



# final report

Project Code: MRR.483  
Prepared by: N.G. MC Phail & B.P. Cain  
CSIRO  
Date published: January 2006

PUBLISHED BY  
Meat and Livestock Australia Limited  
Locked Bag 991  
NORTH SYDNEY NSW 2059

## **An automatic beef side orientation device**

Meat & Livestock Australia acknowledges the matching funds provided by the Australian Government and contributions from the Australian Meat Processor Corporation to support the research and development detailed in this publication.

This publication is published by Meat & Livestock Australia Limited ABN 39 081 678 364 (MLA). Care is taken to ensure the accuracy of the information contained in this publication. However MLA cannot accept responsibility for the accuracy or completeness of the information or opinions contained in the publication. You should make your own enquiries before making decisions concerning your interests. Reproduction in whole or in part of this publication is prohibited without prior written consent of MLA.

CONTENTS

	<u>Page</u>
SUMMARY	1
INTRODUCTION	2
CONSTRUCTION AND OPERATION	2
RESULTS AND DISCUSSION	6
CONCLUSIONS	6
FIGURE 1 - PRINCIPLE OF OPERATION OF SIDE ORIENTATION DEVICE	3
FIGURE 2 - GENERAL ARRANGEMENT OF BEEF SIDE ORIENTATION MECHANISM	4
FIGURE 3 - CONTROL CIRCUIT FOR ORIENTATION MECHANISM	5
FIGURE 4(a) - BEEF ROLLER SUITABLE FOR AUTOMATIC SIDE ORIENTATION	7
FIGURE 4(b) - SUGGESTED MODIFICATION TO BEEF ROLLER NOT SUITABLE FOR AUTOMATIC SIDE ORIENTATION	7

SUMMARY

It is advantageous in the automatic washing and imperative in electrical stimulation of sides of beef to have the side oriented so that the backbone is always facing in the same direction. In some plants this task may not be able to be done by existing workers on the processing line. An automatic device for orienting beef sides has been constructed and tested. It consists of a guide bar to align the sides, a limit switch to detect via the hook which sides have the backbone facing the wrong way and a pneumatic ram to turn those sides.

## INTRODUCTION

In recent years many meatworks have installed automatic beef wash cabinets and some have installed beef side electrical stimulation (ES) equipment. Removal of bone dust is the most difficult operation in carcass washing. If all sides were oriented to face the same way, one side of the wash cabinet could be equipped with suitable nozzles operating at sufficient pressure to remove bone dust while the other side may have fewer and/or smaller nozzles. This could result in lower water usage and more efficient washing.

For effective ES of sides, it is essential that they are oriented so that the backbone does not contact the rubbing bar electrode.

In many cases beef sides can be properly orientated by the last operator before the ES or wash cabinet, however in some cases he is remote from the cabinet and hence an automatic method of orienting the side is desirable. This report describes a device which aligns beef sides so that the backbones all face the same direction. A prototype has been constructed and tested in an abattoir.

## CONSTRUCTION AND OPERATION

### Principle of Operation

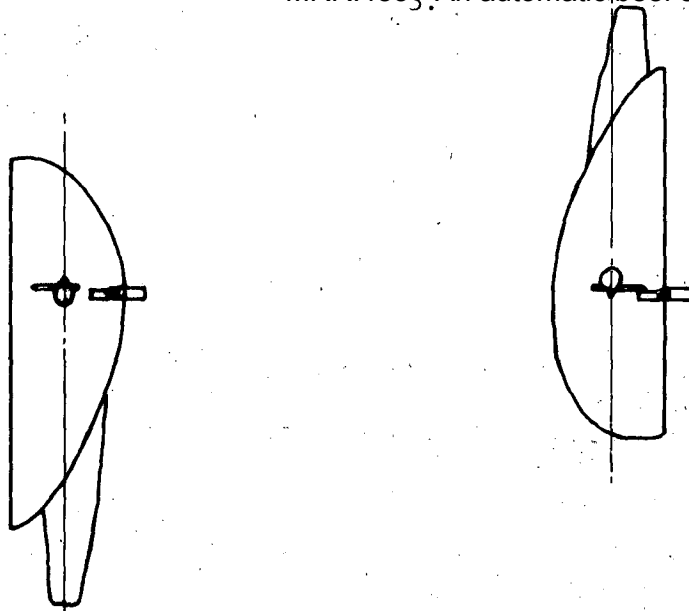
Beef sides can be aligned by means of a guide bar constructed at a suitable height parallel to the rail. The backbone of some sides will face the desired way whereas others will require rotation through 180°. A method that identifies sides which face the wrong way is needed.

The hook from which the side is suspended will be at approximately 90° to the rail. As the hook is always inserted through the Achilles tendon in the same direction, the position of the tip of the hook will indicate which way the side is facing. Detection of the tip will indicate that the side is facing the wrong way and must be turned through 180°. (Refer to Figure 1).

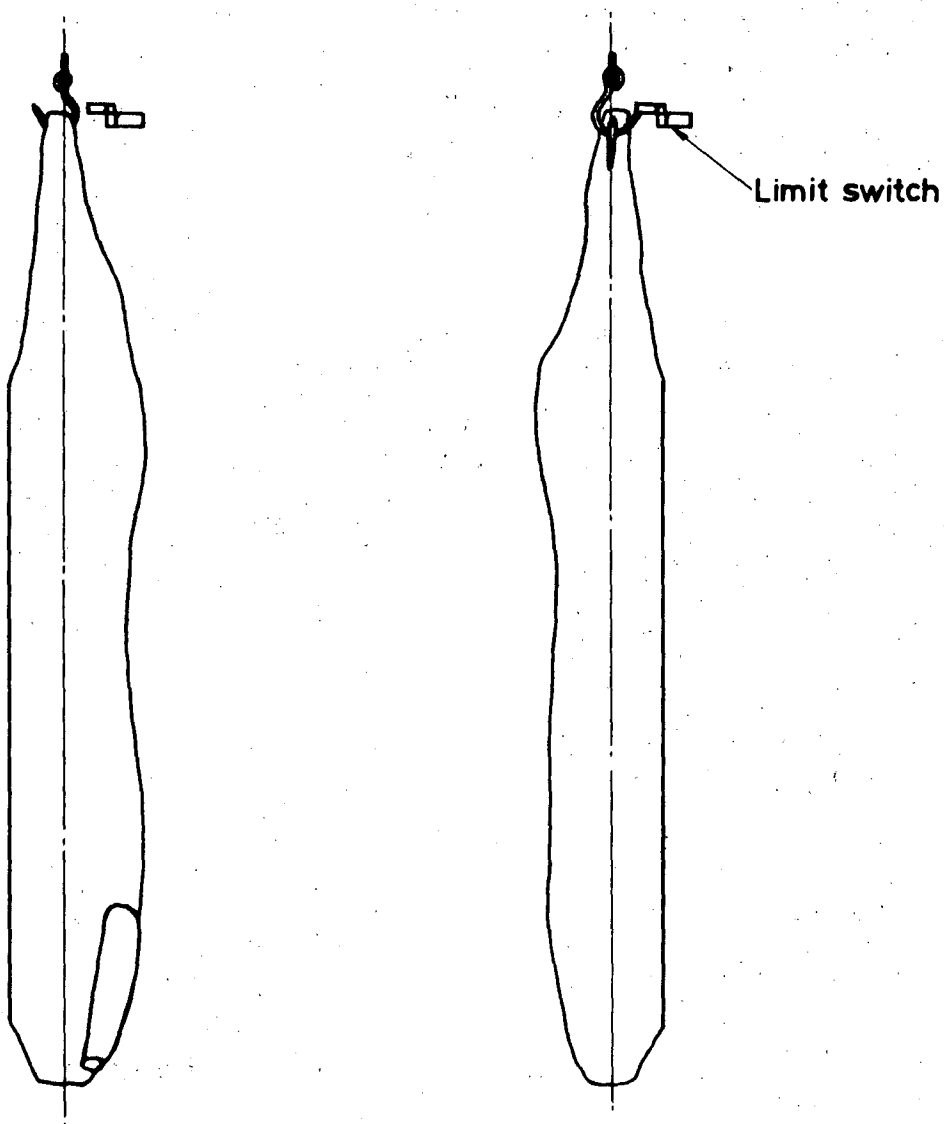
### Design

The arrangement of the orientation mechanism is shown in Figure 2. It consists of a guide bar which aligns the sides, an electric limit switch mounted below the rail to detect the tip of the hook of an incorrectly oriented side, and a pneumatic cylinder mounted above the bar to turn the sides. The end of the cylinder rod is fitted with a 300 mm dia. dome which pushes the backbone or brisket of the side when re-orientation is required. A second guide bar completes the turning and maintains the alignment for the subsequent process.

The pneumatic and electrical control circuit is shown in Figure 3. The cylinder is controlled by a pilot valve operated by a 24V DC solenoid which is activated by the limit switch via a 1.5s off delay timer. The off delay timer ensures that the cylinder piston travels its full stroke before retracting.



PLAN

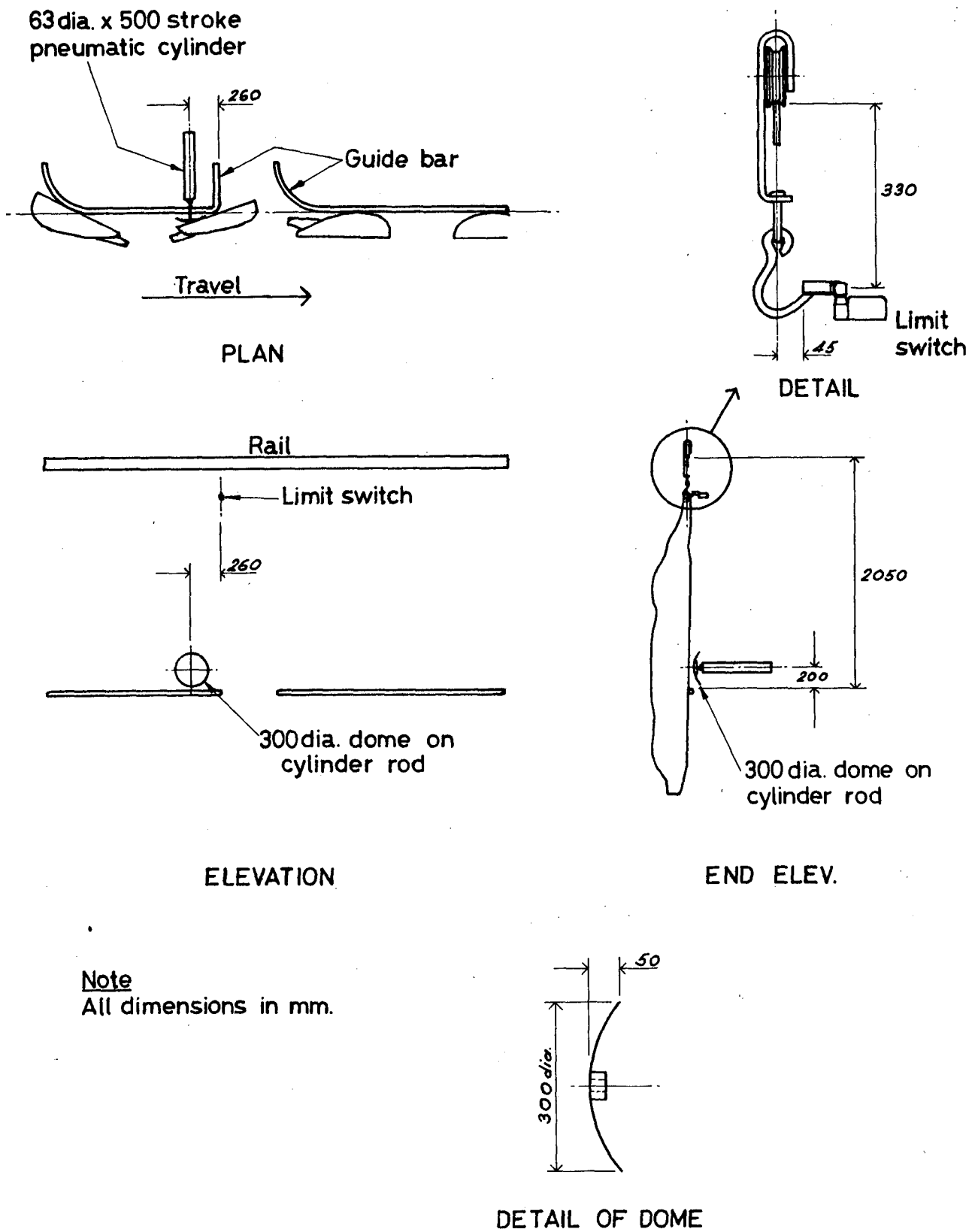


(a) Back of hook clears switch

(b) Tip of hook trips switch

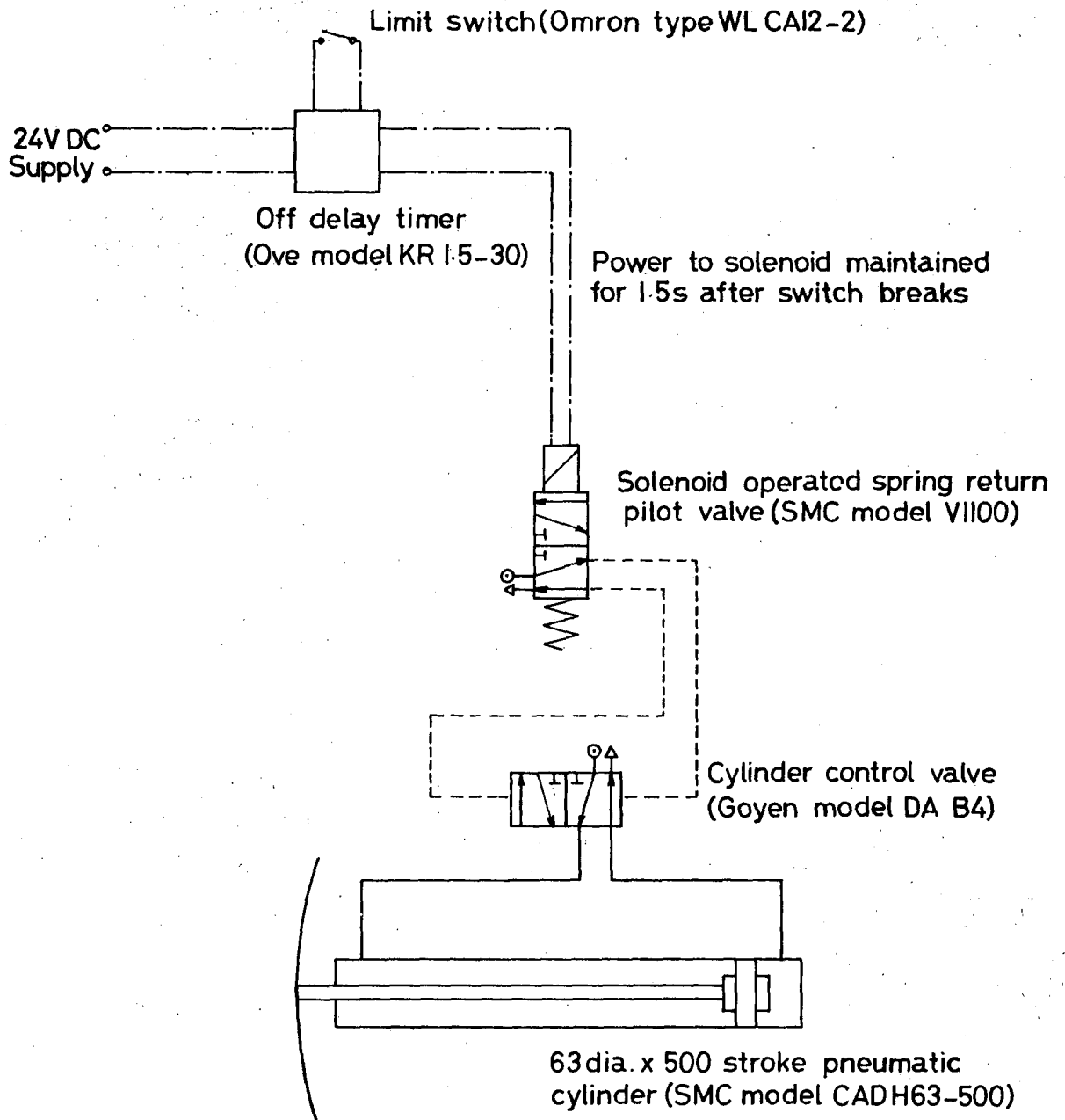
ELEVATION

PRINCIPAL OF OPERATION OF SIDE ORIENTATION DETECTION



GENERAL ARRANGEMENT OF BEEF SIDE ORIENTATION MECHANISM

FIG.2



CONTROL CIRCUIT FOR ORIENTATION MECHANISM

## RESULTS AND DISCUSSION

The orientation mechanism was installed on a beef dressing line and operated successfully during the processing of more than 500 sides. The only time a problem occurred was when a side was excessively trimmed by removal of the brisket or several ribs causing it to hang unevenly.

The cylinder size of 63 mm diameter x 500 mm stroke was found to be suitable and subsequent tests showed that a shorter stroke of 400 mm was also adequate. A cylinder of smaller diameter was not tested but it is considered a 40 mm or 50 mm cylinder would suffice. The cylinder was operated at various air pressures and it was found that 400 kPa (60 psig) provided the best combination of speed and force. Other cylinder sizes may require different pressures.

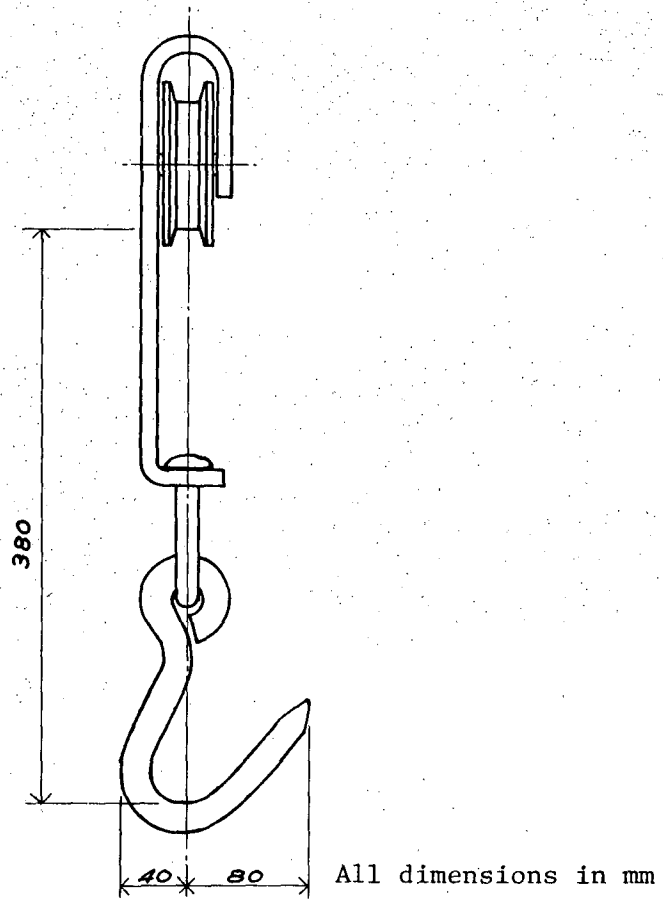
The limit switch was of the overtravel type. It operated at 30° and allowed overtravel of 60°. The switch lever was enlarged by fitting a section of 25 x 25 stainless steel angle to enable vertical variations in hook tip position to be detected.

The shape of the hooks used by the abattoir during this project is shown in Figure 4(a). The tip of this hook projects approximately 40 mm further from the centre than does the back of the hook. Other works use hooks of different profiles. Some may not be suitable for detection of the tip as the projection of the tip and the back of the hook is approximately equal. If these works wish to employ this orientation technique, a lug which contacts the limit switch could be welded to the hook as shown in Figure 4(b). The switch would then be relocated to a suitable position.

## CONCLUSIONS

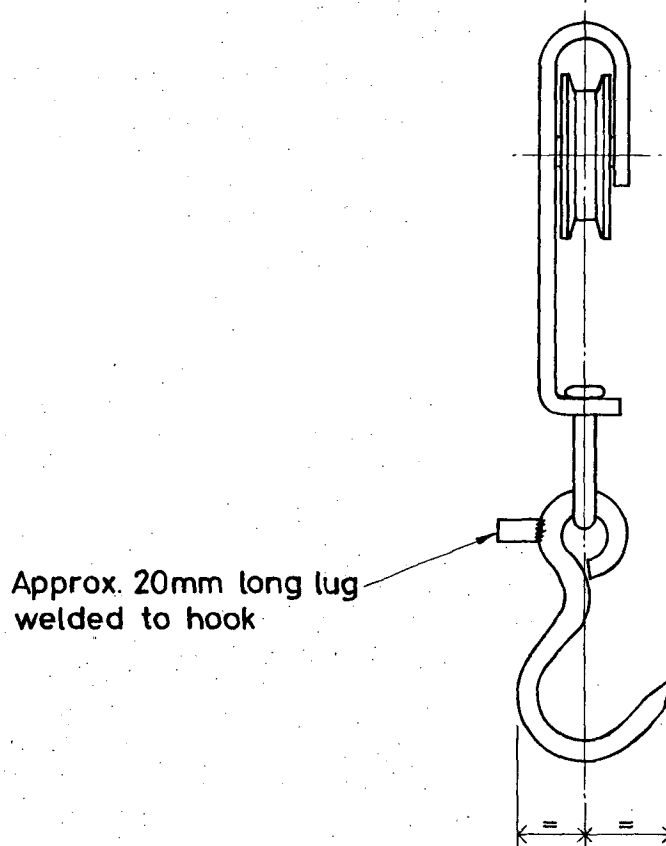
A device to automatically orient sides of beef prior to operations such as beef side electrical stimulation and automatic washing has been constructed and tested under operational conditions. The equipment could be fitted to most conveyorised slaughter lines. As there are variations in hook design some works will require a lug welded to the hook for detection by a limit switch.





BEEF ROLLER SUITABLE FOR AUTOMATIC SIDE ORIENTATION

FIG.4(A)



SUGGESTED MODIFICATION TO BEEF ROLLER NOT SUITABLE FOR AUTOMATIC SIDE ORIENTATION

FIG.4(B)