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(54) **Multifunctional rotating planes on a suspended supporting structure**

(57) My invention is to be considered a piece of furniture and is composed of two rotating planes on a suspended supporting element in triangular sections which can be fitted to a fixed or mobile support.

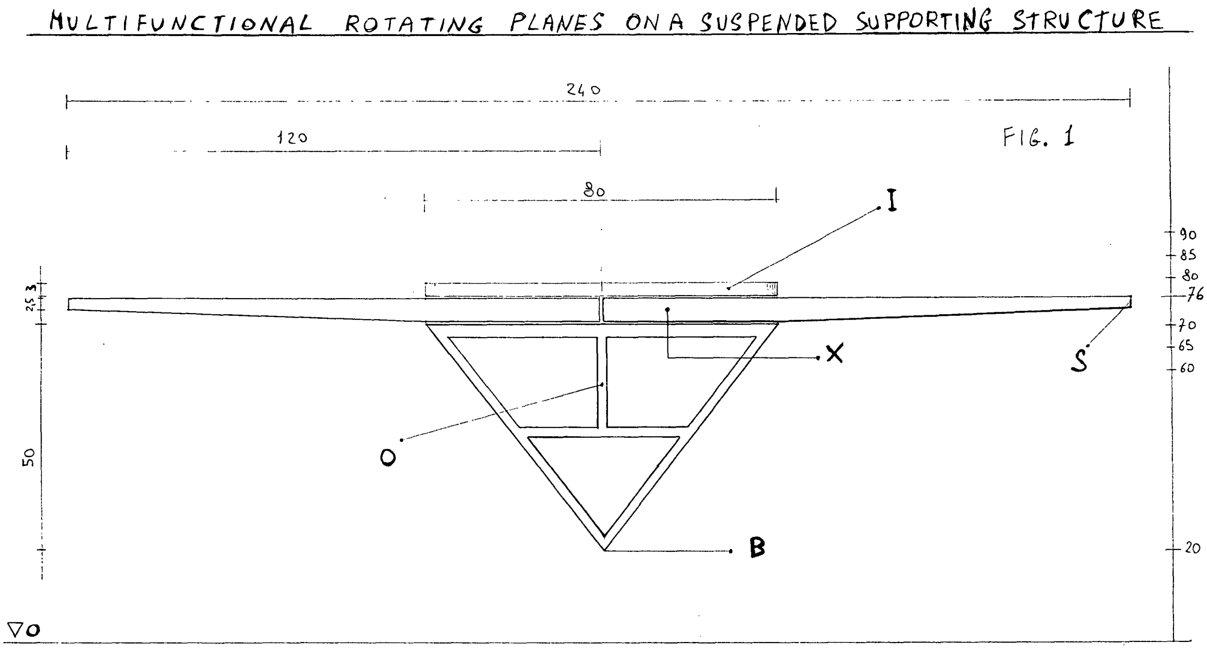
The rotating planes are cut lengthwise, their thickness gradually decreasing to allow for suspension and with a semicircular cut at one end to allow for rotation by means of a rotation joint with steel buffers, produced industrially (as used in the workings of large iron gates or doors), but modified in the workshop.

The supporting structure is triangular, and is in effect similar to a cross-section of a square-based upside-down pyramid, its dimensions being directly proportional to those of the rotating axes.

The proportion between the dimensions of the rotating planes, the supporting element and the material used determines its functionality.

It is a multifunctional object because it is capable of satisfying very different needs depending on the use that is required. In fact, by varying the dimensions and the height, it can be used in various applications, such as a table, a work bench, a double bed, a bedside table etc.

This structure, with its geometric and simple form, can be easily adapted to any type of ambient and furnishing, as it can be constructed in any size and using any kind of resistant and flexible material.



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Description

[0001] The structure that I have planned finds it place in the ambit of the furniture subject-matters and finds among its "next ancestors", the table, the desk, the work-bench, the sales desk, etc.

[0002] The direct ancestor of the realized prototype is the common industrial production table, for 4 persons (80 x 80 x 75cm). Analyzing industrial products we notice, however, that it is an element of static furniture, that it is meant to occupy an area of 0.8 m^2, and occupies the space of the classical 4 support legs or of the various bases of support.

[0003] Viceversa the structure carried out by me is multifunctional, ergonomic, eco-compatible, versatile and presents innovative dynamics.

[0004] This invention presents simple lines and geometric shapes, not conditioned by aesthetic factors (which among other things make them adaptable to any environment and furniture), but not at all accidental.

[0005] Specifically it consists of two rotating planes, positioned on a supporting suspended element in the form of a triangular section (Tab.1, fig.1).

[0006] In the prototype as seen in the drawings, realized entirely in wood lump, the rotating planes present a longitudinal cut, with thickness that goes gradually reducing itself until arriving to 2.5 cm in order to allow for the overhang (Tab.3, fig.1(X,S,Sb)), and a semicircular cut to an extremity in order to concur the rotation (Tab.3 fig.2(A)), and they have respectively a length of 120 cm and a width of 40 cm (Tab.3, fig. 1 e 2).

[0007] The suspended support element is presented, instead, as a hollow pyramid whose cross section is an isosceles triangle, with the vertex pointing downwards and whose base has the length equal to the double of the width. In the prototype the length of the base is 80 cm and the width is 40 cm while the height of the cross section of the pyramid is 50 cm (Tab.2, fig.1, 2 e 3). The vertex angle is, instead, 77° (Tab.1, fig.1(B) e Tab.2, fig. 1). The dimensions of the support surface are directly proportional to the dimensions of the rotating planes.

[0008] This element has been fixed to the wall but can also be fixed to an eventual movable support (which would concur the rotation of 180° of the rotating planes), and presents some small shelves that act as ulterior planes of support (Tab.1, fig. 1(o))

[0009] There is, finally, a strip of wood for closing positioned as in table 1, fig. 1, this is also realized in wood lump, with a length of 80 cm and a thickness of 3 cm, shaped to finishing at the two extremities. According to the various requirements of who commissions the embodiment of the structure, the closing strip can be planned in order to act as a salt shaker, oil holder or for a courtesy light (consider as an example the use of a different material, such as plexiglass, that would concur to lodge a neon inside).

[0010] The two axes are capable of carrying out a rotation of 90° (or 180°, if the structure is applied on a movable support) thanks to a bearing in steel of industrial production used for the operation of great gates in iron or doors, handicraft modified in order to adapt it to the function it must carry out.

[0011] The modification consists in welding a cylindrical tube in solid steel in the central part of the closing cap of the bearing (the dimensions vary according to the dimensions given to the rotating planes) and in realizing 4 passage holes and one male thread at the tip (Tab.2, fig. 4(C,D,E)).

[0012] The holes serve for the fixing of the modified bearing in the housings of the rotating planes (Tab.2, fig. 4 Tab. 3, fig.1(F)).

[0013] It is clearly a dynamic structure because occupying, to the occurrence, a surface of 0,8 m^2 like an industrially produced table, thanks to a rotation of 90° of the two planes, the bulk is immediately eliminated, transforming themselves into a single wide suspended shelf that renders it a such an element of furniture and an ideal solution for environments of modest dimensions, in which an industrial table could turn out to be not very functional, not leaving enough space for circulation to guarantee anyone full freedom of movement (Tab.4, fig.1).

[0014] At the same time it is also a versatile structure because it can satisfy various requirements, being able to be used, according to the desired usefullness, as a dining table, or desk or ironing board (using the rotation of a single plane or, to the occurrence of both) etc.

[0015] Differently, then, of the common industrial production table, that adapts perfectly only to the physical characteristics of a person of medium stature (1,75 m approximately), my rotating planes can be regulated also taking into account the various physical requirements of those who use them and therefore they present themselves as an ergonomic structure. For example if we have an individual with a height of 2,00 m, the optimal height of use for being able to eat or to write is not 75 cm from ground, like normally previewed in the industrial production of a common table, but it is of 80/83 cm, and therefore it is to such height that the rotating axes will be positioned.

[0016] Also the triangular shape given to the support element is not fruit of an accidental choice, but it has been planned taking into account the human body structure. Thinking, in fact, in particular of the possibility of use of the rotating planes, such as a dining table for 4 persons at the same time and therefore of the requirement to leave a space necessary for the knees in order to allow the person to sit near enough to the rotation planes, I have thought that the triangular section cut of the support element pits the ideal solution.

[0017] The structure planned by me is also presented as an element of multifunctional furniture, seeing as it can be regulated in height, starting from a minimal height of 50 cm and arriving beyond the metre, and eventually varying also in the dimensions, it lends itself to various applications: fixing, as an example, the height of use to 90 cm from ground we obtain an innovative work-bench or desk, with the characteristics already described; increasing, instead, the dimensions of the rotating axes and suspended support element, as an example, of approximately 2 times regarding the prototype of which to the drawings, and lowering the utility quotient, we could realize two single beds that thanks to the rotation of the rotating planes are transformed into a characteristic double bed; on the contrary, reducing opportunely some dimensions we could obtain a useful and versatile bedside table.

[0018] But even by notably reducing the dimensions and using precious materials, given its characteristic shape, we could succeed in placing this idea also in various ambits, such as among the subject-matters of ornaments, obtaining a pendant or a pair of earrings.

[0019] It is an element of furniture that can be planned in nearly all the types of wood let alone in steel, iron, aluminium, carbon, various polycarbonates, or a mixture of these elements, and just for this ability to adapt itself to very many materials it can be defmed an eco-compatible product.

[0020] The prototype of which to the drawings has been realized in red pine, seeing as I think that such type of wood has the excellent characteristics for experiments like mine, presenting a specific weight lighter in respect to other essences, but also a remarkable elasticity and all to the minimal and competitive cost.

[0021] The functionality of the rotating planes is given from the proportion between the dimensions of the rotating planes and the support element (variable data according to the various requirements).

[0022] In the prototype in wood, the two axes are respectively characterized by a width of 40 cm and a length of 120 cm, with a starting thickness of 5 cm and a final thickness equal to 2,5 cm (Tab.1, fig.1(X,S) e Tab.3, fig. 1(X,S)). The suspended support element presents, instead, a base with a length of 80 cm and a height of 40 cm.

[0023] The thickness at the origin of the rotating axes has been calculated according to the following equation:

$$Sb: L = X: S$$

$$X = (Sb \text{ x } S)/L$$

[0024] Legend:

Sb = overhang (part of the rotating planes overhanging from support element);
L = width of the planes and suspended support element;
X = thickness at the origin of the planes;
S = final thickness of the planes.

[0025] In my prototype the X have been, therefore, calculated in the following way:

$$80 : 40 = X: 2.5$$

$$X = (80 \text{ x } 2,5) /40$$

$$X=5$$

[0026] If we wish to obtain a greater overhang, for example of 100 cm, according to the proportion of my working prototype, we will have that:

$$100 : 40 = X: 2.5$$

$$X = (100 \text{ x } 2.5) /40$$

$$X = 6.5$$

[0027] A greater thickness at the origin will be therefore necessary for having a overhang of a metre.

[0028] Obviously it is possible to obtain as overhang any intermediate size according to the various structural requirements.

[0029] But If we want to realize my rotating planes to overhang so as to form with the rotation a wider table or a counter, we notice that based on the above mentioned equation the thickness at the origin of the planes diminishes with the increasing of the width of the support element.

[0030] Assuming, in fact, we want an overhang of 80 cm and having, however, a support element with a width of 45 cm, the thickness at the origin will be equal to 4.4 cm based on the equation:

$$80 : 45 = X: 2.5$$

[0031] If we wanted, instead, to approach the same proportions of my prototype in wood, it would be enough to increase the final thickness by 3 millimetres

$$80 : 45 = X: 2.8$$

[0032] This demonstrates that small variations of even a single one of the dimensions of the rotating planes determine a variation of the dimension of the thickness at the origin of the same.

[0033] Obviously the dimensions of the axes and the suspended support element would vary in a still more sensitive way if for my prototype you use other types of material. If, as an example, we realized the rotating planes to overhang in iron we could have the same overhang and the same load of the prototype in wood as in the drawings, but with an initial thickness and a final thickness of the planes by far inferior.

[0034] However it does not seem opportune in relation to the final thickness of the planes, to come down to under 2.5 cm, because otherwise we would have a structure not in compliance with the safety standards, because the extremity would be too thin and therefore dangerous. Therefore I think that the final thickness constitutes a variable element but only in increasing size regarding my prototype of 2.5 cm.

[0035] I could continue to the infinite with the algebraic examples and the hypotheses of applications but I think that what I have written is sufficient to illustrate the potentialities and the innovation of my rotating planes, capable, thanks to the above cited characteristics, of transforming the space to which they are destined.

LEGEND:

[0036]

Tab. 1 (fig. 1) = front perspective of the multifunctional rotating planes on a suspended supporting structure;
Tab. 2 (fig. 1) = front perspective of the supporting suspended structure;
Tab. 2 (fig. 2) = inserted back panel of the supporting suspended structure, thickness 3 cm;
Tab. 2 (fig. 3) = plan of the supporting suspended structure;
Tab. 2 (fig. 4) = solid steel bearing with the applied modifications;
Tab. 3 (fig. 1) = central section of the rotating planes;
Tab. 3 (fig. 2) = plan of the rotating planes;
Tab. 4 (fig.1)= rotation of the rotating planes and the area they occupy;
A = circular cut of the rotating planes;
B = vertex of the carrying triangular section suspended structure;
C = cylindrical tube with threaded tip;
D = welding point of the cylindrical tube with the threaded tip inside the cap of the solid steel bearing;
E = no. 4 holes for the fixture of the cap of the solid steel bearing to the rotating planes;
F = lodging of the cap of the solid steel bearing positioned under the rotating planes;
G = closing plug of the solid steel bearing which has a hole positioned in the central part for the passage of the cylindrical tube and located on the base of the suspended supporting structure;
H = self-blocking bolt for the fixture of the rotating planes onto the suspended supporting structure;
I = safety catch chiselled down to nothing at the extremities;
L = width of the rotating planes and of the base of the carrying triangular section suspended element;
l = length of the base of the carrying triangular section suspended element;
M = anchorage holes on a fixed or mobile structure
N = inserted back panel, thickness 3 cm
O = beehive structure, thickness 2 cm
P = steel washer, diameter 5 cm
R = plug lodging for the closing of the solid steel bearing
S = final thickness of the rotating planes;
Sb = suspended part, part of the rotating planes which protrude from the carrying element;
X = original thickness of the rotating planes.

Claims

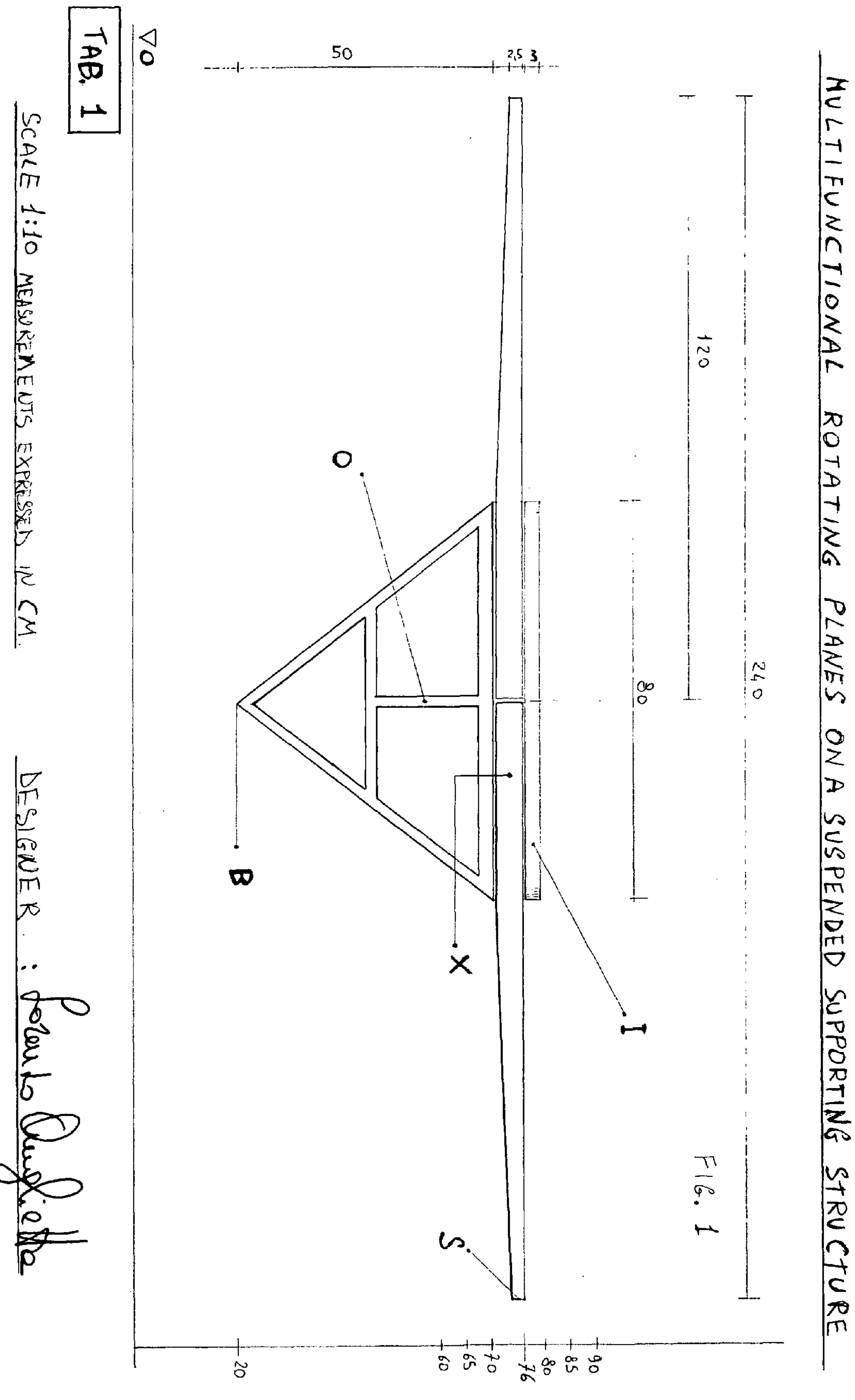
1. multifunctional rotating planes on a suspended supporting structure composed of:

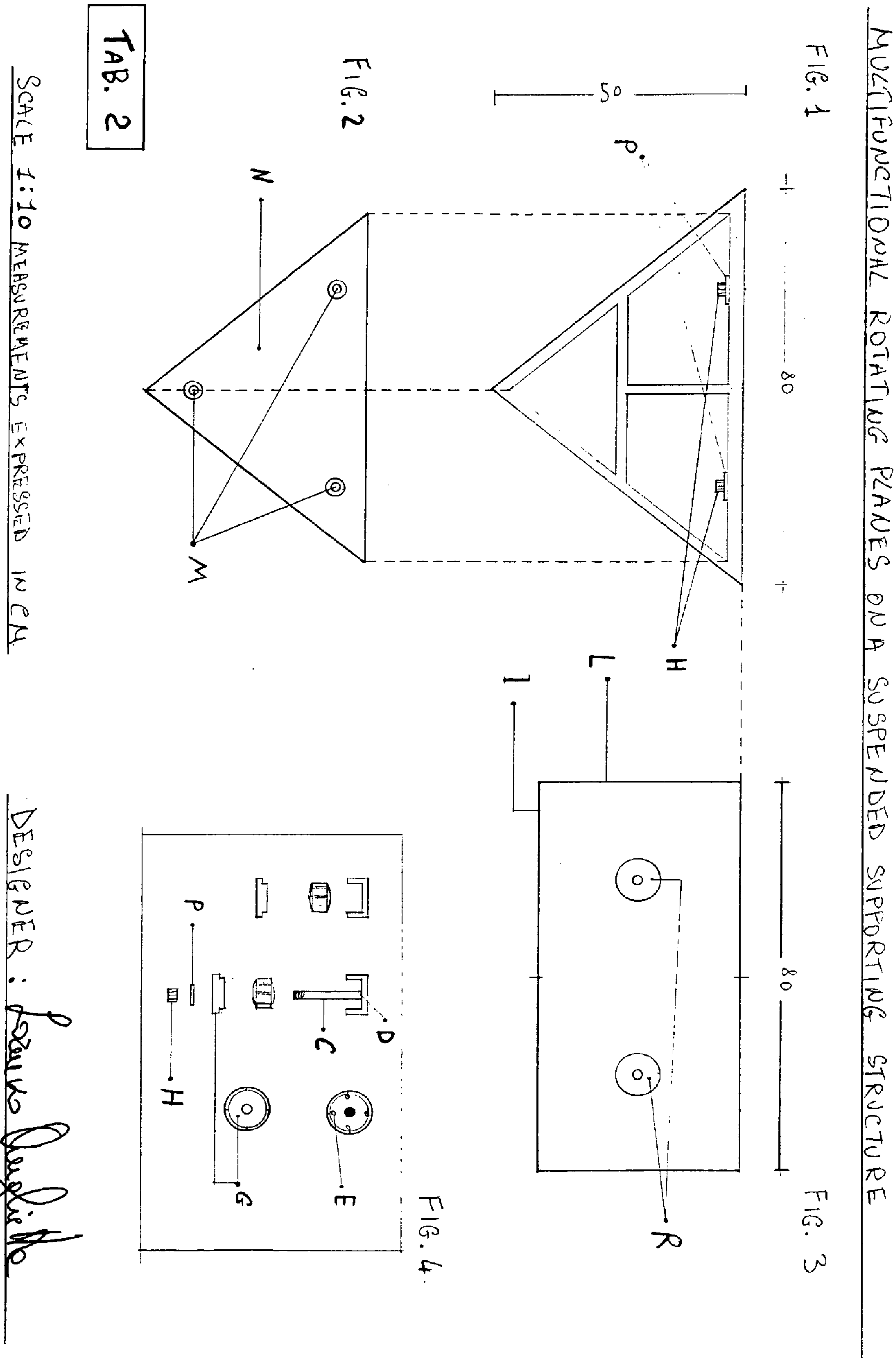
- two rotating planes (Tab.4, fig.1) **characterized by** a lengthways cut (Tab.1, fig.1(X, S); Tab.3, fig 1(X, S)) whose thickness decreases gradually at the point to allow for suspension and **characterized by** a circular cut at the base (Tab.3, fig.2(A)) to allow for rotation;
- a suspended supporting structure **characterized by** a triangular section cutting (Tab.1, fig. 1 and Tab.2, fig.1) with the vertex pointing downwards (Tab.2, fig.1(B)), whose base has the width (Tab.2, fig. 3(L)) and length (Tab.2, fig.3 (1)) directly proportional to these rotating planes according to the equation Sb:L=X:S; by which X = (Sb x S)/L (Tab.1, fig.1(sb, s, x); Tab.2, fig. 3(L); Tab.3, fig.1(S, Sb, X) and fig.2(L, Sb)); the supporting suspended structure is **characterized**, moreover, by a posterior inserted panel (Tab.2, fig.2) which has 3 anchorage holes on a fixed or mobile structure (Tab.2, fig.2(M));
- solid steel bearing **characterized by**: a cylindrical tube threaded at the tip (Tab. 2, fig. 4(C)) welded in the central part of the cap of the bearing (Tab.2, fig. 4(D)) which has in turn 4 holes (Tab.2, fig.4(E)) located in the central lodgings of the rotating planes (Tab.3, fig.1(F) and fig.2 (F)); closing plug of the solid steel bearing which has a hole positioned in the central part (Tab.2, fig.3(G)) for the passage of the cylindrical tube and located on the base of the supporting suspended structure (Tab.2, fig.3); self-blocking bolt for the fixing of the rotating planes onto the supporting suspended structure (Tab.2, fig. 1(H) and fig. 4(H)); which screws into the threading of the above mentioned cylindrical tube, and **characterized by** the fact that by either tightening or loosening it the resistance to rotation either increases or decreases;

2. multifunctional rotating planes on a supporting suspended structure as described in claim 1 **characterized by** a safety catch chiselled down to nothing at the extremities (tab.1, fig. (l));

3. multifunctional rotating planes on a suspended supporting structure as described in one of the above claims with the application of the suspended supporting element on a fixed or mobile support.

4. multifunctional rotating planes on a suspended supporting structure as described in one of the above claims **characterized by** the fact of being made in material which is resistant to flexibility both in metals and non-metals.


MULTIFUNCTIONAL ROTATING PLANES ON A SUSPENDED SUPPORTING STRUCTURE
FIG. 1
TAB. 1
SCALE 1:10 MEASUREMENTS EXPRESSED IN CM.
DESIGNER :
50
2,5
3
120
240
80
O
B
X
I
S
20
60
65
70
76
80
85
90


MULTIFUNCTIONAL ROTATING PLANES ON A SUSPENDED SUPPORTING STRUCTURE
FIG. 1
50
80
P
H
L
I
FIG. 3
80
R
FIG. 2
N
M
FIG. 4
D
C
E
P
H
G
TAB. 2
SCALE 1:10 MEASUREMENTS EXPRESSED IN CM.
DESIGNER :

MULTIFUNCTIONAL ROTATING PLANES ON A SUSPENDED SUPPORTING STRUCTURE

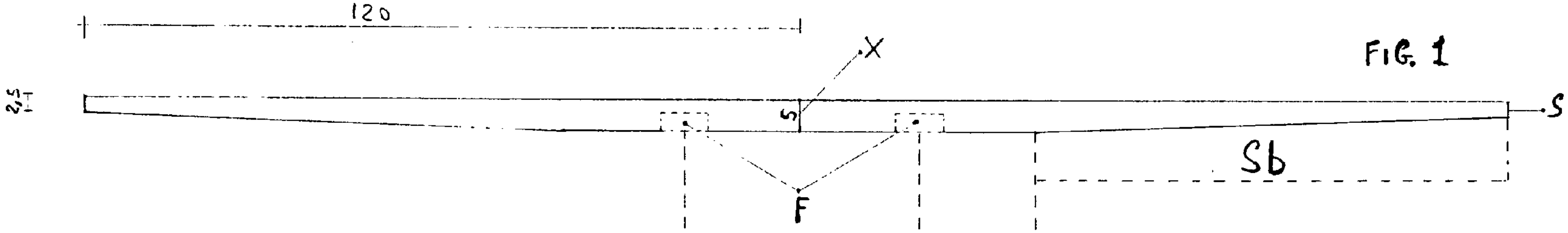


FIG. 1

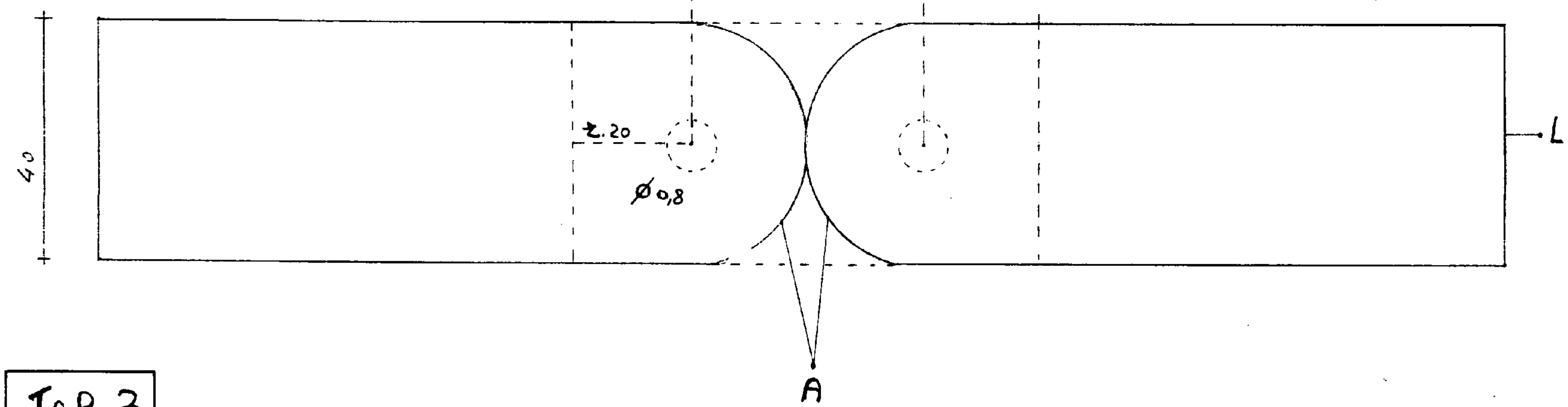
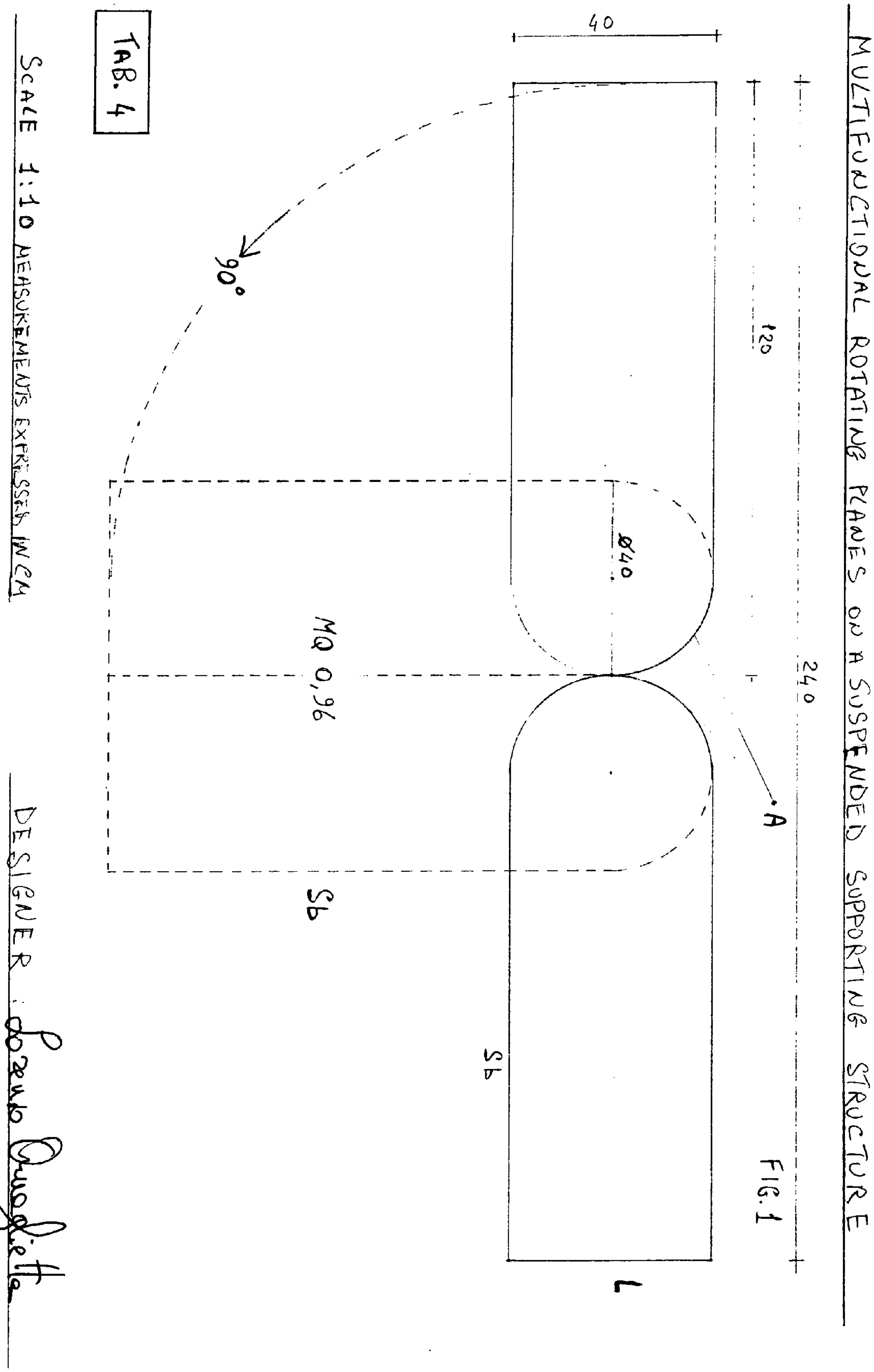


FIG. 2

TAB. 3

SCALE 1:10 MEASUREMENTS EXPRESSED IN CM

DESIGNER :


MULTIFUNCTIONAL ROTATING PLANES ON A SUSPENDED SUPPORTING STRUCTURE
FIG.1
TAB. 4
40
120
240
90°
Ø40
MQ 0,96
Sb
Sb
A
L
SCALE 1:10 MEASUREMENTS EXPRESSED IN CM
DESIGNER :