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A Castellated Hollow Section

Un profil creux à âme ajourée

Ein Wabenhohlprofil

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1. GENERAL DESCRIPTION

It is proposed to use a "castellated hollow-section" as shown in fig. 1

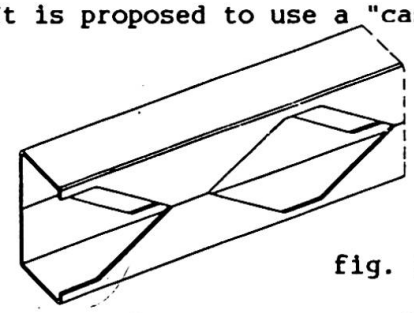


fig. 1

fig. 2

instead of the usual cold formed beams with open cross sections as shown in fig. 2.

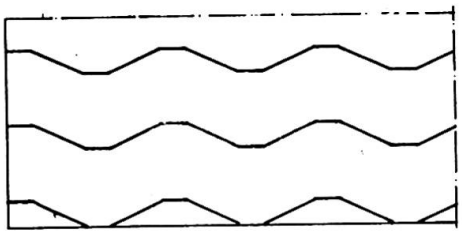


fig. 3

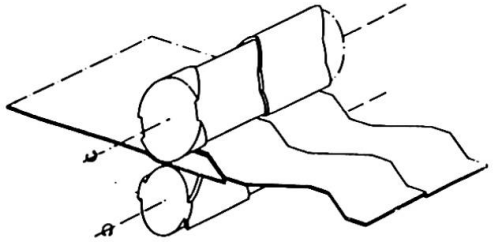


fig. 4

Such a beam is made of specially formed strips as shown in fig. 3.
These strips can be obtained out of steel sheet practically without loss of material. A proposal for a simple method is shown in fig. 4.
The beam can be produced automatized in the same way as normal welded hollow sections. So the relatively thin steel sheet on coil is the basic material. New now is the slitting with the help of specially profiled rolls as already shown in fig. 4. It is also possible to form the strips by punching.

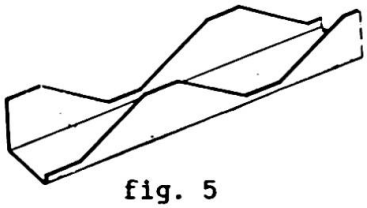


fig. 5

The strips obtained in this way can become channel shaped by cold rollings, as shown in fig. 5.
Two channel shaped parts together make one "castellated hollow section".

2. ADVANTAGES

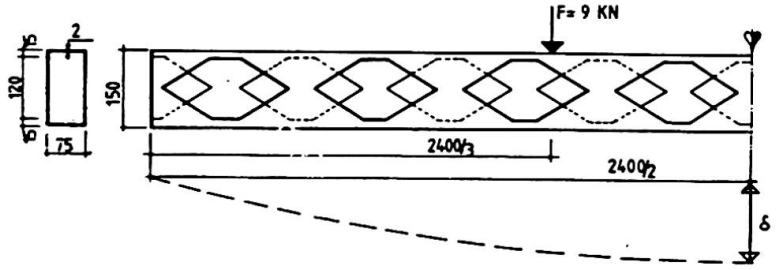
This new type of beam has the following advantages with regard to some of the usual beams:

- Great torsional rigidity.
- Economic use of material similar to that of Z. or C. profiles. Savings up to 25 - 35% are possible with regard to the normally used hollow sections and savings up to 10 - 15% with regard to the Zeta and Σ-profiles.
- A high grade of automation can be obtained by using the proposed cutting method.
- Because of the alternate position of the holes in the two webs, there are no local rather weak points as occur in normal castellated beams.
- Connections are possible by the accessibility of the interior of the beam.
- Simple application of local stiffeners against web crippling is possible.
- Far greater applicability than the usual thin walled open beams as shown in fig. 2.
- Rolled stiffeners against buckling as in the Zeta and Sigma beams are possible.
- The holes in the web allow transition of piping.

3. SOME THEORETICAL RESULTS

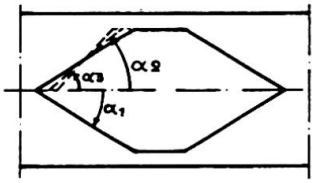
A computercalculation is made for a normal as well as for a castellated hollow section both of the same size.Hereby the castellated h.s. has 27% less material. A comparison of the results gives the following pictures

- Deflection

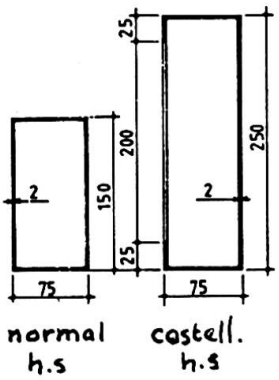


δ=7,8mm for normal h.s. (σ_{max}=195 N/mm^2)
σ=10,2mm for castell.h.s (σ_{max}=240 N/mm^2)

- The calculated influence on the deflection of some different hole shapes.



$tg\alpha_1$=0,6 → δ=10,2 mm
$tg\alpha_2$=0,8 → δ=10,6 mm
$tg\alpha_3$=1,0 → δ=10,9 mm



A comparison between two beams with the same use of material gives the following ratios between some characteristic values.

	normal h.s.	:	castell.h.s.
σ_{max} =	1	:	0,6
δ_{max} =	1	:	0,4
I_{tors}=	1	:	2,5