

The invention relates to a shuttering element of the type explained in the preamble of Claim 1, a process for the production thereof, of the type explained in the preamble of Claim 9, and to an apparatus which is suitable therefor.

5 A shuttering element of this type and a process for the production thereof is known from German Utility Model 86 04 345. The known shuttering element comprises a prefabricated steel fabric mat on which a panel which
10 consists of rib-type expanded metal is arranged on one side and fastened by tying. The known shuttering element is particularly suitable for shuttering connection surfaces to which a further concrete section is intended to be connected at a later date. On the other hand, the
15 known shuttering element is not so suitable for permanent shutterings. Furthermore, its production is complicated and costly.

The object of the invention is thus to provide a shuttering element which can be produced simply and
20 relatively cost-effectively and is suitable, in particular, for permanent shutterings, a process for the production thereof, and an apparatus which is of simple design and is intended for carrying out the process.

The object is achieved by the shuttering element
25 specified in Claim 1.

By means of the development according to the invention, the bars of the grid which forms the carrying element are no longer arranged only on one side of the metal panel. The bars, located, according to the invention, on the two surfaces of the panel located there-
30 between, effect considerably improved anchorage and reinforcement in the concrete. Furthermore, the invention avoids the prior-art points of intersection, of the bars, which are covered on one side. Consequently, the shutter-
35 ing element according to the invention is particularly suitable for permanent shutterings. Although German Patent Specification 33 02 296 discloses an element which comprises transverse and longitudinal bars having a wire cloth located therebetween, this is intended specially

for use as a lagging mat for mine support. A shuttering produced therefrom would be virtually useless.

5 The use of an expanded-metal panel according to Claim 2 is particularly expedient, whose upright edges and through-passages, in connection with the bars arranged on both sides, further improve the anchorage and the effect of reinforcement of the concrete.

10 Advantageous further developments of the shuttering element according to the invention can be taken from Claims 3 to 8.

 The object is further achieved by a process specified in Claim 9.

15 The arrangement, according to the invention, of the panel, consisting of sheet metal, between the transverse and the longitudinal bars improves the flexibility of the element, with the result that the tying which permits restricted relative movement between the parts can be dispensed with, and the parts of the shuttering element can be welded to one another in a simple and
20 cost-effective manner.

 Advantageous further developments of the process can be taken from Claims 10 to 16.

 The object is further achieved by the apparatus specified in Claim 15.

25 The apparatus according to the invention permits a continuous, automated production of the shuttering elements according to the invention. Although German Patent Specification 33 02 296 discloses a similar production line, the latter serves to produce lagging
30 mats for mine support and not to produce shuttering elements for concrete construction, where wire cloth wound up on rollers and bar material which can be wound up on rollers is processed. Furthermore, nothing is said therein about the type of welding and the point in time
35 at which welding is carried out.

 Advantageous further developments of the apparatus can be taken from Claims 16 to 18.

 An exemplary embodiment of the invention is explained in more detail hereinbelow with reference to

the drawings, in which

Figure 1 shows a perspective representation of a shuttering element, according to the invention, in the form of a panel,

- 5 Figure 2 shows the section II-II from Figure 1, and
Figure 3 shows a schematic representation of the apparatus according to the invention.

Figures 1 and 2 show a shuttering element in the form of a shuttering panel 1 which comprises transverse bars 2, longitudinal bars 3 and a covering layer which is arranged between the transverse and longitudinal bars 2, 3 and is in the form of a panel 4 consisting of commercially available expanded metal. The transverse and longitudinal bars 2, 3 are distributed such that in each case one of the transverse and longitudinal bars 2, 3 is located on each of the transverse and longitudinal edges of the shuttering panel 1. As transverse and longitudinal bars, use can be made of the bar material which is also used for reinforcement mats or the like and consists of structural steel or the like.

In order to protect the shuttering element 1 against corrosion, particularly when using it for permanent shuttering, an anti-corrosion coating 5 is applied, on both sides and running right the way around, on the border region of the shuttering element 1, as is represented in an emphasized manner in Figure 2. The anti-corrosion coating 5 consists of zinc which has been applied in the usual layer thickness by the known flame-spraying process. The width of the anti-corrosion coating in the direction of the centre of the shuttering element is approximately 4 to 6 cm, preferably 5 cm. It is, however, also possible to coat the entire surface of the shuttering panel 1 with zinc if it is intended for use in particularly corrosive surroundings.

35 An apparatus 6 for producing the shuttering panel 1 is represented schematically in Figure 3. The apparatus 6 contains an advancement table 7 on which longitudinal bars 3 which have already been cut to length are laid at spacings predetermined for the shuttering element 1. For

each of the longitudinal bars 3, the guide table 7 exhibits an advancement finger 8 which acts at the trailing end of each longitudinal bar 3 such that all the longitudinal bars 3 are moved together in a stepwise manner in the advancement direction A. Provided above the guide table 7 is a further guide 9 which is designed as an oblique guide and feeds panels 4 which have already been cut to the size of the finished shuttering element 1. The further guide 9 is arranged such that the panel 4 comes into contact with the longitudinal bars 3 at, or at a short distance in front of, a welding station 10. Provided at the welding station 10 is a holding-down element 11 which aligns the panel 4 parallel to the transverse bars 3.

Provided above the welding station 10 is a drum 12 which is designed as a feed device for the transverse bars 2, can rotate in the direction of the arrow B and on whose circumference there are arranged retaining means 13 for the transverse bars 2 in the form of semicircular depressions. Provided above the drum 12 is a ramp 14, by means of which the transverse bars 12 [sic] are introduced individually into the retaining means 13. Extending between the ramp 14 and the welding station 10 in the direction of the arrow B is a covering rail 15 which retains the transverse bars 2 in their retaining means 13. Vertically above the welding station 10, the covering rail 15 is interrupted by a gap 16, through which the respectively incoming transverse bar falls downwards, under the effect of gravity, onto the panel 4. At the holding-down means 11 there may be provided a magnetic stop (not shown) which aligns the transverse bar 12 [sic] precisely at right angles with respect to the longitudinal bars 3 and fixes it in this position. Furthermore, the welding station 10 exhibits a spot-welding device 17, indicated only by its electrodes, which acts from the bottom and from the top. After each transverse bar 2 has been laid down, the electrodes are applied to that point of the shuttering element 1 at which, in vertical projection, the transverse bar 2, which is to be welded on,

intersects the longitudinal bars 3. In this manner, both the transverse bar 2 and each longitudinal bar 3 are welded to the panel 4 in each case.

Subsequently, the longitudinal bars 3 and the panel 4 are conveyed in the advancement direction A by a distance corresponding to the spacing between the transverse bars 2. The drum 12 is further rotated likewise through one step, with the result that the next transverse bar 2 is located above the welding station 10 and can be laid down. Thereafter, the second transverse bar is welded in a manner analogous to the first transverse bar. If desired, the further advancement can be transmitted from the advancement fingers 8 to a drawing device (not shown) which acts on the already welded region of the shuttering panel and draws the latter through the apparatus 6. After all the transverse and longitudinal bars have been welded to the panel, the zinc coating 5 is applied by flame-spraying and the shuttering element 1 is, if appropriate, bent into the desired shape. The shuttering element according to the invention is particularly suitable for a recess, partition and hole shuttering, concrete being applied on both sides of the shuttering and, for example, an opening being kept open by a core.

As a modification of the exemplary embodiment which has been described and drawn, instead of expanded metal, use can be made of any other sheet-metal panel, i.e. both smooth sheet steel having a thickness of preferably 0.5 to 2 mm and imbricated or goffered plate or the like. Furthermore, the transverse and longitudinal bars may also be arranged at different spacings. The production of the shuttering elements may also take place continuously, in this case the web being cut to the desired length only after welding. Furthermore, provision may be made for other suitable welding processes.



Patent Claims

1. Shuttering element (1) for concrete construction, having a metal grid made up of transverse and longitudinal bars (2, 3) and having a panel (4) which is connected
5 to the bars and consists of a metal sheet, characterized in that the panel (4) is arranged between the transverse and longitudinal bars (2, 3) of the metal grid and is welded both to the transverse bars and to the longitudinal bars (2, 3).
- 10 2. Shuttering element according to Claim 1, characterized in that the panel (4) consists of expanded metal.
3. Shuttering element according to Claim 1 or 2, characterized in that the metal grid and the panel (4) are of the same size.
- 15 4. Shuttering element according to one of Claims 1 to 3, characterized in that the delimiting edges of the metal grid are formed by transverse and longitudinal bars (2, 3).
5. Shuttering element according to one of Claims 1
20 to 4, characterized by an anti-corrosion coating (5).
6. Shuttering element according to Claim 5, characterized in that the anti-corrosion coating (5) is provided in the border region.
7. Shuttering element according to Claim 6, characterized
25 in that the anti-corrosion coating (5) has a width of approximately 4 to 6 cm, preferably 5 cm.
8. Shuttering element according to one of Claims 5 to 7, characterized in that the anti-corrosion coating (5) is a zinc coating applied by flame-spraying.
- 30 9. Process for producing a shuttering element (1) for concrete construction, a metal grid comprising transverse and longitudinal bars (2, 3) being connected
35 to a panel (4) consisting of sheet metal, characterized in that the panel (4) is at least partially laid on the longitudinal bars (3) which are arranged at the predetermined grid spacing, in that, thereafter, the transverse bars (2) are laid, at the predetermined grid spacing, on the panel (4), and in that, after having been laid down, each transverse bar (2) is welded on the panel (4)



simultaneously with a region, of the longitudinal bars (3), resting on the opposite side of the panel (4).

10. Process according to Claim 9, characterized in that use is made of a panel consisting of expanded metal.

5 11. Process according to Claim 9 or 10, characterized in that the welding takes place through the panel (4) by spot welding at the points of intersection of the transverse and longitudinal bars (2, 3).

10 12. Process according to one of Claims 9 to 11, characterized in that, before being joined together, the transverse and longitudinal bars (2, 3) and panel (4) are cut to the desired size of the shuttering panel (1).

15 13. Process according to one of Claims 9 to 12, characterized in that an anti-corrosion coating (5) is applied onto the assembled shuttering element (1), on both sides thereof.

14. Process according to Claim 13, characterized in that a zinc coating is applied by flame-spraying as anti-corrosion means (5).

20 15. Apparatus (6) for carrying out the process according to one of Claims 9 to 14, having an advancement guide (7) for conveying a plurality of longitudinal bars (3), at a predetermined spacing from one another, in a stepwise manner through a spot-welding station (10),
25 having a second guide (9), upstream of the spot-welding station (10), for feeding a panel consisting of sheet metal (4) and laying it on the longitudinal bars (3), and having a feed device (12) for laying a plurality of transverse bars (2), at a predetermined spacing from one
30 another, on the panel (4) located on the longitudinal bars (3), the electrodes of the spot-welding station (10) being applied to the points at which the transverse bar (2), which is to be welded on, intersects the longitudinal bars (3), in order to weld both the transverse bar (2) and each longitudinal bar (3) to the panel
35 (4) respectively.

16. Apparatus according to Claim 15, characterized in that the spot-welding station (10) exhibits a device for fixing the transverse bars (2) on the panel (4).



17. Apparatus according to Claim 15 or 16, characterized in that the feed device (12) contains a drum which is provided, on its circumference, with retaining devices (13) for a plurality of transverse bars (2),
5 rotates in time with the movement of the advancement guide (7, 8) and exhibits a release device (16) for the respective transverse bar (2) located at the spot-welding station (10).

18. Apparatus according to one of Claims 15 to 17,
10 characterized in that the second guide (9) is an oblique guide, and in that a holding-down means (11) for pressing the panel (4) onto the longitudinal bars (3) is provided in the spot-welding station (10).