of oscillation.

3. The surfing wave system of claim 1, wherein there is a passageway between the main reefs and a base of the wave pool through which water that has broken on the shore line may return to a centre of the wave pool.

4. The surfing wave system of claim 1, wherein the main reefs are buoyant.

5. The surfing wave system of claim 1, wherein the wave generating

object is configured so that its oscillation causes waves to extend in substantially all directions.

6. The surfing wave system of claim 1, wherein at least part of a wave generating surface of the wave generating object is selected from a group including a revolution of part of a straight line, a portion of a circle, a portion of an ellipse and a portion of parabola.

7. The surfing wave system of claim 6, wherein at least part of the wave generating surface is asymmetrical.

8. The surfing wave system of claim 1, including a convex wave generating surface, said convex wave generating surface generating a wave that expands as it extends away from the wave generating surface.

9. The surfing wave system of claim 1, wherein the main reef includes adjustable legs so a position of a surface of the main reef under the water surface may be adjusted.

10. The surfing wave system of claim 1, including multiple wave generating surfaces on a single wave generating object.

11. The surfing wave system of claim 1, including wave guides that constrain the extent of waves on the surface of the body of water.

12. The surfing wave system of claim 1, wherein the wave generating object is buoyant.

13. The surfing wave system of claim 1, wherein the drive mechanism drives the at least one wave generating object toward the water or further into the water, with buoyancy causing movement in the opposite direction.

14. The surfing wave system of claim 1, wherein the drive mechanism

moves the wave generating object away from the water or out of the water with gravity being utilised to cause movement in the opposite direction.

15. The surfing wave system of claim 1, wherein the drive mechanism drives the wave generating object in both directions.

16. The surfing wave system of claim 1, wherein an upper surface of the secondary reefs is nearer the water surface than an upper surface of the main reefs.

17. The surfing wave system of claim 1, wherein the drive mechanism comprises electromagnets to drive the wave generating object in one or both directions.

18. The surfing wave system of claim 1, wherein the wave generating object is caused to oscillate along the path by repeatedly being dropped and/or driven into the body of water and then withdrawn.

19. The surfing wave system of claim 1, the main reefs causing a wave generated by the wave generating apparatus to break, the main reefs having at least one submerged break generating surface that extends underneath the water surface, a portion of the or each break generating surface nearer the at least one wave generator being further away from the water surface than a portion of the same break generating surface further away from the wave generating apparatus.

20. The surfing wave system of claim 19, wherein at least one break generating surface extends at an angle to the travel of waves generated by the at least one wave generator, such that a wave breaks progressively along the length of respective break generating surface.

21. The surfing wave system of claim 1, wherein the wave generating

object includes a concave wave generating surface, said concave wave generating surface generating a wave that contracts as it extends away from the wave generating surface.