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ELECTROMAGNET FOR SUPPORTING AND DROPPING WEIGHTS

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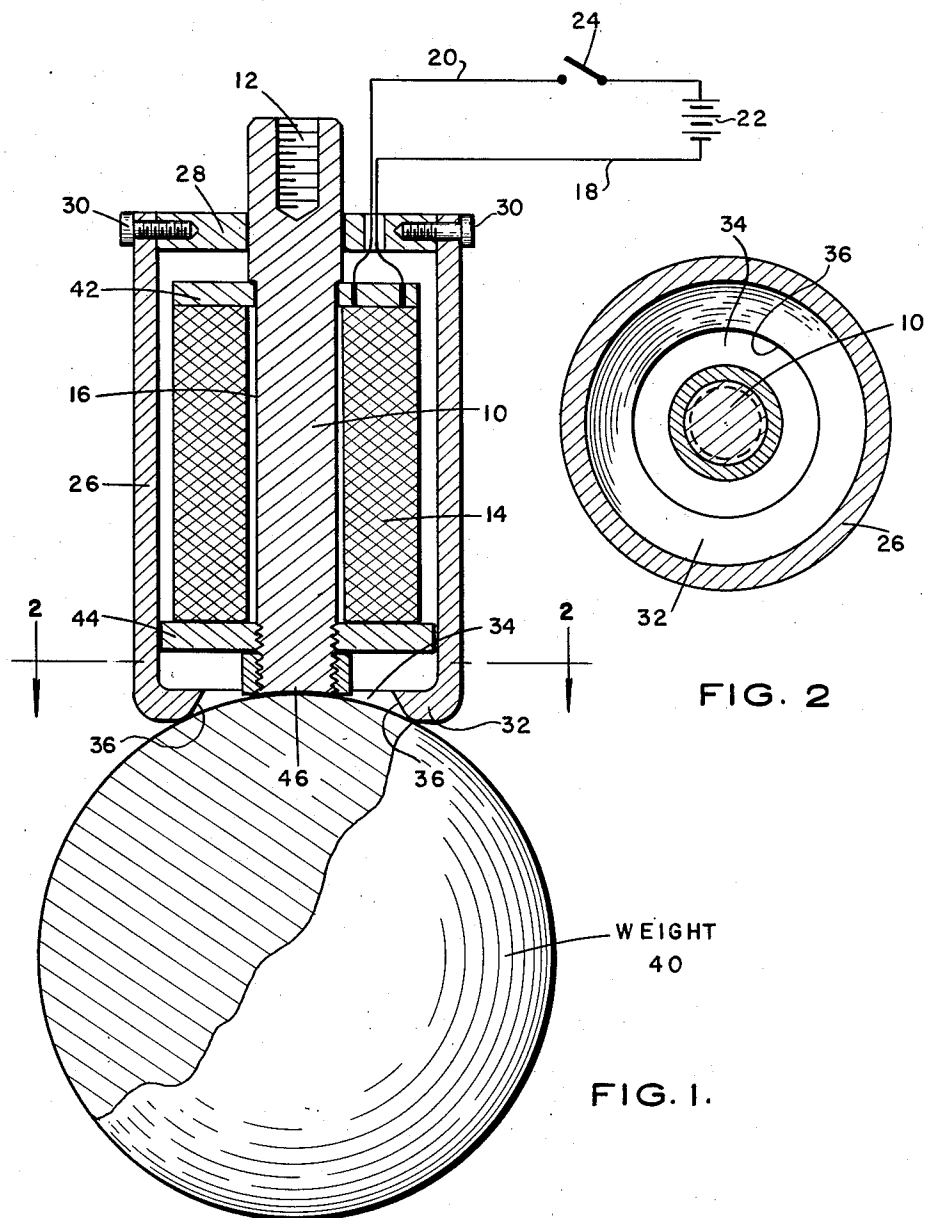


FIG. 1.

FIG. 2

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ELECTROMAGNET FOR SUPPORTING AND
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This invention relates to the measurement of impact strength of materials.

One of the tests used to determine the impact strength of materials, such as plastic articles, consists of the dropping of steel balls of different size and weight upon the article from a variety of heights. The impact is equal to the weight of the ball in pounds times the height in feet from which the ball is dropped and is expressed in foot pounds.

Spherical objects are relatively difficult to lift and drop reproducibly. Some of the problems are:

- (1) They are hard to hold onto mechanically.
- (2) They tend to roll as they are released, giving the sphere a lateral energy in addition to its known vertical component of energy. This complicates the impact strength calculations and makes it difficult to control the point at which the sphere strikes the test article.

This invention is a new electromagnet for lifting and supporting weights and is particularly useful with spherical weights. It is more efficient than currently used electromagnets and drops the weight without any lateral component of velocity thereby making it easier to predict the point of impact of the weight on the test specimen.

The invention as well as its many advantages will be further understood by reference to the drawings in which:

FIG. 1 is a cross sectional view of the electromagnet supporting a spherical weight; and

FIG. 2 is a sectional view taken along the line 2—2 of FIG. 1.

Referring to the drawing, the electromagnet includes a soft iron core 10. The core 10 is provided with an internal screw thread 12 at its top for attachment to an overhead member (not shown).

A coil 14 is wrapped upon a coil supporting member 16. Conductors 18 and 20 lead from coil 14 to a source of voltage, such as the battery 22. The flow of current through conductors 18 and 20 is controlled by means of a switch 24.

A hollow cylindrical case 26, made of soft iron, is arranged for slidable movement along the soft iron core 10. Connected across the top of the case 26 is a flat disk 28, made of soft iron. The connection of disk 28 to case 26 is accomplished by means of screws 30.

The base 32 of the cylindrical case 26 has a circular opening 34. The circular opening 34 is defined by rounded portions 36 extending through the base 32. The opening 34 is shaped to substantially conform to the spherical perimeter of the weight 40.

The coil supporting member 16 is provided with an upper plate 42 and a lower plate 44, both made from nonmagnetic materials. The lower plate 44 is in slidable contact with the inside of the cylindrical case 26.

The magnetic flux path includes the core 10, the disk

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28, and the case 26. For a fixed coil size, the amount of electrical power required to establish a given value of attractive force is proportional to the attractive force times the total air gap which exists in the magnetic circuit. Hence, in order to obtain a given attractive force with a minimum amount of power, the air gap must be very small. Thus, the electromagnet and the load should be in intimate contact. This condition is achieved by this invention. When the weight 40 is properly supported by the electromagnet, it is in intimate contact with both the portion 36 of opening 34 in the hollow cylindrical case 26 and the bottom 46 of the core 10. Thus, the air gap in the magnetic flux path is minimized. The slidable relationship of the hollow cylindrical case 26 and the core 10 also permits one to automatically align the sphere with the axis of the electromagnet regardless of the size of the sphere.

The plate 44 of the coil support 16 prevents lateral movement of the bottom portion of the cylindrical case 26 with respect to the soft iron core 10.

Thus, the following is obtained:

- (1) The intimate contact provides for the efficient mechanical support of the weight on the electromagnet.
- (2) Lateral movement of the weight as it is dropped is eliminated and the point of impact of the weight on the test specimen is easily predicted.

I claim:

1. An electromagnet for supporting and dropping weights comprising: a soft iron core; a coil wrapped about said core; and a slidable soft iron member about said coil, said member having an opening therein shaped to conform with the shape of the outer perimeter of the weight to be supported in intimate contact with both the core and the slidable soft iron member and then dropped.

2. An electromagnet for supporting and dropping spherical weights comprising: an elongated soft iron core; a coil wrapped about said core; a slidable soft iron hollow cylindrical case about said core and having an opening in the bottom therein shaped to substantially conform to the spherical shape of the weight, said core extending below the coil so that when the weight is properly supported by the electromagnet, it is in intimate contact with both the case and the core.

3. An electromagnet for supporting and dropping spherical weights comprising: an elongated soft iron core; a slidable soft iron hollow cylindrical case about said core and having an opening in the bottom thereof shaped to substantially conform to the spherical shape of the weight; a coil supporting member mounted about the core and having a lower plate in slidable contact with the inside of the cylindrical case to prevent lateral movement of the lower portion of the case, said plate being located above the lower end of the core so that when the weight is properly supported by the electromagnet, it is in intimate contact with both the case and the bottom of the core; and a coil wrapped about the coil supporting member.

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