Review- Improvement in Safe Locking Mechanism

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Abstract:- **The present project work is to change the existing mechanism which is fully welded construction requires lot of rework which consumes lot of time, human resource & hence delay in production. In order to overcome these difficulties new mechanism will be designed based on bolted construction in order to eliminate distortion, welding reworks and rework for proper alignment. The use of bolting arrangement helps to avoid distortion and rework but it also reduce the manufacturing cost which may deliver same function without compromising security and quality with enhanced manufacturing ability.**

key words: *Mechanism, safes, door assembly.*

1. INTRODUCTION

Security and safety are two closely related terms. It is a common belief that when a place or system is secure, it is safe[1].

The construction of safe consist that all five sides and the door of the Safes are armoured with a specially formulated Double duty barrier material that is encased between strong outer and inner steel bodies. This provides massive resistance to attacks of sledge hammers, power drills and chisels, and also helps to withstand the impact of a fall from upper floors. For higher grades of safes, the DDB (Double Duty Barrier) is further fortified by a TDR(Torch and Drill Resistance) matrix which offers excellent protection from torch, drill and tool attacks. The safes are further fortified by armour plating on all 6 sides.

The existing construction of safe assembly consists of,

1. Outer body Assembly
2. Inner body Assembly
3. Door Assembly
4. Locking mechanism

There are other important components are Door cover, Hinge, Handles & other fittings and Internal fixtures like shelf, drawers and the lock.

The material used for construction is mainly of mild steel plates backed with suitable barriers to meet the performance requirements as per different classes.

The different classes of safes are

1. Class C - TL 30D x TL 10 x 5 - FR 30
2. Class B - TRTL - 15 (D) x TL 15 x5
3. Class BB - TRTL - 15 x 6
4. Class A - TRTL - 30 x 6
5. Class AA - TRTL - 60 x 6.

The safes should withstand the one hour fire resistance test and withstand burglary attacks.

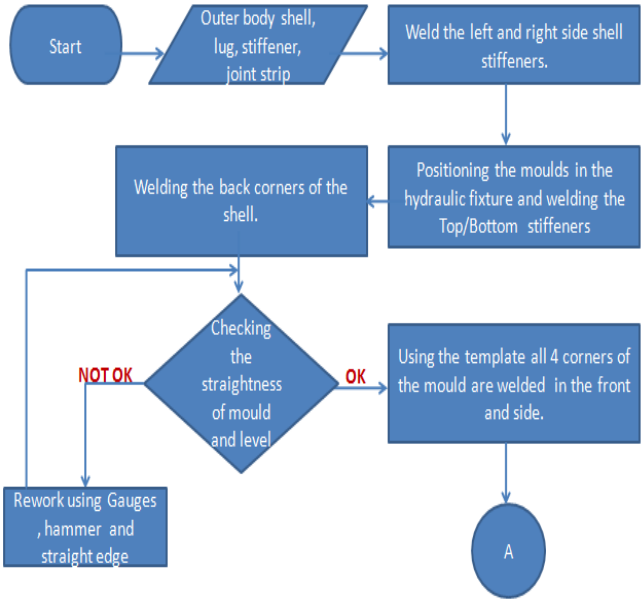
There are variety of Models stands from Model 26 to higher 84DD.Strong movable shooting bolts on either side are evenly placed to secure the door behind the solid jamb box. unique balanced pressure bolt work ensures safety from attacks by dislodging.

Highly sensitive re-locking device on both locks prevents burglary by instantly deadlocking the Door if the locks are tampered with either mechanically or by using liquid explosives. Unique Drill defeat shields protect vital parts of the lock and dead locking device.

The safes are fitted with superior quality dual control, high precision locks which are unpick able and only the original keys will open them. The locks are protected with specially designed unique with 14mm drill defeat with shield provided in the door.

All steel components are given a thorough twelve stage anti-corrosion treatment followed by coats of rust - inhibiting paint for protection against corrosion.

2. OUTER AND INNER BODY ASSEMBLY



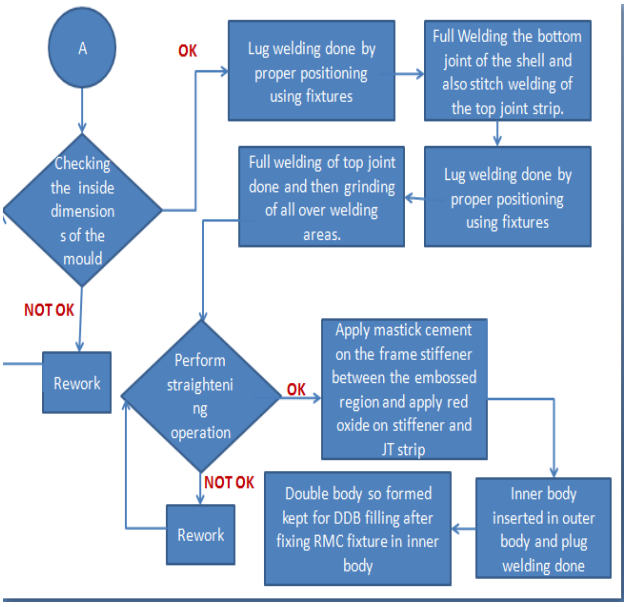


FIG 1. Flow diagram of outer and inner body assembly

Flow diagram of outer and inner body assembly as shown in fig 1.The assembly starts from receiving the shell from press shop. locate and clamp the frame stiffener and weld it. Turn by 180º in the same plane and Turn it by 90º in z-axis with mould at bottom. Position the mould sides in the hydraulic fixture maintain the gap level of the joinery shells. Position joint strips from inside and weld it from outside along the depth of shell joint. Position the top/bottom front stiffeners on the mould and weld it. Transfer the outer body to the next side and weld the back corners of shell. Strength the top bottom shell in level turn the shell by 180º. Place the back shell stiffener on the inside back edge of the shell and weld it at the ends. Weld top and bottom frame stiffeners from front. Lower the template on the shell and weld the four corners of mould in the front and side. Transfer the body to next W/S.

Lower the lug welding fixture and position the lugs and tack weld them. Lift the lug welding fixture up and full weld the lugs. Transfer the OB to the next W/S and turn it by 90^0. Full weld the bottom joint of the shell of length 720mm. Stitch weld the top joint strip and the lower corners of the shell from inside. Transfer the OB to the next W/S for corner chipping/grinding. Transfer the OB to the next W/S and turn the shell by 180^0. Full weld the top joint of the shell. Stitch welds the bolt, joint strip and the two corners of the shell from inside. Transfer the OB to the next W/S for corner chipping/grinding. Transfer the OB to the next W/S and turn it 180^0 in same plane with lug sides on top. Position the Outer body on the grinding machine, clamp it. Grind the weld joint on the topside. Left and turn the body by 180^0 in the same plane, clamp it and perform grinding of the other joint. Transfer the body to the next workstation. Rough grind the area around lugs and polish grind all the four corners and lugs. Perform straightening operation. Apply mastic cement on the frame stiffener between the embossed regions and apply red oxide on stiffener and JT strip.

Straighten the inner body insert the inner body in the outer body and rest it on the frame stiffener and perform plug welding in the inner body holes and weld the metal strip at centre of double body. Perform emery on the plugs welded position. Apply red primer on the ground surface of OB and apply putty on the joinery of Outer Body. Fix RMC filling fixture inside the IB and rotate the shell by 180^0. Transfer the double body for DDB filling.

3. DOOR ASSEMBLY

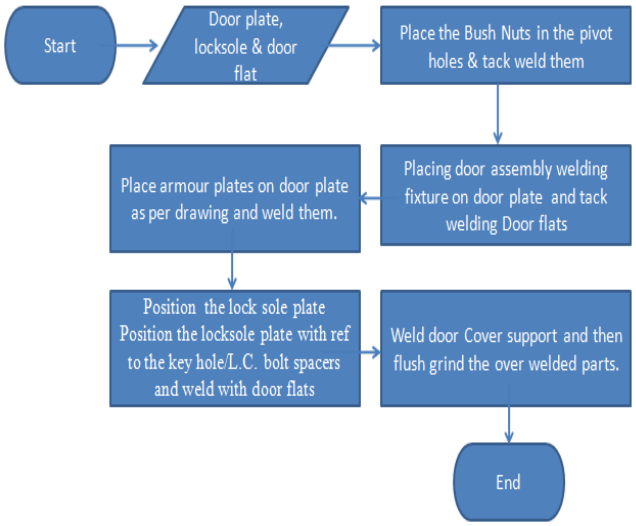


FIG 2.Flow diagram of door assembly

Door assembly flow diagram as shown in Fig 2. Receive the door plate from the door storage stack. Lift the door plate using magnetic lifter and place it on shuttle 1. Place the threaded bush assembly in the holes of the door plate. Shuttle 1 move to position below door flat weld fixture and locked. Position the front, back, top door flat (except bottom door flat) in the inverted fixture and ensure that they are in proper position. Clamp the door flats. Weld the door flats at all adjacent corners joineries. Top door flat to be welded with front and rear door flat. Rotate the door weld fixture 180º.Lifter assembly on shuttle 1 raises the door plate till it makes tight contact with the bottom surface of door flat. Tack welds the door flat to the door plate. Lower the lifter on the shuttle1 and move the shuttle , back to its home position. Move the shuttle 2 below the door weld fixture which is holding the door flat and plate assembly. Release the assembly on the shuttle 2 and declamp the fixture. move the shuttle 2 to the next work station. Lift the tray and insert it from the bottom side of the assembly. Locate if properly wrt to holes on the door plate and weld it at the support.

Insert the lock sole and insert it from the bottom. Position the lock sole plate with reference of the key hole spacer and weld it. Place the welding template on the front and rear door flat and weld the door cover support properly. Remove the door cover support welding template and transfer the door to the next work Table. Flush grind the over welded part at the junction of front, rear, bottom, door

flats. Transfer the door to the next workstation for DDB filling.

4. LOCKING MECHANISM

The existing locking mechanism of door is of welded construction. Strong movable shooting bolts on either side are evenly spaced to secure the door behind the solid jamb box. Unique balanced pressure bolt-work ensures safety from attacks by dislodging.
The alignment of shooting bolt assembly plays an important role in door locking mechanism. Many locking mechanism components are directly welded to the shooting bolt angle hence possibility of distortion of this shooting bolt angle is more hence it's alignment is very much crucial for shooting bolt engagement on both side of the door. Apart from the lock check bar, sliding flat, Lock check plate etc., are heart of the locking mechanism components. Any distortion/shrinkage of these components are directly affecting the mechanism. In such cases correction of these mechanism requires lot of rework which consumes lot of time, human resource & delay in production.

5. LIMITATION

- Distortion of shooting bolt angle is more.
- Requires lot of Rework
- Consumes lot of time, human resources
- Delay in Production hence it increases manufacturing cost.

6. METHODOLOGY

The Currently used mechanism is mainly welded construction which causes distortion and requires lot of rework. In order to overcome from these losses, new mechanism will be designed based on bolted construction which will deliver same function without compromising security and quality with enhanced manufacturing ability and cost reduction.

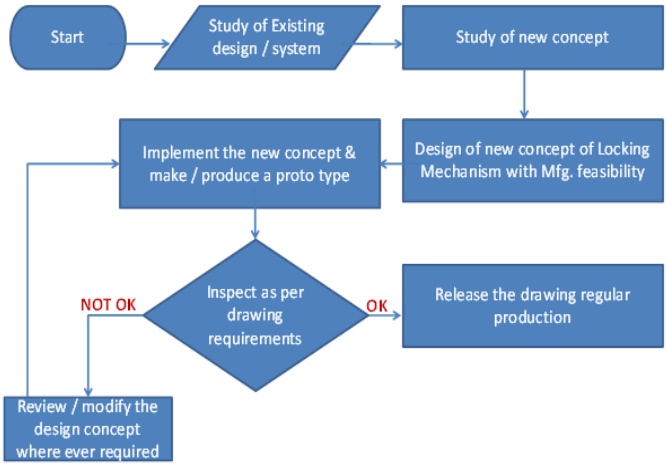


FIG 3. Methodology flow chart

6. CONCLUSIONS:

- Simplified manufacturing processes
- Reduces manufacturing cost
- Reduce employee fatigue
- Improved production.

7. REFERENCES

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