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[54] **HOISTING SHACKLE WITH QUICK RELEASE ATTACHMENT MEANS**

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[51] **Int. Cl.** **B66c 1/36**

[58] **Field of Search** ..... 294/78 R, 82 R, 83 R, 89; 24/232, 238, 239, 240, 241 R, 241 SL, 241 PL, 233; 52/698, 699, 700; 59/85, 89, 93

[56] **References Cited**

UNITED STATES PATENTS

239,291	3/1881	Work	24/239
307,054	10/1884	Kelly	24/233 X
1,365,911	1/1921	Goozey	24/238
1,783,391	12/1930	Schorr et al.	52/700
2,222,053	11/1940	Waller	24/240
2,338,328	1/1944	Handel	52/699
2,366,656	1/1945	Saffert	52/698 X
3,425,739	2/1969	Frost et al.	294/83 R

FOREIGN PATENTS OR APPLICATIONS

46,536	6/1966	Germany

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[57] **ABSTRACT**

A hoisting shackle with quick release attachment means cooperating with non-recoverable anchoring elements in the load e.g., a prefab building component, the closed hollow shackle body having a slot across which a locking bolt can be engaged with the anchoring element. Retraction of the locking bolt for remote release can be accomplished by means of a Bowden cable.

15 Claims, 6 Drawing Figures

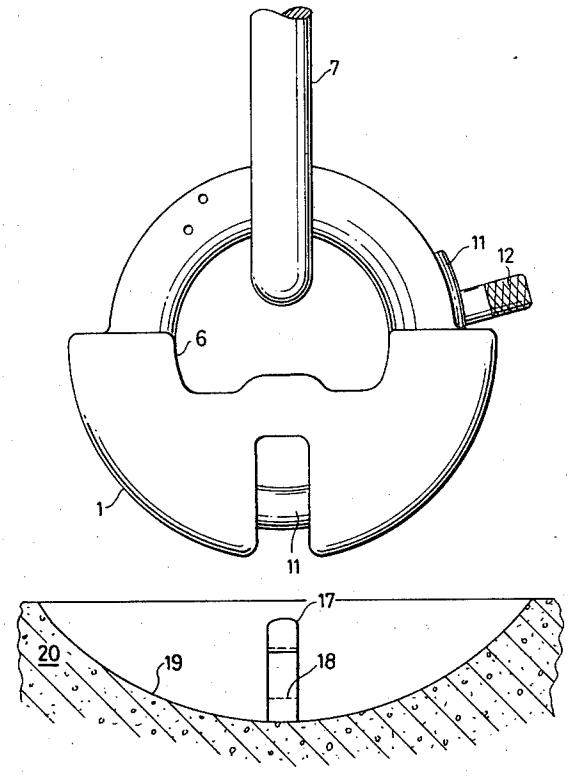
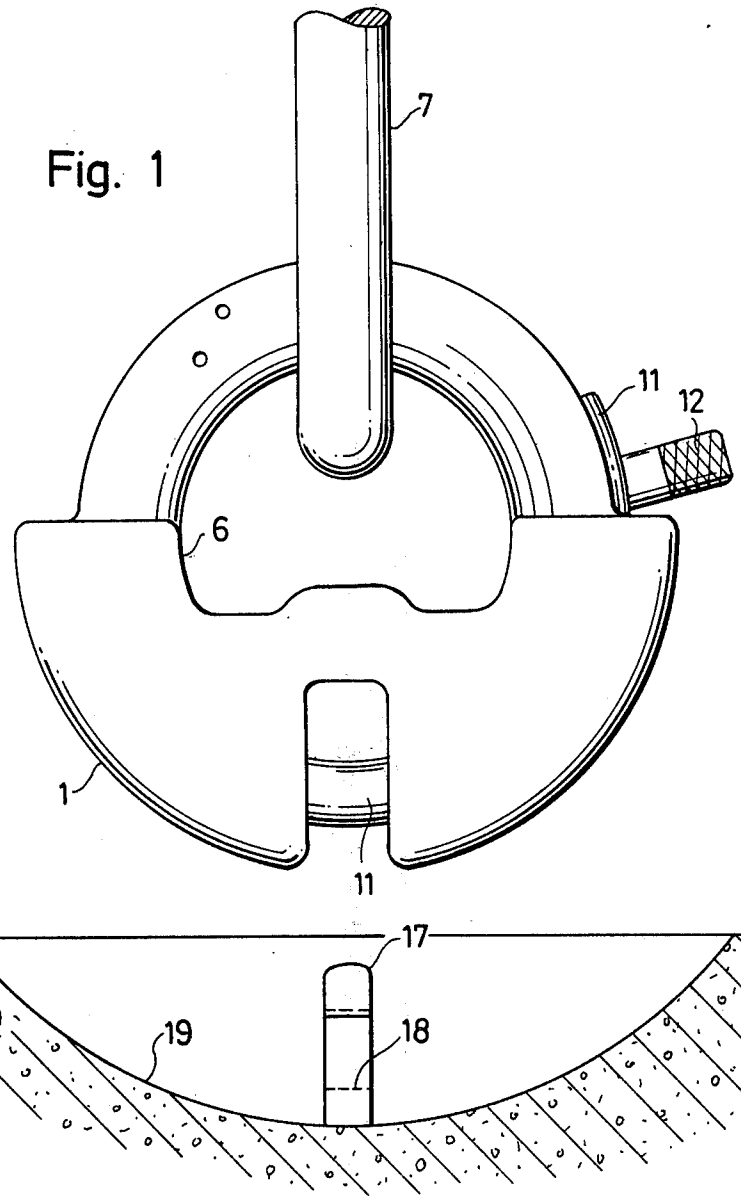


Fig. 1



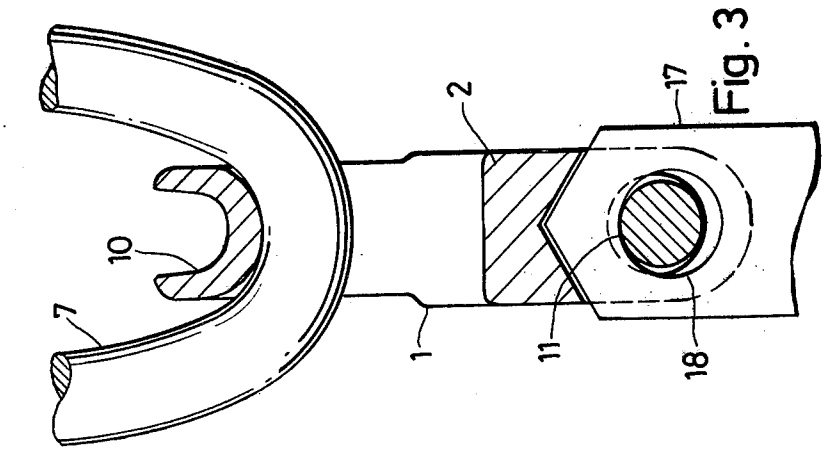


Fig. 3

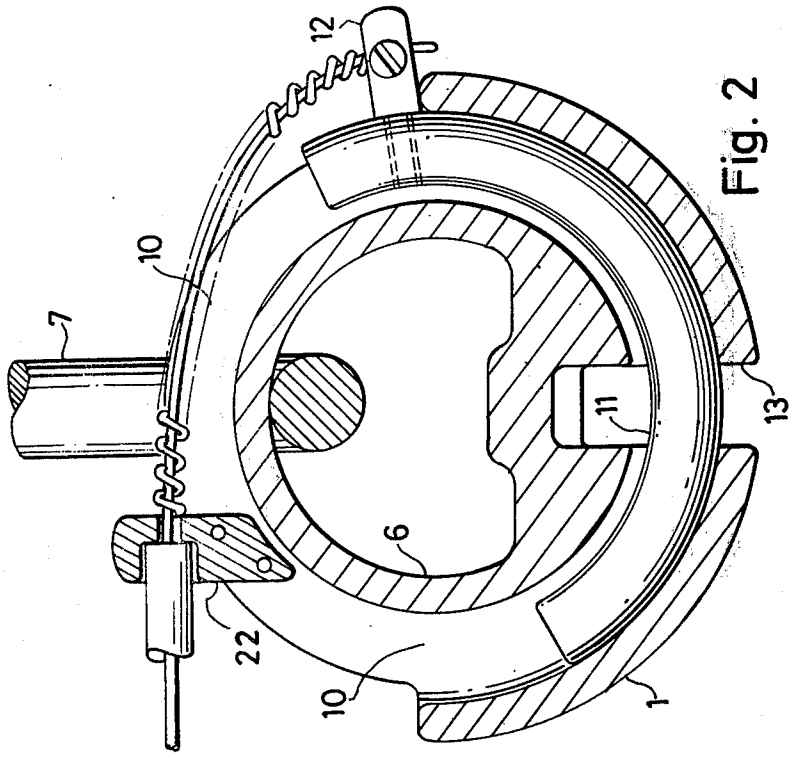


Fig. 2

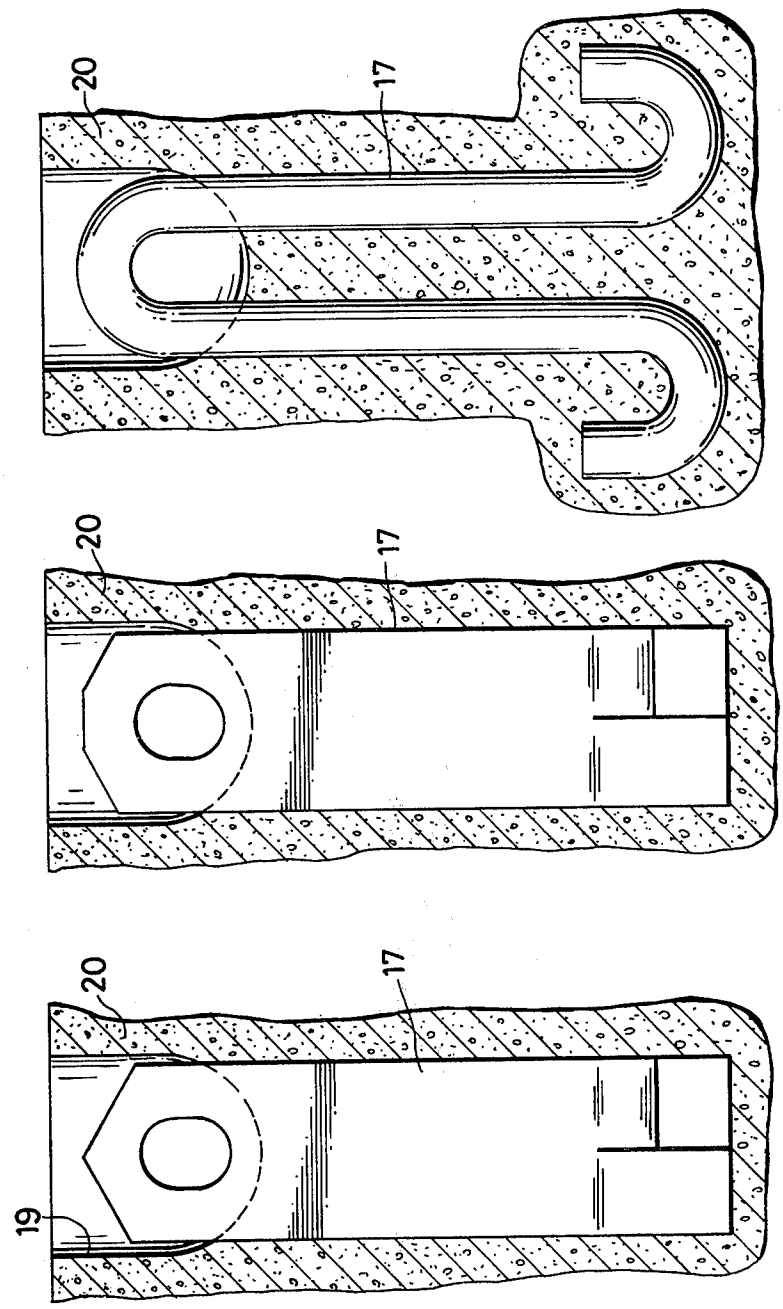


FIG. 4c

FIG. 4b

FIG. 4a

HOISTING SHACKLE WITH QUICK RELEASE ATTACHMENT MEANS

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to hoisting attachments, and in particular to hoisting shackles which have quick release attachments cooperating with special anchoring elements arranged in the load itself, or attachable thereto, and which are especially suitable for hoisting operations in connection with prefabricated building elements in the construction industry.

2. Description of the Prior Art

Modern construction technology not only requires the transportation and hoisting of increasingly heavier prefabricated building components, it also requires such material handling operations to be efficient and safe. It is therefore no longer adequate to use ropes or cables for the attachment of these prefabricated building components to a hoisting crane, because it is often difficult and risky to remove the ropes or cables.

It has therefore already been suggested to incorporate non-recoverable anchoring elements in the building components themselves during prefabrication and to attach these components directly to the crane by means of hooks or shackles which engage the anchoring elements. One shortcoming of this prior art suggestion is that the anchoring elements remaining on the prefab components either form permanent protrusions thereon, or have to be removed by cutting them with a blow torch, for example.

In order to avoid this problem, it has also been suggested to provide recessed anchoring elements in the prefabricated building components which do not project over the adjacent surface of the part and can therefore be left in place after emplacement of the building component. Where called for, the recesses surrounding the anchoring elements are filled in, thereby removing any trace of the anchoring elements. For a satisfactory operation of these recessed anchoring elements or "lost anchors" it is necessary that they be accurately positioned within their recesses. It has therefore also been suggested to produce these recesses and the positioning of the anchoring elements during the concrete pouring operation of the building component by inserting a core piece of rubber or foam plastic into the mold which then forms the recess around the anchoring element and also positions the latter. Once the concrete in the mold is set, the core elements can be removed from the prefab component.

In many cases the use of recessed anchoring elements also offers cost economies. On the other hand, however, the recesses themselves may represent a structural problem in that they are either too small for convenient access with conventional hooks, or are so large that they entail structural stress problems by reducing the overall bending resistence of the prefabricated building component.

SUMMARY OF THE INVENTION

It is a primary objective of the present invention to overcome the above shortcomings by suggesting a novel hoisting shackle with a quick release attachment which is capable of cooperating with special, recessed anchoring elements which require a minimal recess space in the prefab components.

The present invention proposes to attain the above objective by suggesting a hoisting shackle whose main body is in the form of a closed hollow ring comparable to a tubular torus, with a portion of the outer ring wall removed, and including an arcuate attachment bolt which is received in the annular cavity of the shackle body.

In a preferred embodiment the arcuate locking bolt has a semi-annular outline and a circular cross section, the similarly curved annular cavity of the shackle body being likewise circular in cross section. At its lowest point the shackle body has a transverse slot into which the eye portion of a cooperating anchoring element can be inserted to be retained therein by the locking bolt which traverses this slot. The semi-annular locking bolt, when not clamped in place by the forces acting on the anchoring element, tends to assume a position in the lower portion of the shackle body under the influence of gravity, thereby normally locking the shackle.

The preferred embodiment of the invention also offers an advantageous feature in regard to the release operation on the shackle, which merely requires a comparatively simple angular displacement of the locking bolt inside the annular cavity of the shackle. This release operation is very safe and positive, because the shackle body itself is positioned against the eye portion of the anchoring element while the locking bolt is retracted inside the shackle body.

A still further advantageous feature of the present invention relates to the possibility of remotely actuating the release movement of the locking bolt. This result is obtained in a very simple way by adding to the hoisting shackle of the invention a cable pull, for example a Bowden cable, which permits the release of the hoisting shackle from its anchoring element from a distance, for instance from the ground or from a safe place on the construction site. Accidental or premature release of the locking bolt is practically impossible, because the load acting on the anchoring element creates a clamping action between the locking bolt and the cavity wall of the shackle body.

BRIEF DESCRIPTION OF THE DRAWINGS

Further special features and advantages of the invention will become apparent from the description following below, when taken together with the accompanying drawings which illustrate, by way of example, several embodiments of the invention, represented in the various figures as follows:

FIG. 1 shows in an elevational front view a hoisting shackle with manual release and a cooperating anchoring element representing a first embodiment of the invention;

FIG. 2 shows an elevational cross section of a hoisting shackle similar to that of FIG. 1, but arranged for remotely controlled release representing a second embodiment of the invention;

FIG. 3 shows a sectional side view of the hoisting shackle of FIGS. 1 or 2; and

FIG. 4 shows the three different versions of anchoring elements, designated as 4*a*, 4*b*, and 4*c*, as part of the preferred embodiments of the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

As illustrated in FIGS. 1 and 2, the hoisting shackle of the invention consists of a shackle body 1 of cast

steel, the general outline of the shackle body being that of a ring, or more precisely of a hollow torus. The shackle body **1** has an annular cavity **10** which is open to the outside in the upper half of the shackle body, where the outer wall portion of the hollow torus profile is removed. The upper half of the shackle body **1** thus has a U-shaped cross section, as can be seen in FIG. **3.** In the area of this U-shaped profile the shackle body is engaged by the eye of a connecting element **7,** which may be a closed ring, a hook, or the loop of a cable. Since the inner profile of the aperture **6** of the shackle body **1** is rounded in at least the upper half of the body, the connecting element **7** is allowed to swing sideways in both directions from the vertical plane to accommodate conditions in which the direction of cable pull or chain pull is inclined up to approximately 60° from the vertical. Such a condition may obtain, when the hoisting harness includes two or more cables with hoisting shackles at their extremities.

Inside the circular cavity **10** of the shackle body **1** is arranged an arcuate locking bolt **11** which occupies approximately one-half of the channel circumference and is guided inside the channel **10** for motion along a circular path. The locking bolt **11** is introduced into cavity **10** of the shackle body **1** through the open upper half of the channel **10** and, because of the effect of gravity, will normally slide into the lower half of shackle body **1.** A nose **12** which extends radially from one end portion of the locking bolt **11** serves as an abutment element between bolt **11** and shackle body **1** and can also be used to move the locking bolt **11** upwardly out of the lower half of the cavity **10.**

In the mid-portion of the lower half of the shackle body **1** is further arranged a vertical slot **13** which traverses the circular channel **10** of the body in that area without separating it structurally. This slot **13** is adapted to receive the free extremity of a matching anchoring element **17** (FIGS. **1** and **3**) which has a hole **18** through which the locking bolt **11** can be engaged, when the eye portion of the anchoring element **17** is brought into alignment with slot **13** of shackle body **1.** Thus, the shackle body **1** and locking bolt **11** cooperate with a matching anchoring element **17** in a manner comparable to a known necklace lock, any load or pull on the anchoring element **17** having the tendency of clamping the locking bolt **11** in place, thereby preventing an inadvertent or accidental release motion.

The hoisting shackle of the invention is designed to be used for the transportation of very heavy loads, such as prefabricated building components which are to be hoisted into place, and following which the hoisting harness is to be released from the component. For this purpose, it has been found to be advantageous and convenient to incorporate the anchoring element **17** in the prefab building component as an integral non-recoverable part or so-called lost anchor which need not be removed from the prefab component during building assembly.

The hoisting shackle of the invention lends itself very advantageously to the use of such lost anchors, because it requires a minimum of space around the eye portion of the anchoring element. This can best be seen in the lower portion of FIG. **1** and in the three illustrations of FIG. **4** where several comparable embodiments of anchoring elements are illustrated. On the one hand, it is necessary that the eye portion of each anchoring element **17** is recessed in relation to the upper surface of a building component **20** so that it does not interfere with other building components during and after assembly. On the other hand, it is also important to minimize the depth and width of the recess **19** around the free portion of the anchoring element **17,** in order to keep the cross-sectional weakening of the prefabricated element **20** to a minimum. This feature is clearly illustrated in FIGS. **1** and **4** which show that the recess **19** required for the proposed lost anchor of the invention is shallow and advantageously rounded in all directions. The latter thus also serves to positively guide the hoisting shackle into engagement with the eye portion of the anchoring element **17.**

The entry guidance between the hoisting shackle **1** and the free eye portion of the anchoring element **17** can be further enhanced by providing a pointed shape at the extremity of the anchoring element **17** and by giving the hole **18** of its eye portion an elongated configuration. The reinforced connection web **2** which forms that portion of the shackle body **1** which is located above slot **13** may be provided with a matching configuration so that, when the hoisting shackle **1** is forcibly set onto the free end of the anchoring element **17,** the hole **18** of the latter is automatically placed in alignment with the locking bolt **11** inside the circular channel **10** of the shackle body **1.**

Of the three versions of the anchoring element **17** shown in FIG. **4,** version *a* shows a pointed upper end, version *b* shows a bevelled end portion, and version *c* has the rounded configuration of a loop. The first two versions of the anchoring element are conveniently produced as stampings, the lower end portion of the stamping being longitudinally split so as to form two anchoring legs which are bent in opposite directions. As an alternative, the embodiment *c* shows an anchoring element **17** obtained from a rod which is bent into the shape of a twin hook, the loop portion on its upper end providing both the rounded entry configuration for its guidance into slot **13** of shackle body **1** and an opening equivalent to the hole **18** for cooperation with the locking bolt **11.**

The anchoring element **17** is in each case incorporated in the prefabricated building component by placing it into the component mold after the concrete has been poured, but before the latter has set. The recess **19** around the high portion of the anchoring element **17** is preferably obtained by using a core piece having the shape of the recess, the core piece being attached to the eye portion of the anchoring element **17.** This recess core piece may be of rubber or plastic, for example, and it may have a flat end face which, when aligned with the corresponding end face of the building component properly positions the anchoring element **17** as to its depth and orientation.

In FIG. **2** is further illustrated a modified embodiment of the invention in which the locking bolt **11** can be withdrawn into its released position by a remotely controlled release mechanism. This release mechanism may for instance be in the form of a Bowden-type cable pull which includes a cable which is attached to the nose **12** of locking bolt **11** and a removable sheath bracket **22** which is mounted on the shackle body **1** in the area of the annular cavity **10.** Thus, the release of the hoisting shackle from the anchoring element **17** can be controlled from a remote position by means of the release cable, thereby eliminating the need for a worker to be in the immediate vicinity of the hoisting

shackle to affect its release. The remote release feature thus eliminates risky climbing and balancing maneuvers which may otherwise be necessary for the release of the hoisting harness from the building component after emplacement of the latter.

As long as the load is suspended on the hoisting harness, the inadvertent or accidental retraction and release of the locking bolt **11** is effectively prevented by the load itself, which causes the locking bolt **11** to be firmly clamped inside the annular cavity **10** of the shackle body **1.** On the other hand, the locking bolt **11** can be retracted with little effort, once the load has been set down and the hoisting harness is slack.

The Bowden cable release mechanism may further include a return spring (not shown in drawing) which surrounds the exposed cable position in the space between the nose **12** and the sheath bracket **22** and which urges the locking bolt **11** into its locking position.

The safety advantages of the remote release feature are particularly advantageous in the case where large and heavy prefabricated wall panels are to be installed, and where it would be difficult for a worker to reach the hoisting attachments on the upper end of the installed panel with his hand. The hoisting shackle of the invention is suitable for application with the heaviest building components, including components weighing up to 12 Mp (12,000 tons). It should be understood, that the remote-controlled release mechanism may include means other than the Bowden cable, such as, for example, release means which are operable through the movement of the hoisting harness itself, or which are operable by means of a long rod or the like. The latter may include a cocked release spring arranged inside the annular cavity **10** of shackle body **1** and a trigger mechanism which when actuated, allows the release spring to retract the locking bolt **11.**

It should be understood, of course, that the foregoing disclosure describes only preferred embodiments of the invention and that it is intended to cover all changes and modifications of these examples of the invention which fall within the scope of the appended claims.

What is claimed is:

1. A hoisting shackle system with a quick release attachment device for attaching a hoisting harness to a load at one or more attachment points, comprising in combination:

a ring-shaped closed shackle body having an annular cavity giving it a shape similar to that of an upright hollow torus and being thus adapted to form an articulated, chain-link-type end member of a hoisting harness or the like of which a hook or end loop can reach through the central aperture of the torus, the shackle body having an upper arcuate portion in which the outer peripheral wall of the hollow torus structure is removed so as to leave a radially open, U-shaped cross-sectional wall profile around its annular cavity;

an arcuate locking bolt received in the annular cavity of the shackle body so as to be guided therein for movement along the curvature of said annular cavity;

a transverse radial slot in the lowermost portion of the shackle body which reaches upwardly a distance beyond the cross-sectional space occupied by the locking bolt inside the annular cavity;

an anchoring element capable of being fixedly attached to a load and having an upstanding eye portion with a transverse opening, the eye portion fitting into the radial slot of the shackle body in such a way that the locking bolt can be inserted through its opening, thereby attaching the anchoring element to the shackle body; and

means for releasing the anchoring element from the shackle body, by retracting the locking bolt from its locked position in which it traverses said radial slot to a position outside the slot region.

2. A hoisting shackle system as defined in claim **1,** wherein:

the load is a concrete body, such as a building component or the like; and

the anchoring element is permanently embedded in the concrete of the load in such a way that only its upstanding eye portion protrudes from the concrete.

3. A hoisting shackle system as defined in claim **1,** wherein:

the load is a prefabricated building component of concrete;

the anchoring element is permanently embedded in the concrete of the building component in such a way that only its upstanding eye portion protrudes from the concrete; and

the building component includes a recess in its surface surrounding said eye portion, the recess having an outline which matches approximately that portion of the shackle body which reaches into the recess when the shackle body is attached to the anchoring element.

4. A hoisting shackle system as defined in claim **3,** wherein:

the anchoring element is a steel bar of flat section whose upper end portion forms the eye portion and whose lower end portion includes at least one laterally extending extremity by which it is retained in the concrete of the building component.

5. A hoisting shackle system as defined in claim **3,** wherein:

the anchoring element is a bent steel rod in the shape of a twin hook, with a central hairpin-type loop forming the upwardly extending eye portion and two hook portions on its lower end retaining it in the concrete of the building component.

6. A hoisting shackle system as defined inclaim **1,** wherein:

the eye portion of the anchoring element has a converging outline at its uppermost extremity, and the radial slot in the shackle body has a matchingly shaped bottom portion which, when pressed against the extremity of the anchoring element, centers the latter inside the slot for alignment of its transverse opening with the locking bolt.

7. A hoisting shackle system as defined in claim **1,** wherein:

the locking bolt is of such a length that one of its extremities reaches upwardly into the open, U-shaped portion of the shackle body when the other end portion traverses its radial slot in the locked position; and

the releasing means includes a radially extending actuating nose on the upper end portion of the locking bolt.

8. A hoisting shackle system as defined in claim **1,** wherein:

the releasing means includes means for remotely actuating the reaction of the locking bolt from its locked position.

9. A hoisting shackle system as defined in claim **8**, wherein:

the remote actuating means includes a Bowden-type pull cable, a sheath bracket on the shackle body for the abutment and positioning of the near end of the cable sheath, and a cable attachment between the corresponding end of the cable and one end of the locking bolt; the sheath bracket being so positioned in relation to the cable attachment that a pulling action on the Bowden cable causes the locking bolt to be retracted from its locked position.

10. A hoisting shackle system as defined in claim **9**, wherein:

the remote-actuating means further includes a return spring surrounding the cable between the sheath bracket and the cable attachment, the return spring urging the locking bolt into its locked position.

11. A hoisting shackle for releasably attaching a hoisting harness to a load, the shackle comprising:

a generally torus-shaped, unitary shackle body having a central annular cavity of circular outline arranged therein; a hook or end link of the hoisting harness being engageable through the center opening of the torus shape;

an arcuate locking bolt received in the annular cavity of the shackle body so as to be guided therein for movement along the center circle of the cavity;

a radial opening in the shackle body of such width and arcuate length that the locking bolt can be inserted therethrough;

a wall reinforcement on that portion of the shackle body which is located diametrally opposite its radial opening, the wall reinforcement occupying a generally segment-shaped portion of the center opening of the torus; and

a radial slot in the shackle body in angular alignment with its wall reinforcement the slot having opposing slot flanks which extend substantially perpendicularly to said annular cavity from the periphery of the torus towards said reinforcment, without cutting across the latter; and wherein

the locking bolt is movable between a locked position in which a portion thereof extends across said radial slot, serving as a load-carrying member, and a release position in which the bolt is positioned outside said slot.

12. A hoisting shackle as defined in claim **11**, wherein

the arcuate length of the locking bolt is substantially one-half of the length of the annular cavity of the shackle body; and

the radial opening in the shackle body occupies approximately one-half of the torus circumference, the torus cross section in the area of said opening having the shape of a U-channel.

13. A hoisting shackle as defined in claim **11**, further comprising:

means for retracting the locking bolt to its release position from a remote location.

14. A hoisting shackle as defined in claim **13**, wherein

the retracting means includes a Bowden cable attached by one end to the locking bolt and a sheath bracket on the shackle body positioning one end of the Bowden cable sheath at a distance from where the cable is attached to the locking bolt.

15. A hoisting shackle as defined in claim **14**, wherein

the retracting means further includes a return spring surrounding the Bowden cable end portion between the sheath bracket and the cable attachment, the spring urging the locking bolt into its locked position.

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