Jan. 27, 1970 E. THURNER 3,491,648

ANCHORING ELEMENT CONSTRUCTION

Filed Oct. 25, 1968 2 Sheets-Sheet 1

Fig. 1

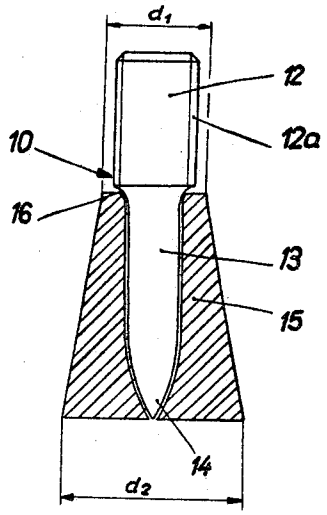


Fig. 2

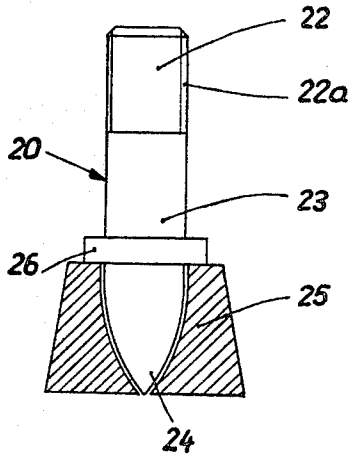


Fig. 3

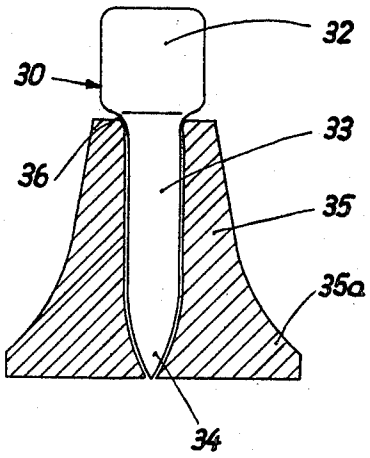
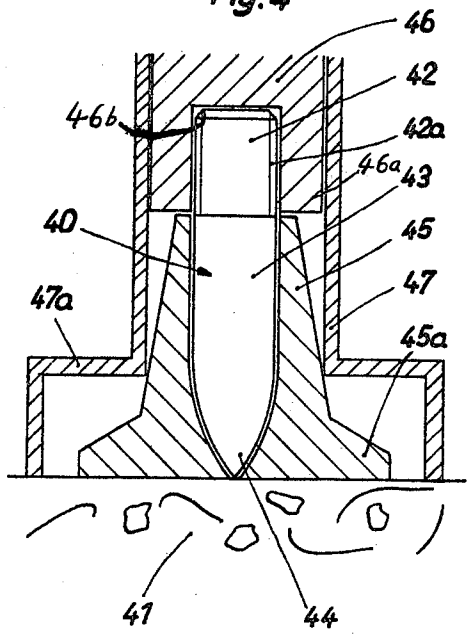


Fig. 4



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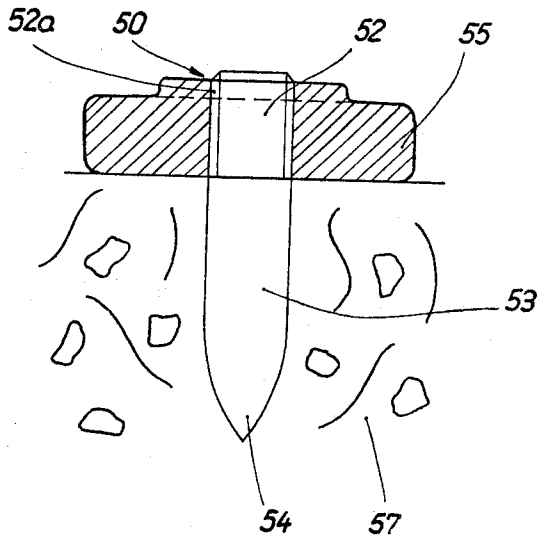
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Fig. 5



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ANCHORING ELEMENT CONSTRUCTION

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U.S. Cl. 85—10 2 Claims

ABSTRACT OF THE DISCLOSURE

A securing device or anchoring element such as a nail, bolt, etc., which is adapted to be driven into a hard receiving material such as a concrete or a steel includes a shank portion with a pointed end which is enclosed by a casing of elastic material at least adjacent the pointed end of the shank portion. The construction includes a collar portion formed on the shank adjacent the pointed portion. A casing of elastic material surrounds the pointed end from the collar to the pointed tip and is preferably widened at the location at the tip to provide a shoulder to increase the driving power range at the target material into which the anchoring device is to be driven.

SUMMARY OF THE INVENTION

This invention relates, in general, to the construction of anchoring devices and, in particular, to a new and useful anchoring device of a type which is adapted to be driven into a hard receiving material by a power operated setting tool and which includes a collar formed at a location adjacent the pointed end thereof and with a casing of an elastic material surrounding the pointed end up from the tip to the collar.

The present invention is particularly applicable for applications of securing elements to a hard brittle material such as concrete. When bolts of this nature are to be driven into the concrete, the concrete is stressed by shear and it is thus loosened or cracks in the proximity of the drive in point. The result is that it chips during further use thereof. The loosening of the target concrete material as well as the subsequent chipping thereof leads to a reduction of the holding power of the bolt in the concrete. In addition, the chipping causes the surface of the concrete to become marred. Attempts to prevent this by applying a collar to the rear part of the bolt shaft or shank portion have not lead to satisfactory results, since the chipping cannot be prevented in this manner. The collar does tend to strengthen the concrete material which becomes loosened by the driving operation.

In accordance with the present invention, there is provided an anchoring device which includes a shank portion which is covered with a casing at least at the forward tip portion and up to a collar which is formed on the shank portion or on a driving barrel of a setting tool. The surrounding casing provides means for exerting force in the driving direction on the surface region of the concrete surrounding the drive in point. The casing provides this protection surface even before the driving process starts so that cracking and loosening of the target material is avoided. In addition, the concrete will not tend to chip away after the anchoring device is driven in.

An anchoring device such as a bolt is advantageously provided with a collar on the shank portion directly adjacent the pointed tip portion and the tip portion is surrounded by a casing of an elastic material which advantageously has an exterior diameter which increases toward the point. The casing provides means for insuring that the driving power which acts from the setting

tool driving piston to a collar portion of the setting element is transmitted by a surrounding casing at the tip portion to the target material in a wide area surrounding the drive in point. Shearing stresses are thus reduced from the outset and the loosening of the concrete and its subsequent chipping are avoided. The casing must comprise an elastic deformable material so that it is deformed but not destroyed by the driving in operation.

Securing devices are known which carry plastic caps on the pointed parts but as tests have shown, such devices do not prevent the occurrence of shearing stresses in a receiving material such as concrete, since they are not in an operative connection with the bolt which transmits the driving power. The pressure transmitted to the cap from the point of the bolt at the start of the driving process with such devices is completely insufficient. In addition, anchoring devices which include a casing surrounding the entire shaft of the bolt provides a good guidance and sealing of the bolt in the barrel of the driving gun and also insures the straight attachment of the bolt to the target material. However, the casing extends from the point to a collar provided between the head and the shaft portion but such a bolt cannot be used in the sense of the invention because the material forming the casing can be easily destroyed. Thus, the casing does not provide a sufficient transmission of power. In addition, the casings of these known elements are usually uniform in diameter and they do not provide a relatively large bearing surface surrounding the point at which the anchoring device is to be driven into the receiving material.

The securing device of the invention may thus include a collar which is formed by a transition from the shank portion to the head of the element but it is also possible to provide a collar as an extension of the shaft portion at a location directly adjacent the pointed end. This provides an additional advantage in that the driving piston of a setting tool can act on the collar arranged at the lower portion of the bolt provided the driving piston of the setting tool is provided with a deep bore to accommodate the remaining shank portion and the head of the securing element. This arrangement makes it possible to drive in very long bolts by applying the driving force to the collar arranged at the pointed end. The collar can also be formed by a part of the setting tool itself, for example, by a hammer piston which embraces the head portion of the bolt by the provision of a receiving bore in the drive piston, but the forward end extends forwardly along the exterior of the bolt to define a collar which bears against the casing of elastic material.

It is particularly advantageous to provide a casing which widens from the location of the collar to the tip of the anchoring drive. In addition, it is desirable that the casing be narrower than the barrel of the setting tool so that a space remains into which the casing can yield in its deformation by the driving power. The casing is also provided with a wider shoulder directly adjacent the point which bears on the target material. In this way, a larger region around the drive in point is provided which prevents the loosening of the concrete and the chipping action caused by the driving in power. The casing advantageously comprises a plastic material and it functions not only in the manner set forth above, but also in preventing buckling and shearing of the bolt.

Accordingly, it is an object of the present invention to provide an improved anchoring element construction and arrangement including a collar formation on the anchoring element at a spaced location from the pointed tip and a casing of elastic material surrounding the anchoring element and advantageously being widened at the forward end to provide a large bearing surface against the material to which the anchoring device is to be inserted.

A further object of the invention is to provide an anchoring element which includes a collar formation thereon at a spaced location from the tip and which may be formed as a transition between the head of the element and the shank portion or as a widened collar formation closed to the tip than the head portion, and including a surrounding casing extending from the tip up to the collar.

A further object of the invention is to provide an anchoring device which is simple in design, rugged in construction and economical to manufacture.

The various features of novelty which characterize the invention are pointed out with particularity in the claims annexed to and forming a part of this specification. For a better understanding of the invention, its operating advantages and specific objects attained by its use, reference should be had to the accompanying drawings and descriptive matter in which there are illustrated and described preferred embodiments of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings:

FIG. 1 is a sectional view of an anchoring element having a surrounding casing constructed in accordance with the invention;

FIG. 2 is a view similar to FIG. 1 of another embodiment of the invention;

FIG. 3 is a view similar to FIG. 1 of still another embodiment of the invention;

FIG. 4 is a transverse sectional view through a setting device and anchoring element constructed in accordance with another embodiment of the invention; and

FIG. 5 is a transverse sectional view through a receiving material with a securing element therein.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to the drawings, in particular, the invention embodied therein in FIG. 1 comprises a threaded bolt anchoring element generally designated **10** having a head portion **12** which is extremely threaded at **12***a*. The anchoring element **10** also includes a shaft portion **13** and a point **14**.

In accordance with the invention, the head portion **12** is made to a larger diameter than the shaft portion and the transmission between the shaft portion **13** and the head portion forms a collar **16**. A casing **15** of an elastic material such as a palstic extends from the collar **16** to the point **14**. The outside diameter of the casing **15** increases from the collar to the point **14** in order to provide a wide bearing surface at the target material and to facilitate the deformation of the casing.

In the embodiment of FIG. 2, a collar **26** is arranged on a shaft portion **23** of a bolt or securing element generally designated **20**. The head portion **22** is provided with an external head **22***a* and it is made to the same diameter as the shaft portion **23**. The collar is located close to the pointed end **24** and the pointed end **24** is surrounded by a casing **25** of elastic material which extends from the point up to the collar **26**.

In the embodiment of FIG. 3, there is indicated a set-bolt anchoring element generally designated **30** which does not have any exterior thread on a head portion **32**. The shaft portion **36** terminates in a point **34**. The head portion **32** has a larger diameter than the shaft portion **33** and forms a collar **36** with the shaft portion. An exterior casing **35** of an elastic deformable material extends from the collar **36** to the point **34**. The casing **35** has a widened shoulder **35***a* so that the driving power will be transmitted to a wide range around the drive in point,

In FIG. 4, there is indicated a bolt securing element generally designated **40** having a head portion **42** carrying an external thread **42***a* and a shaft portion **43** terminating in a point **44**. The shaft portion **43** is surrounded by a casing **45** of an elastic deformable material which extends from a point up to a collar which, in this instance, is formed by the lower tip or annular portion **46***a* of a driving piston **46** of a setting tool having an exterior barrel **47**. The setting tool **46** also includes a bore **46***b* into which the head portion **42** of the securing element **40** extends. The surrounding casing **45** is tapered from the location of the collar formed by the surrounding portion **46***a* of the drive piston **46** to the end adjacent the point **45** at a location overlying the receiving material or concrete **41**. The casing **45** thus is provided with a shoulder portion **45***a* which rests on the target material **41**. The casing **45** contacts the barrel **47** at the transition of the widened outer portion **47***a* and thus provides a means for guiding the bolt **40** during the setting operation.

In FIG. 5, there is shown a bolt generally designated **50** of the type indicated in FIG. 4 by the configuration shown in FIG. 5 by the same driving process. In the set condition indicated in FIG. 5, the casing **55** can be screwed off the threaded end **52***a* of the head portion **52** of the anchoring device **50**. During the driving in process, the casing **55** also protects the bolt shaft **53** and the point **54**, since it counteracts any shearing forces which would act on the bolt shaft. An advantageous plastic for the casing of each of the embodiments is a polyethylene.

What is claimed is:

1. An anchoring element comprising an elongated shank portion, a head portion adjacent one end of said shank portion, said shank portion terminating at its opposite end in a pointed tip, and a collar of increased dimension formed at a spaced location from said pointed tip, a casing surrounding said shaft portion between said pointed tip and said collar and being of an elastic deformable material, said head portion and said shaft portion being substantially the same diameter, said collar comprising an exterior driving piston surrounding said head portion and extending to said shaft portion, said casing extending from the surounding drive piston to the pointed tip end and including a widened shoulder portion adjacent the pointed tip end adapted to rest on a target and a tapered portion from said widened shoulder portion tapered outwardly in a direction from said head portion to said tip, and a driving tool barrel including a first portion surrounding said driving piston and a second widened portion surrounding said shoulder portion of said casing.

2. An anchoring device, according to claim **1**, wherein said tapered portion of said casing contacts said barrel first portion at the junction of said first and second portions.

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RAMON S. BRITTS, Primary Examiner

U.S. Cl. X.R.

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