

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
8 November 2007 (08.11.2007)

PCT

(10) International Publication Number
WO 2007/124702 A2

(51) International Patent Classification:
F41H 11/08 (2006.01)

(21) International Application Number:
PCT/CZ2007/000032

(22) International Filing Date: 2 May 2007 (02.05.2007)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
PV2006-283 2 May 2006 (02.05.2006) CZ

(71) Applicants and

(72) Inventors: **ZEMAN, Miroslav** [CZ/CZ]; Sídliste os-
vobození 628/15, 682 01 Vyskov (CZ). **TUREK, Josef**
[CZ/CZ]; Ritonice 3, 294 04 Dolní Bousov (CZ).

(74) Agent: **ZAK, Vitezslav**; Lidická 51, 602 00 Brno (CZ).

(81) Designated States (*unless otherwise indicated, for every
kind of national protection available*): AE, AG, AL, AM,

AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH,
CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES,
FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN,
IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR,
LS, LT, LU, LY, MA, MD, MG, MK, MN, MW, MX, MY,
MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RS,
RU, SC, SD, SE, SG, SK, SL, SM, SV, SY, TJ, TM, TN,
TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (*unless otherwise indicated, for every
kind of regional protection available*): ARIPO (BW, GH,
GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM,
ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM),
European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI,
FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, MT, NL, PL,
PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM,
GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— *without international search report and to be republished
upon receipt of that report*

*For two-letter codes and other abbreviations, refer to the "Guid-
ance Notes on Codes and Abbreviations" appearing at the begin-
ning of each regular issue of the PCT Gazette.*

(54) Title: A CONSTRUCTIONAL ELEMENT

(57) **Abstract:** For military applications and for civil engineering, especially for construction of temporary structures there is de-
signed a constructional element comprising a disc-shaped central part (1) with at least four legs (2) extending outwards substantially
radial with respect to a transversal axis of the central part (1) and having longitudinal axis arranged in a plane perpendicular to the
transversal axis of the central part which is furnished with a face recess (4) extending inwardly from the central part periphery be-
tween two adjacent legs, the face recess (4) having a width corresponding to the central part thickness and the depth being equal
from one to two thirds of the central part width in a place of the recess (4). Each leg (2) is at its end furnished with a metal foot (10)
having a base (11) out of which there projects an anchor plate (12) which is substantially perpendicular to the face surface (3) of the
central part (1) and with respect to the base (11) supported by at least two wedge-shaped ribs (15, 16), while the legs (2) and the
central part (1) are provided with an integral internal reinforcement which the foot (10) is fixed to. Each leg (2) is provided with at
least one assembly opening (18) furnished with a metal sleeve being fixed to the element internal reinforcement.



WO 2007/124702 A2

A CONSTRUCTIONAL ELEMENT

Technical Field

The invention relates to a constructional element comprising a disc-shaped
5 central part with at least three legs extending outwards substantially radially
with respect to a transversal axis of the central part and having longitudinal
axis arranged in a plane perpendicular to the transversal axis of the central
part, where the central part comprises a face recess having a width
10 corresponding to the central part thickness and the depth being equal from
one to two thirds of the central part width measured within the face recess.

Background of the Invention

Robustness of a defence build for army troops in a terrain depends upon
barriers which should effectively protect soldiers in the defence and make
15 movements of an enemy more difficult and even prevent them, or at least
direct them towards a pre-selected area. Known barrier systems comprise
a complex of natural and man-made non-explosive and explosive devices.
Nevertheless for a long time no attention had been paid to non-explosive
barriers though at the beginning of a military conflict, at the moment of an
20 attack, they are important for protection of borders and preparation of
military resistance posts at directions of assumed advance of the enemy.
Due to international activities of their opponents, use of explosive barriers,
especially mines of any type and application, have been significantly limited.
Thus an importance of barriers of the non-explosive type has increased.
25 Barriers of this type could be divided in three basic groups, each of them
having own sub-groups. There exist anti-tank barriers, such as walls, steep
slopes, ditches, undercut trees and iron-concrete pyramids, anti-transport
barriers comprising damaging up to devastation of existing roads and ways,
ditches, undercut trees, traps, obstacles like barricades and finally there
30 are anti-infantry barriers, especially various wire systems, undercut trees,
horns and hedgehogs made of wood or iron. As experienced from military
conflicts throughout the world and from results of tests, which have been

carried out in specialised laboratories or within military training, the arrangements known so far become less and less effective because of improving parameters of the present military equipment and techniques. As an example there could be presented concrete pyramids anchored in earth, which are no obstacle for up-today tanks. And what is also very important, all the known technology of creation of barriers demands lot of machinery, manpower and is very costly as there are used devices and elements having no other application but the military one. On a site an extensive application of earthwork building machines, mechanical loaders, trucks, cars or railroad wagons and hand engineer equipment is always necessary.

From a paper PCT CZ 98/00044 there is known a construction element which consists of a disc-shaped central part with at least three legs extending outwards substantially radially with respect to a transversal axis of the central part and having longitudinal axis arranged in a plane perpendicular to the transversal axis of the central part. The central part comprises a face recess having a width corresponding to the central part thickness and the depth being equal from one to two thirds of the central part width measured within the face recess. The central part is furnished with a first passage the axis of which is parallel to the transversal axis of the central part and a second passage opening into the central part face walls and having an axis perpendicular to the axis of the face recess. The elements of this type are to be applied individually or combined as intermeshing pairs providing for barriers.

It is an object of the invention to increase a rigidity of the present construction element for building military barriers with higher efficiency when compared with the present ones and to increase their resistance against undesired movement.

Disclosure and Object of the Invention

The object of the invention is achieved and the foregoing problems are solved by a constructional element comprising a disc-shaped central part

with at least four legs extending outwards substantially radially with respect to a transversal axis of the central part and having longitudinal axis arranged in a plane perpendicular to the transversal axis of the central part which is furnished with a face recess extending inwardly from the central part periphery between two adjacent legs, each of which, in accordance with the present invention, is at its end furnished with a metal foot having a base out of which there projects an anchor plate which is substantially perpendicular to the face surface of the central part and with respect to the base supported by at least two wedge-shaped ribs, while the legs and the central part are provided with an integral internal reinforcement which the foot is fixed to.

Further according to the invention the central part is at least partially provided with a metal protecting jacket which is fixed to the internal reinforcement. In a preferred embodiment the anchor plate is reinforced with two side ribs and two central ribs, which project from the lowest point of a concave free edge of the anchor plate and is provided with at least one aperture arranged by the end adjacent to the base. In another preferred embodiment the foot base cross-section has a shape of a square U letter. Still further according to the invention the central part is provided with two passages, the first passage being arranged in the recess axis and perpendicular to the leg plane and the second passage is located in the central part face wall having its axis perpendicular to the face recess axis, provided the distance of the first passage axis from the central part transversal axis equals the distance of the second passage axis from the central part transversal axis. According to another preferred embodiment each leg is provided with at least one assembly opening furnished with a metal sleeve, the metal sleeve being fixed to the element internal reinforcement.

The discussed invention features high mechanical wear stability of both individual and assembled elements against bending moment stress, displacement force or torsional moment, resulting from dynamic and impact load or a combination of these loads. In a case of military application an assembly of the elements manifests high resistance against break through of heavy combat machines. The sagittate feet provide for two purposes,

- contrary to each other, as they increase resistance against undesired movement on a solid ground and substantially limit the element sink on a soft ground. The elements can be also used as anchoring devices by construction of anti-flood protection barriers. The elements may also serve as a protection
- 5 of pillars of bridges on watercourses. The elements can be used as individual pieces or assembled units to stiffen a ground for permanent or temporary buildings. The once applied units can be later, when being no more needed, dismantled, removed and stored for next applications. Thus the above discussed elements present no problem for the environment ecology.
- 10 The elements allow for very versatile applications, they can be easily manipulated without any heavy machinery. Due to its construction the element offers long life-time and resistance against wear and weather conditions.

15 Brief Description of the Drawings

- By way of an example the invention will be now described with reference to the accompanying drawings, where Fig. 1 presents a front view on the constructional element having four legs and Fig. 2 shows a ground view on the element according to Fig. 1. Fig. 3 presents an axonometric view on a
- 20 foot of each leg of the element.

Description of a Preferred Embodiment

- The constructional element, preferably made of concrete, comprise a disc-shaped central part 1 equipped with four legs 2 extending outwards
- 25 substantially radially. The central part 1 and the legs 2 are furnished with integral internal reinforcement. The reinforcement is not shown on the drawings as its construction is irrelevant as far as the subject of the invention is concerned. All the legs 2 have their longitudinal axis arranged in a plane extending collateral with a face surface 3 of the central part 1. The central
- 30 part 1 is completed with a side recess 4 extending inwardly from the central part 1 periphery between two adjacent legs 2 as far as a transversal axis 5 of the central part 1, i.e. up to a half of the central part 1 depth within a location

of the recess 4. The above mentioned transversal direction is to be understood as the direction perpendicular to the face surface 3 of the central part 1. A longitudinal axis 6 of the side recess 4 intersects the transversal axis 5 of the central part 1. Width of the side recess 4 corresponds to a thickness of the central part 1.

The central part 1 is further provided with two passages. The first passage 8 has its longitudinal axis 8a running parallel to the transversal axis 5 of the central part 1 and intersecting the longitudinal axis 6 of the side recess 4, while the second passage 7, running sideways, across the side recess 4, has a longitudinal axis 7a which is perpendicular to the longitudinal axis 6 of the side recess 4 and located in a plane being perpendicular to the transversal axis 5 of the central part 1. For both passages 8,7 it applies the distance of the intersections of the first passage 8 transversal axis 8a with the longitudinal axis 6 of the side recess 4 equals the distance of the intersections of the second passage 7 transversal axis 7a with the longitudinal axis 6 of the side recess 4. This fact allows for combining individual elements into assemblies as described below.

The central part 1 is at least partially furnished with a metal jacket 9, preferably of steel, which is fixed to the internal reinforcement. In the embodiment presented in the drawings the jacket completely covers inside walls of the recess 4 and both face surfaces of the central part 1 throughout an area larger than the recess width. The jacket of the central part 1 face surface fits to the face surface of this part.

According to the invention each of the four legs 2 ends with a metal foot 10 having a sagittate shape. To increase mechanical strength of attachment of the leg 2 to the foot 10, the foot base 11 has its both mutually opposed face ends 13 bend in such a way, that their outside surfaces are flush with the face surface of the respective leg 2 and the cross-section of the foot base 11 has a shape of a square U letter. From the foot base 11, in the direction of adjacent leg 2, there extends an anchor plate 12, which is substantially perpendicular to the face surface of the central part 1. A free edge 14 of the anchor plate 12, i.e. the edge opposite the edge connecting the plate with the

base 11, has a shape of a broken line, similar to a V letter. Thus both rims of the free edges 14 constitute tips which are to provide for better grip of the elements on a site. In general the free edge 14 of the anchor plate 12 may have any concave shape. With respect to the foot base 11 the anchor plate 12 is reinforced with at least two wedge-shaped ribs. In the embodiment presented in the drawings there are used two lateral ribs 15 and one central rib 16, dividing the foot 10 in two parts. In each of the two parts the anchor plate 12 is provided with an aperture 17, allowing for a drain of water out of the foot 10 when the element is installed in an open-air area. The foot 10, which is preferably manufactured as a unit welded from flat parts such as the base 11, the anchor plate 12 and the ribs 15,16, has its base 11 fixed to the internal reinforcement of the legs 2 and the central part 1.

Due to its design, especially by tips of the anchor plate 12 and pockets created in spaces between the plate 12 and the ribs 15,16 the feet 10 prevent free displacement of the element in a horizontal direction and its sinking deep into a ground which could result from the element own mass.

Each leg 12 is completed with at least one assembly hole 18, the axis of may be, but not necessarily, parallel to the transversal axis 5 of the central part 1. The assembly hole 18 is lined with a metal sleeve which is fixed to the internal reinforcement of the element thus increasing rigidity of the leg 2.

The recess 4 facilitates mounting of a basic set comprising two elements fastened together. Two elements facing each other by the recesses 4 with transversal axis 5 being mutually turned by 90° are coupled by inserting the central part 1 of one element into the recess 4 of the other element. The assembly is then secured by a rod plugged into the second passage 7 of the second element. The rod continues through the first passage 8 of the first element and ends in the continuation of the second passage 7 of the second element.

The overall width of the recess 4, incl. the jacket, shall be at least as wide as the total thickness of the central part 1, also incl. the jacket. Nevertheless the recess width should allow for easy mounting of sets.

The element assemblies can be prepared by direct coupling of two elements as described above, or in a way when two adjacent elements are coupled by spikes inserted into assembly holes 18 in the legs 2.

5 The second passage 7 and assembly holes 18 also serve for manual manipulation with the elements, when a steel rod inserted into the passage or the hole provide for a grip for the workers.

The element may have more than just four legs 2, as described above. Number of legs 2 depends upon particular application. For military purposes, for construction of barriers four legs offer an optimal solution. Particularly for
10 barriers the above described basic set, comprising two mutually anchored elements should find its basic application. Such an assembly representing arrangement of elements into two mutually perpendicular planes manifests good stability and resistance against front impact.

15 Industrial applications

The present invention is designed for military applications, but offers very wide range of application in the field of civil engineering, especially for creation of temporary constructions, e.g. anti-flood protecting barriers.

CLAIMS

1. A constructional element comprising a disc-shaped central part (1)
5 with at least four legs (2) extending outwards substantially radial with respect to a transversal axis of the central part (1) and having longitudinal axis arranged in a plane perpendicular to the transversal axis of the central part which is furnished with a face recess (4) extending inwardly from the central part periphery between two adjacent legs, the face recess (4) having a width
10 corresponding to the central part thickness and the depth being equal from one to two thirds of the central part width in a place of the recess (4), **characterised in**, that each leg (2) is at its end furnished with a metal foot (10) having a base (11) out of which there projects an anchor plate (12) which is substantially perpendicular to the face surface (3) of the central part
15 (1) and with respect to the base (11) supported by at least two wedge-shaped ribs (15,16), while the legs (2) and the central part (1) are provided with an integral internal reinforcement which the foot (10) is fixed to.
2. A constructional element according to claim 1, **characterised in**, that
20 the central part (2) is at least partially provided with a metal protecting jacket (9) which is fixed to the internal reinforcement.
3. A constructional element according to claim 1 or 2, **characterised in**, that the anchor plate (12) is reinforced with two side ribs (15) and two central
25 ribs (16), which project from the lowest point of a concave free edge (14) of the anchor plate (12)
4. A constructional element according to claim 1, **characterised in**, that the foot base (11) cross-section has a shape of a square U letter.
- 30 5. A constructional element according to any of the preceding claims, **characterised in**, that the anchor plate (12) is provided with at least one aperture (17) arranged by the end adjacent to the base.

6. A constructional element according to any of the preceding claims, **characterised in**, that the central part (1) is provided with two passages, the first passage (5) being arranged in the recess axis (6) and perpendicular to the leg plane and the second passage (7) located in the central part (1) face wall having its axis perpendicular to the face recess axis, provided the distance of the first passage axis from the central part transversal axis (5) equals the distance of the second passage axis from the central part transversal axis (5).
- 10 7. A constructional element according to claim 1, **characterised in**, that each leg (2) is provided with at least one assembly opening (18) furnished with a metal sleeve being fixed to the element internal reinforcement.

