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REDUCTION OF METAL WASTAGE BY NEW LOCKING SYSTEM OF LADLE

Prof. Darshana K. Dave
Department of Production Engineering
Government Engineering College
Bhavnagar, Gujarat, India

Dr.H.S.Trivedi
Department of Production Engineering
Shantilal Shah Engineering College,
Bhavnagar, Gujarat, India

***Abstract*— Majority of Indian and other countries' foundries uses ladle for pouring molten metal into previously created mold as well as handling of molten metal from cupola or induction furnace to mold. Ladle design plays a most important role in foundry Industries. Size of ladle depends upon its holding molten metal capacity from 20 Kg to 330 tons .In certain cases of; nonferrous foundry ceramic crucibles are used as ladle.**

Keywords— **Foundry industries, Ladle design**

I. INTRODUCTION

Depends upon the end use of ladle can be classified in to three categories:1 Casting ladle (to pour molten metal in to mould); 2.Transfer ladle(Torpedo ladles to transfer the molten metal from source of melting to automatic pouring unit as in continuous casting process) and 3 . Treatment ladle (used as mixing of various elements to obtain metallurgical properties or to convert C.I. to ductile iron) . In transfer Ladle Refractory lining materials like precast firebricks or refractory concretes are used to avoid melting of steel ladle shell. Ladles can also classified according to hand operated ladle, overhead crane operated ladle and special purpose wheel car used in steel plant.

General design of ladle is vertical cone while tapered cone type shell gives more strength and rigidity. In small scale foundries drum ladle is made up of horizontal cylinder which is suspended between two carriers or bogies. Furthermore ladle is either open or dome shaped with removable covered lid to reduces drop down of heat/temperature of molten metal to avoid solidification of molten metal in ladle itself. In small ladle ceramic coating is used if required.

In large scale industry, medium and large ladles operated through shafts on an overhead crane by means of worm gear type gearbox which is operated either by large hand wheel or an electric motor. Figure 1 shows a pouring of molten metal through overhead crane and ladle.

Fig. 1 Pouring of molten metal through overhead crane and ladle

II. DESCRIPTION OF PRESENT DESIGN OF LADLE LOCKING SYSTEM

Figure 2 shows a present ladle locking design. When handle in down position than rod of gearing system goes to up position .When rod of gearing system goes to up than also rod of lock goes to up position .When rod of lock goes to in up position then metal goes to outside of the ladle i.e. in molding box. But when lock is closed than some part of metal stick on mouth of hole show in figure. Some part of metal are wasted, and this wasted metal goes again in furnace.1kg-1.5kg metal are wasted per ladle. Use of old design ladle, very large times are consumed and low productivity. More man power is required. More electricity is required for old locking system of ladle.
One advantage of old locking system of ladle is that only reciprocating motion is required, so life of locking system is more.

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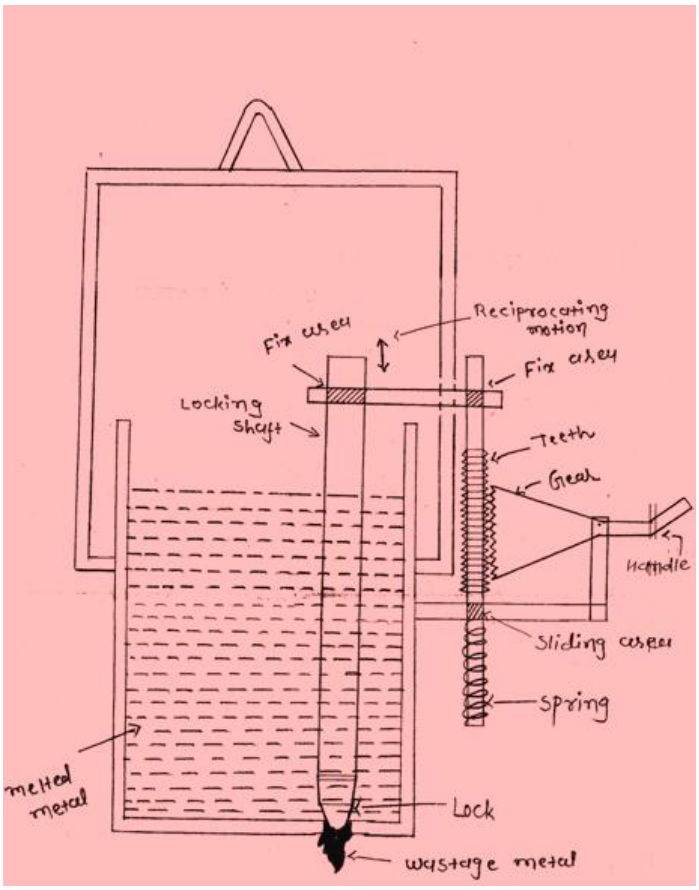
Dis-advantages:

- Low productivity.
- More time consumed.
- More manpower are required
- High electricity is used
- Metal wastage



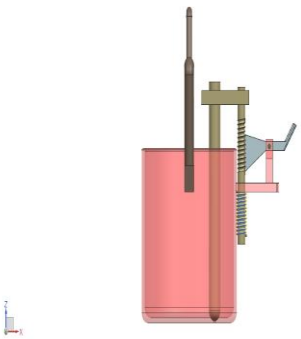


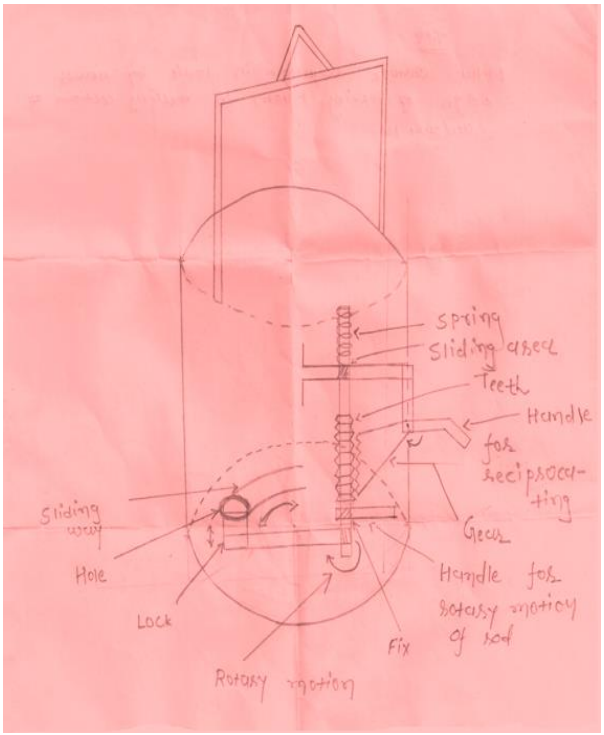
Fig. 2 Present ladle design

III. DESCRIPTION OF NEW LADLE DESIGN OF LOCKING SYSTEM

Figure 3 shows a new design of locking system of ladle. When handle of reciprocating motion is goes to in upward position than rod of gearing system is goes in downward position. When rod of gearing system is goes in downward position than also rod of lock is goes to in downward position and then handle of rotating motion are used. When handle will rotate than lock goes on slide way so in figure and metal goes to outside of ladle i.e. in molding box. In last, when lock is closed then metal does not to go in outside of ladle so metal are not wastage. But in new ladle, metal are goes in inside of ladle Use of new locking system, very low times are consumed than old locking system. Productivity goes to high than old locking system. Low electricity are required than old locking system. More customer satisfaction than old locking system. One disadvantage of new locking system is that short life.

Advantages:

- High productivity.
- Low manpower is required.
- Low times are required than old locking system.
- Low electricity are required than old locking system.



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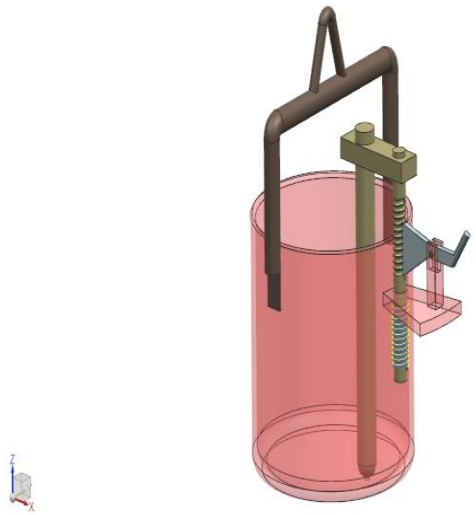

Fig.3 Improved ladle design

IV. CONCLUSION

With the improvement in ladle design we can reduce the solidification of molten metal in ladle by 15 to 20% per ladle and minimum 12 to 15 ladle required per shift as in small scale industry.

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