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A Research on Design of Sheet Straightening Machine

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Abstract: ***The consideration is centred around building up a method to rectify business steel bars in a prudent way. There are machines created by different enterprises to fix drawn and snaked metal bars, yet the business bars accessible in the market have varying cross area and material properties. These days fixing of these business bars are done physically in ventures by pounding process. It is an extremely repetitive activity and tedious as well. So there is a mechanical need to mechanize the procedure. Traditional manual straightening technique has low productivity and can't meet the requirement of the assembly. The parallel-roll straightening device raises the straightening speed greatly, however the bar rotates throughout the straightening processes. What is more, the straightening accuracy is low too. In this paper the process of straightening in machines of the stretching sort relies on the generation within the sheet of stresses approaching the yield purpose by the applying of a stretching force. The attention is focused on developing a technique to straighten steel sheets in an economical manner. The outcomes demonstrate that the structure proposition of rectifying framework which is proposed is doable and it gives great hypothetical establishment to the advancement of sheet fixing machine, the process of straightening is a very tedious job and time consuming too.***

Keywords: Straightening technique, machine, bending, fabrication, hammering, rolls.

I. INTRODUCTION

The process of straightening in machines of the stretching kind relies on the generation within the sheet of stresses approaching the yield purpose by the applying of a stretching force .A straightening machine of the stretching kind consists of a stand, 2 clamping heads, mechanism or moving the operating head, and a drive. Stretching machines with hydraulicly driven operating heads are being employed wide. A combined stretching/bending technique for continuous straightening of metal sheets is additionally getting used. The bending is performed on a straightening machine, and also the stretching is accomplished in devices with large-diameter rolls mounted on either side of the straightening machine. spherical steel bars have gotten tremendous application in building, construction and maritime industries.

A machine utilized in rolling mills to level the surface of sheet steel. Straightening machines are divided into roll-type machines, that are the foremost common kind and stretching machines. Roll-type straightening machines are designed or straightening skinny and thick sheets in either the cold or hot states stretching machines are designed primarily for cold straightening of thin sheets (steel and nonferrous metals) of that demanding quality needs are created. The preciseness of straightening depends on the spacing of the rolls (the larger the spacing, the lower the precision) and on the size and number of rolls (the larger the quantity of rolls, the upper the precision). There are sometimes seven to twenty three straightening rolls. most up-to-date straightening machines have supporting rolls additionally to the straightening rolls. There are of straightening is 0.1-6.0m/sec, depending on the thickness of the sheet.

II. LITERATURE SURVEY

R.Sivabalanal.Proposed that adjustable Unified wheel opener may be a special purpose tool created to open/close all the batty of a wheel in just one occasion with less effort. though numerous ways ar used for gap batty, they need plenty of effort to open one nut. the most objective of labor is to develop one tool with multiple mechanisms, which may be created use throughout grouping and dismantlement of wheels in cars. It is with success used as a regular tool no matter the model of the vehicle. additionally it is utilized in mechanical system of cars, garages, workshops and repair stations [1]. Vaibhav Chowki et.al. Suggested that as the way of life in India has expanded, a large portion of the families have somewhere around one vehicle, regularly, vehicle, to move effectively and rapidly. With the augmentation of the quantity of autos in the street, the quantity of vehicles' concern because of tire disappointment has expanded. Regularly, the vehicle is given tire wheel nuts remover and jack for example save tire substitution. All things considered, because of the trouble in applying the expected torque to evacuate the nuts, more often than not, driver

depend on the tow truck and accessible closest specialist to take care of the issue. This dependably happen to the older or female drivers. In light of the capacity of torque application by these drivers, a vehicle all-wheel-nuts remover is planned. The remover is intended to be ergonomic to be utilized, simple upkeep, simple stockpiling, simple to deal with and ready to evacuate all nuts without a moment's delay Adjustable Multiunit wheel opener is a unique reason apparatus made to open/close every one of the nuts of a wheel in one time with less exertion. Albeit different strategies are utilized for opening nuts, they require a great deal of exertion to open a solitary nut. The fundamental target of work is to build up a solitary instrument with various components, which can be made use amid amassing and destroying of wheels in autos [2].

Akshay Kolateet.al. Suggested that this task point is to structure and advancement of four wheel nut evacuating instrument for fixing and expelling of four nuts in a single stroke. With the augmentation of number of vehicle out and about, the quantity of autos issue because of tire disappointment has expanded. Regularly, the vehicle is furnished with tire wheel nuts remover and jack for example save tire substitution. By the by, because of trouble in applying torque to expel nut and to spare a period. They create instrument having a rigging planetary system. In our undertaking we are end eavored to concentrate on the minimization of human exertion for fixing for nuts of 100mm PCD wheel in one time. The principle goal of work is to build up a solitary apparatus, which can be made use amid gathering and dismantling of wheels in cars. It tends to be effectively utilized as standard instrument independent of the model of the vehicle. Likewise it tends to be utilized carports, workshops and administration stations. The remover is intended to be ergonomic to be utilized, simple support, simple stockpiling, simple to took care of and ready to evacuate all nuts on the double [3].

The Author MohdAzman Abdullah Suggested that as the way of life in Malaysia has expanded, the vast majority of the families have something like one vehicle, commonly, vehicle, to move effectively and rapidly. With the addition of the quantity of vehicles in the street, the quantity of autos' concern because of tire disappointment has expanded. Frequently, the vehicle is given tire wheel nuts remover and jack for example save tire substitution. By the by, because of the trouble in applying the expected torque to evacuate the nuts, more often than not, driver depend on the tow truck and accessible closest repairman to take care of the issue. This dependably happen to the old or female drivers. In light of the ability of torque application by these drivers, a vehicle all-wheel-nuts remover is structured. The remover is intended to be ergonomic to be utilized, simple support, simple stockpiling, simple to deal with and ready to expel all nuts without a moment's delay. The structure of the remover depends on standard pitch circle distance across (PCD) of 100 mm and 4 quantities of nuts for a large portion of the vehicles accessible [4].

III.METHODOLOGY

A. Strategies for straightening: 1.hammering 2.flame straightening 3. Mechanical straightening

1) Hammering- Pounding isn't allowed because of perpetually surprising outcomes. Outwardly edges are harmed and are made of unpredictable shapes. Mallet sway marks are exceptionally obvious and are difficult to camouflage.

2) Flame Straightening-This is the generally utilized strategy for avoiding or redressing the unavoidable mutilations that happen all through the creation procedure. It is successful technique for fixing. IN this technique, the spout is warmed in the range around 650 – 1000˚C for dainty sheet metals up to 100 mm thickness.

Fig. 1 Sheet Straightening

3) Mechanical Straightening- Fixing can be conveyed locally with generally little pressure driven jacks, or in substantial presses, bowing machines or rollers for entire sections.It is very basic to utilize a mix of warming and outer power, both controlled to accomplish required result.The utilization of mechanical rectifying applies to circumstance where there are moderately little strains included which have practically zero impact on the mechanical properties of the material itself.

IV.EXPERIMENTAL SETUP

The way toward fixing in machines of the extending type depends on the age in the sheet of stresses moving toward the yield point by the use of an extending power. A fixing machine of the extending type comprises of a stand, two cinching heads, component for moving the working head, and a drive. Extending machines with powerfully determined working heads are being utilized generally.The principal of sytem is the rectifying procedure depends on elastoplastic flexing of the sheet after going between controlled rolls orchestrated in a move remain in two amazed columns. The exactness of fixing relies upon the separating of the rolls and on measurements and number of rolls. There are generally 7 to 23 fixing rolls. The rate of rectifying is 0.1 – 6.0 m/sec, contingent upon the thickness of the sheet.There are some types is as follows :

1) *Straightening Machine For Tubes:* Six-roller fixing machines are being utilized for exact fixing of accuracy containers of steel or non-ferrous material. The extraordinary bit of leeway of this machine is the start to finish fixing. The edge is produced using two pieces held together by solid tie bars, contracted in hot. Rollers are customizable to the ideal rakish position, their hyperbolic shape guarantees a long contact line with the cylinder. All rectifying rollers are driven. The three top and the base focus rollers are customizable in their stature position. The machines can be offered with one or three distinct velocities, or whenever mentioned with steeples variable speed. Passageway and exit controlling channel, can be provided for manual or programmed task.

2) *Profile Straightening Machines:* Machines for fixing square and rectangular segment profiles. Two edges for square and rectangular areas. Free engine reducers to facilitate the upkeep tasks. Programming up to 200 projects away and programmed guideline of the considerable number of moves in the meantime. They can be provided with nourishing and emptying tables. Machines for rectifying profiles of sporadic shapes, for example, "T" bars, and so forth. Fitted with rigging trains, electronic recurrence variator. Accelerate to 80 m/min with direction moves at the passageway and at the exit. Activity task by Touch screen.

3) *Straightening Machine For Rods:* Our fixing machines are being utilized for exact fixing of accuracy poles of steel or non-ferrous material. The extraordinary preferred position of this machine is the start to finish fixing. The edge is produced using two pieces held together by solid tie bars, contracted in hot. Rollers are flexible to the ideal rakish position, their hyperbolic shape guarantees a long contact line with the bar. All fixing rollers are driven. The top roller is additionally flexible in their stature position. The machines can be offered with one or three unique paces, or whenever mentioned with step-less factor speed. Passage and exit managing channels, can be provided for manual or programmed activity.

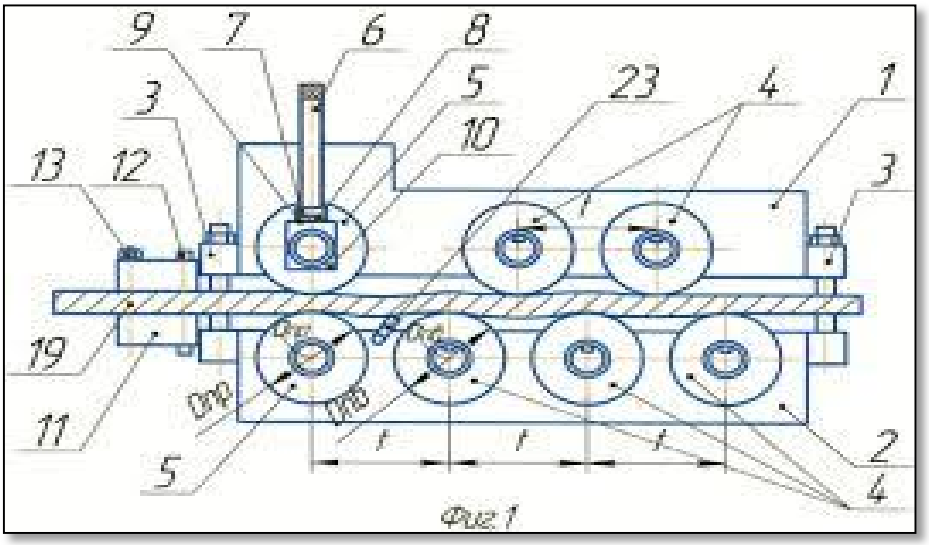

Fig 3: Straightening Machine For Rods

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V. ACTUAL EXPERIMENT SETUP DETAILS

1) *Bar Specification:* A round bar of 10mm diameter was chosen for the process. The bar is made of mild steel. It is 1450mm long.
2) *Stand still Locking Mechanism:* In the rectifying forms, bar is pre-rectified, and afterward its lingering mistake diminishes when it goes through the three-move disfigurement. The misshapening achieves comparable ebb and flow and it ensures the bar doesn't pivot. Finally, the bar is fixed by means of cyclic misshapening in two symmetrical leveling pads, the wire bar of minor width bar receives pivotal feed innovation, so the bar is contorted. The twist bar is accustomed to setting-out before fixing and the torque of the bar is discharged, which causes the vulnerability of rectifying plane due to autorotation of the bar. In the fixing forms, three move twisting innovation in this rectifying framework can shield the bar from turning around its very own hub, which safeguards that the two symmetrical leveling planes don't change and two-dimensional fixing is satisfied. While ebb and flow remaining of a similar bar achieves proportionate arch, which ensures the bar's rectifying precision.There are two self-securing frameworks all the while and the feed power needs to defeat the locking press power. Oneself locking framework is proportionate to a basically bolstered pillar with burden at focus.

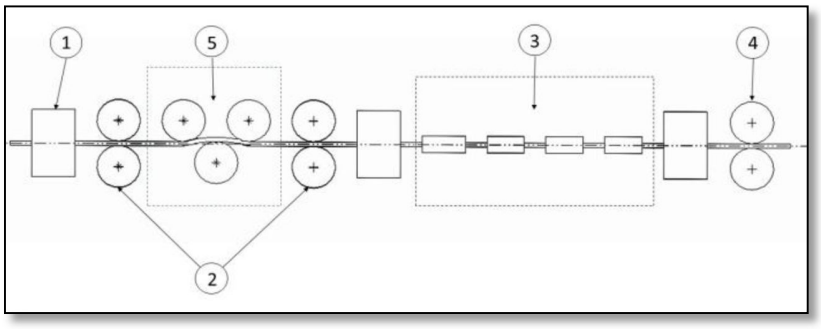

Fig 4: Diagramatic Sketch Of Straightening Roll System

VI. RESULT & DISCUSSION

A. *Results Obtained After The Straightening Process*

The straightness of the bar was measured using v-blocks and dial gauge as shown in fig. the straightened bar is divided into 8 equal parts. the points are marked at 0,17.5,35,52.5,70,87.5,105,122.5,140 in the bar and the straightness at those points were measured using the dial gauge. the values obtained for four specimens are shown in tables.

Position (cm)	Before passing (mm)	After first passing (mm)	After second passing (mm)	After third passing (mm)
0	0	0	0	0
17.5	56	4	2	1
35	123	12	4	2
52.5	158	18	7	4
70	143	25	11	7
87.5	146	16	6	3
105	106	9	3	1
122.5	43	3	1	0
140	0	0	0	0

The bending at various points on the bar specimen 1 before passing through the straightening mechanism were 0, 56, 123, 158, 143, 146, 106, 43, 0 mm. After the first pass the straightness improved to values 0, 4, 12, 18, 25, 16, 9, 3, 0 mm. The straightness is further improved in the second and third passes giving a desired precision of straightness ±10 mm.

Position (cm)	Before passing (mm)	After first passing (mm)	After second passing (mm)	After third passing (mm)
0	0	0	0	0
17.5	48	5	3	1
35	144	12	6	4
52.5	128	10	5	4
70	141	10	6	6
87.5	126	9	5	3
105	89	8	4	2
122.5	34	2	1	1
140	0	0	0	0

B. Calculation Of Press Force Applied By Centre Roller

The maximum deflection at centre is assumed to be

d=3cm=0.03m ----------(1)

Where, l=length between supports=44cm, E=modulus of elasticity=2 ×N/ ,

I=moment of inertia of bar=, d=diameter of bar= 10mm=0.01m

Therefore, I= = 4.9087 × Substituting in (1) we get Press Force =1660N Taking coefficient of friction μ=0.7 Feed force =F1=μ× =1162N.

The diameter of feed roller, D=75 mm.

The mechanism is designed to complete the straightening process within 1020sec. Hence required feed v=18 cm/s But V=R × w m/s Angular speed of feed roller w = rad/s = 4.84 rad/s

Since there are 2 self-locking mechanisms

Total feed force to be provided by a pair of feed roller = 2×F=2×1162=2324N

Torque of feed roller T = 2324 × 0.03718 = 86.41 Nm

Total power = 3×T×w =3×86.41×4.84 =1254.67 W= 1.68 HP

Hence 2 HP motor is to be used.

Spring force on each spring =1660 N . Total vertical force = 2 × 1660 N

= 3320 ----------(2)

Thus the spring of stiffness 52 N/mm is chosen. Speed of feed roller =N =w× = 4.84× = 46.22 rpm The maximum vertical force acting on the bar is 3.32 KN and maximum horizontal force acting is 2KN.

VII. CONCLUSION

Several trade objects are made-up from flat solid. the method of straightening in machines of the stretching kind is predicated on the generation within the sheet of stresses approaching the yield purpose by the appliance of a stretching force. In this project the attention is focused on developing how to straighten steel sheets in a very cost-efficient manner. The results show that the planning proposal of straightening system that is planned is possible and it provides favourable theoretical foundation for the event of sheet straightening machine.

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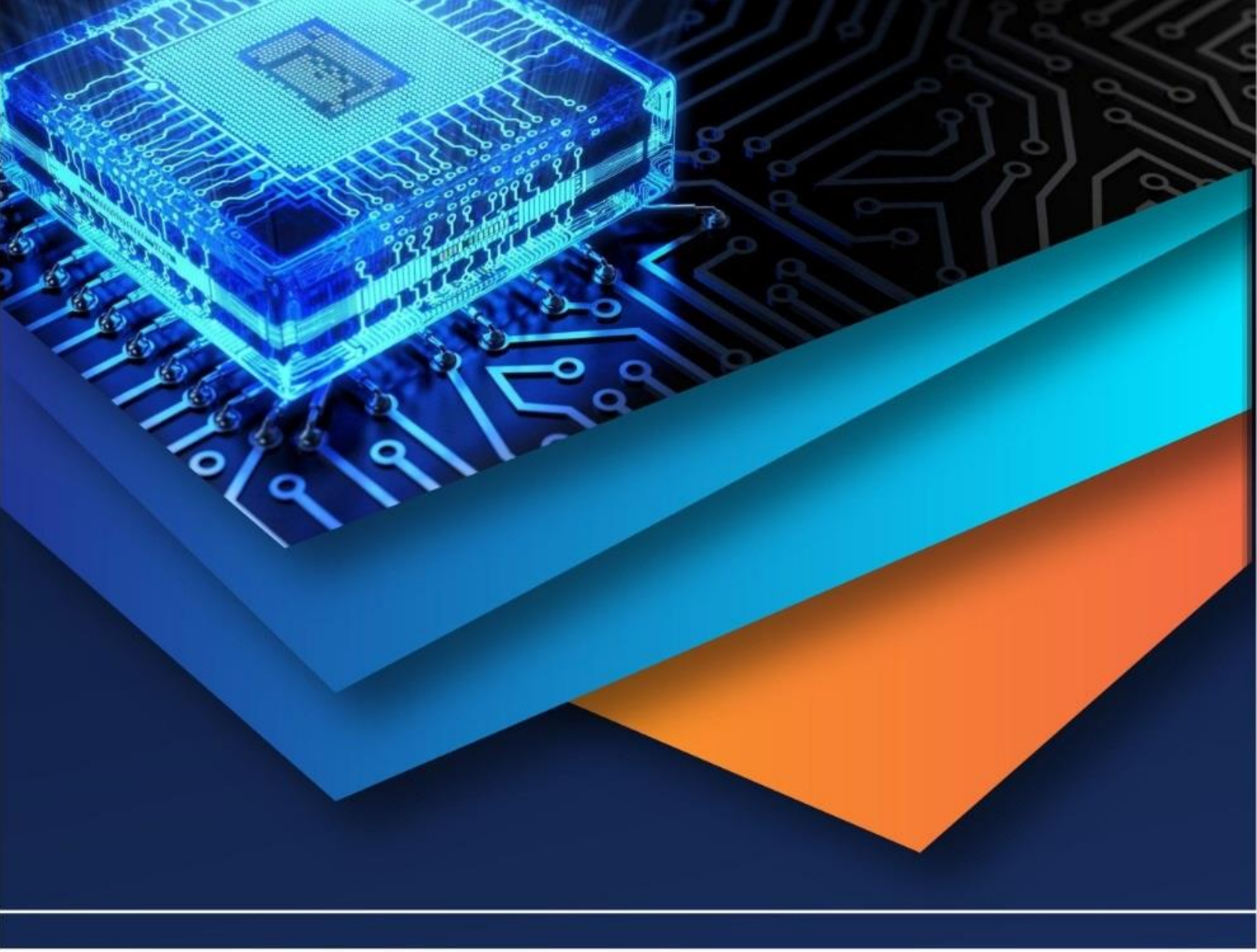

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