ELETTRO SYSTEM

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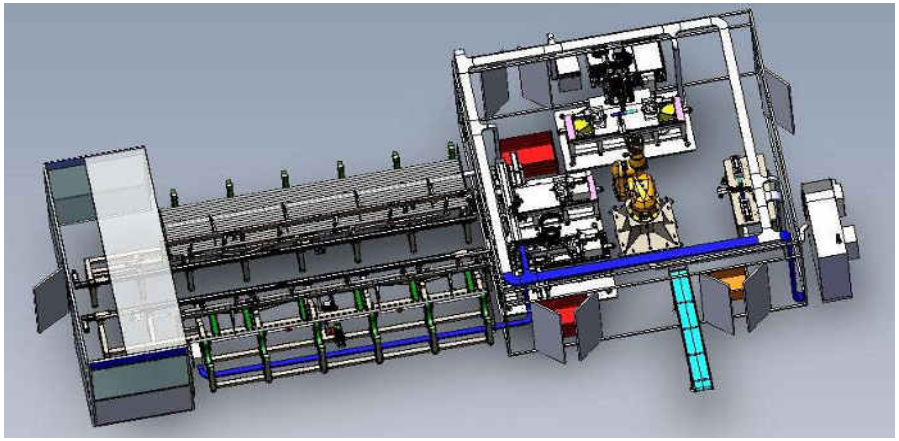
TWIMP Machine Presentation

Abstract:

The object of the TWIMP machine project concerns a process for the production of joined parts made of austenitic stainless steel with high twinning-induced plasticity.

The steel with high plasticity is useful in the automobile industry and in all applications wherein both a high resistance to corrosion and a high formability is requested, together with mechanical performances of high-resistant steels.



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Field of the *TWIMP* machine:

TWIMP machine relates to the field of manufacturing process of austenitic steels with high twinning, hereafter TWIP.

The subject is a process capable of joining tubes and hollow pieces made of austenitic steel with high twinning by means of laser welding technology.
The process start from the row bar, proceed with cut in length with proper finishing surface edges, continue with the alignment of the extremity to be joined and the welding process, ends with a test of seamless joint.
Such process path make the joined steel parts according to the invention particularly economic, ecological and suitable to the application in several fields such as automotive and for structural uses.

Patent Pending

Prior Art:

Although the TWIP steel represents a great opportunity for manufacturers, first experiences have resulted unsatisfactory. Two limitations have been found with the current cutting and welding process technologies to fully exploit TWIP steel features: the cutting and welding finishing does not meet manufacturers' specifications and the cost to obtain an acceptable cutting and welding process are still high. Due to the high precision required for the processes in the automotive and similar industry, manufacturers request the following parameters to be achieved for their cutting and welding finishing.

Cutting: smooth surfaces without burrs (i.e. remaining portion of accumulated materials on the cut edges)

Welding: no breakage, no cracks, no burns loops grooves or concentrations of porosity, correct dimensional marks

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Prior Art:

Seamless check: Direct test in production of the manufactured joined parts to be seamless.

However these is not available yet in the market. Reduced costs is required: Current conventional welding processes for TWIP steel are based on Metal Inert Gas welding (MIG) which requires filler material (incrementing costs and timing), presents high power consumption (2.2 kW) and the whole process is slow, not reaching the production pace.

Current manufacturing welding processes involving TWIP steel point out a method that requires the overlapping of both materials and also requires filler material. However, Elettrosystem machine claims a welding process without pieces overlapping and also avoiding the need to use filler material.

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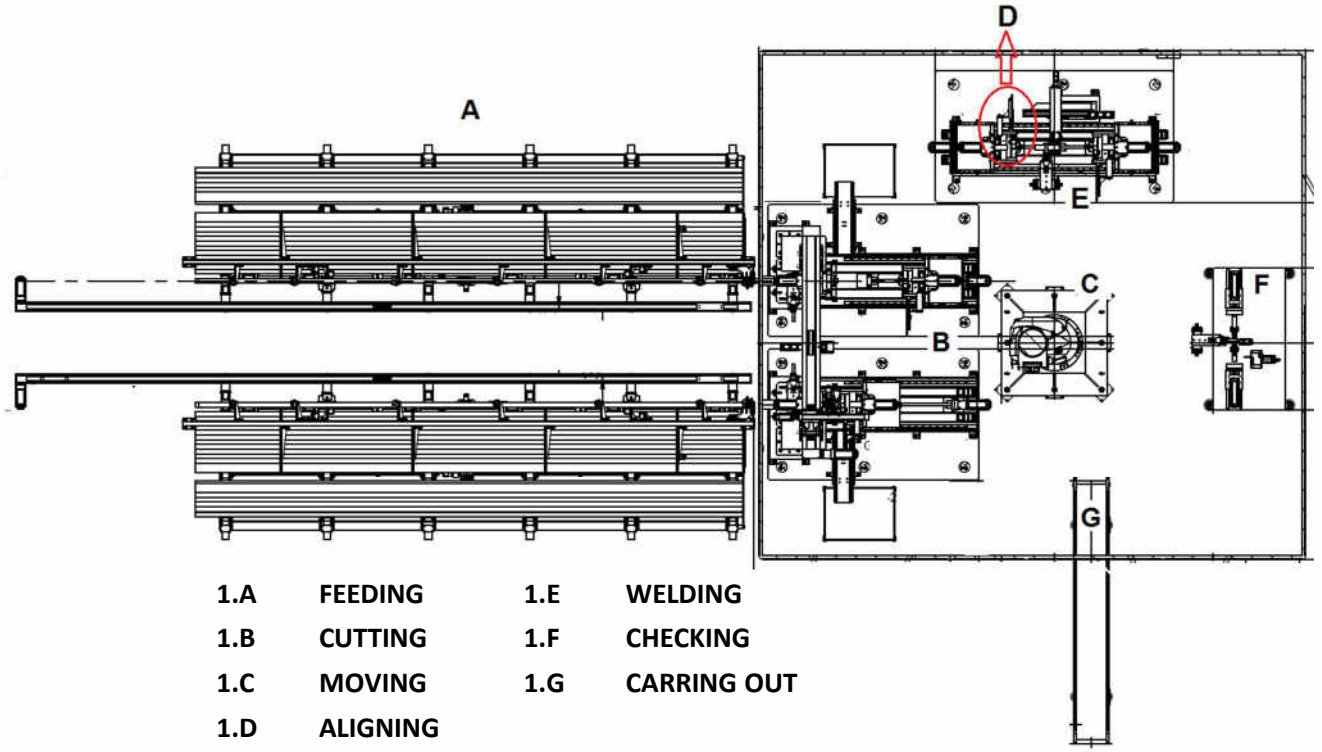
General Layout:

IMAGE 1



1.A	FEEDING	1.E	WELDING
1.B	CUTTING	1.F	CHECKING
1.C	MOVING	1.G	CARRING OUT
1.D	ALIGNING		

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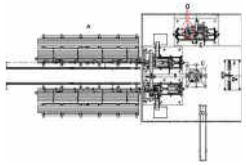
Process Description:



I. TUBES FEEDING – 1.A (image 2)
II. TUBES CUTTING – 1.B (image 3)
III. CUT TUBES MOVING AMONG OTHER STATIONS – 1.C (image 4)
IV. TUBES ALIGNING – 1.D (image 5)
V. TUBES WELDING – 1.E (image 6)
VI. TUBES SEAMLESS CHECK AND MARKING – 1.F (image 7)
VII. GOOD AND FAILED TUBES ARE SEPARATED – 1.G (image 8)

The process to join tubes of different thickness, follow the phases:
I, II, III and IV for each different tube
III, IV, V, VI and VII for welded tubes

And the process for single tube follow the phases:
I, II single tube – for only cutting process
III, VI and VII for cutting, welding and checking tubes

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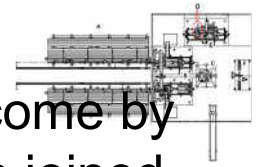
Description of Machine:



The above reported issues related to the TWIP steels joining process are overcome by the current project which provides a process to produce economically seamless joined tubes.

The process is carried by following technique:

1.A Row material feeding (image 2).

The material usually come in shape of long bars sheaf to be cut in length. The function of this system is to:

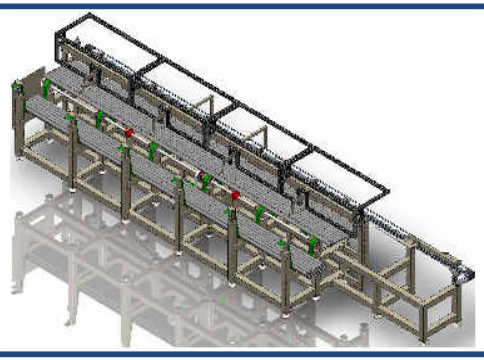
Separate each tube from the sheaf.

Control the thickness of the tube.

Feed each tube inside the laser cutting-welding box.

1.A

IMAGE 2



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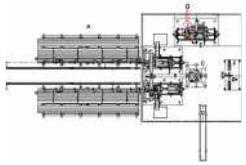
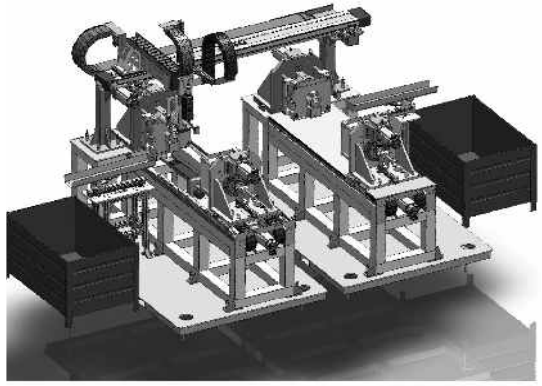
Description of Machine:



1.B Cutting Station (image 3).

Cutting process is very important in order to obtain good edge surface finishing to be properly welded.

1.B
IMAGE 3



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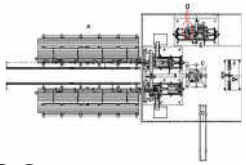
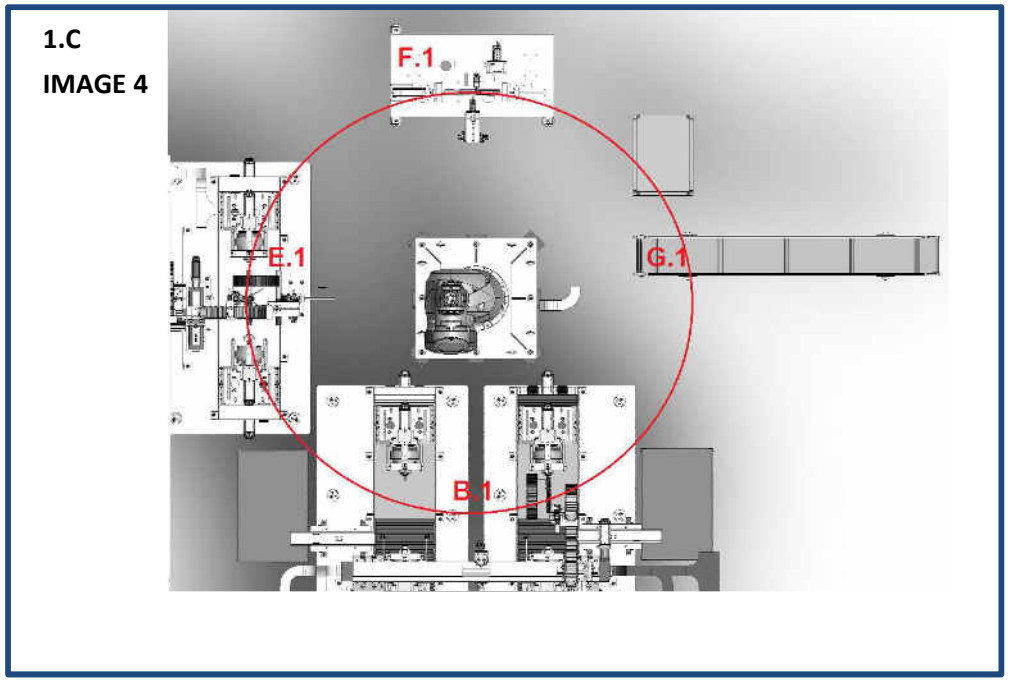


1.C Moving the tubes in different station (image 4)
This function is been performed by a robot. In this way is possible to transport the tubes from a cutting bench in the welding bench or in the checking bench or directly in the output conveyor



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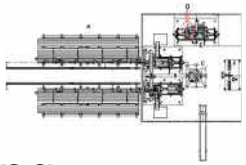

1.D Tube aligning and welding.

Tubes previously cut must be seamless joined. In order to obtain a proper welding tubes must be aligned firmly and precisely head by head. The process measure the extremity position of one tube, aligns the tube extremity precisely under the laser welding head and move the second tube firmly head by head to the first tube controlling effort.

Tubes previously aligned are joined by laser welding process (Know-how and Intellectual property of Elettrosystem).

1.D - 1.E

IMAGE 4

RESERVED

D.1 ALIGNING FUNCTION POSITIONING

D.2 TWO MOBILE UNITS WELDING

D.3 ELECTRONIC AXE TO CONTROL UNITS

D.4 REPEATIBLE

D.5 CROWN COVER GAS

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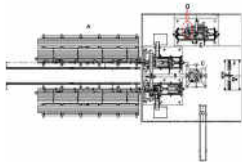
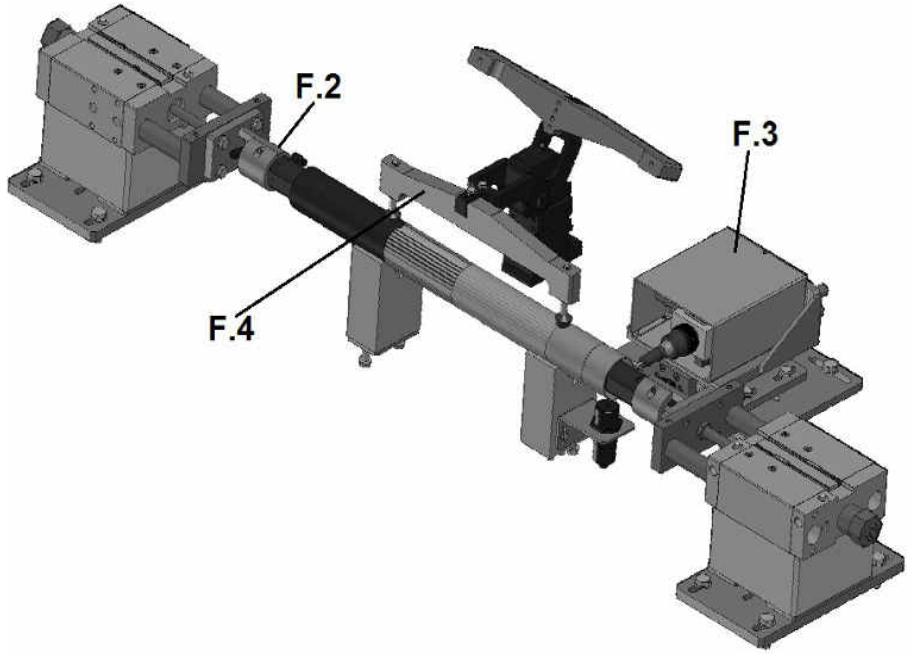
Description of Machine:



1.F Joined tubes seamless check and marked.
Previously welded tubes are checked by means of a pressure drop technique.

1.F

IMAGE 8



F.2 PLIER EXPANTION
F.3 MARKING MACHINE
F.4 MECHANICAL JOIN PIECE LOCK DURING THE SEAMLESS CHECKING AND THE MARKING PROCESS

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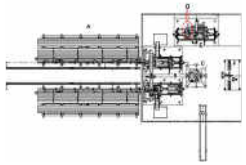
Continuous improvement



Elettrosystem is now working on R&D to improve that process and machine in new compact and innovative platform
(Innovative project presented to European community on program H2020)

New platform will allow flexibility to process many other parts, with different shapes and materials in new human machine environment and programming system.

Coming soon

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Thanks for your time