

(21) Application No 9908743.9

(22) Date of Filing 17.04.1999

(71) Applicant(s)
Ariana Developments Limited
(Incorporated in the United Kingdom)
Unit 13, Westwood Court, Westwood Business Park,
Brunel Road, TOTTON, Southampton, SO40 3WX,
United Kingdom

(72) Inventor(s)
Robert Doe
Brian Sanders

(74) Agent and/or Address for Service
Wynne-Jones, Lainé & James
22 Rodney Road, CHELTENHAM, Gloucestershire,
GL50 1JJ, United Kingdom

(51) INT CL⁷
A22C 18/00

(52) UK CL (Edition S)
B5A AT20P A1R106F A2B2 A2D2 A2H4 A2V A2X

(56) Documents Cited
GB 2268874 A **GB 2122072 A** **GB 2064419 A**
GB 2027383 A **GB 1263486 A** **AU 004790596 A**
CA 000993326 A **DE 003434135 A** **US 5713256 A**

(58) Field of Search
UK CL (Edition R) **B5A AT20P**
INT CL⁷ **A22C**
Online: **WPI EPODOC JAPIO**

(54) Abstract Title
Portioning apparatus

(57) A portioning apparatus comprises an in-feed conveyor 14 and an out-feed conveyor 16 arranged end-to-end to either side of a cutting device 18. In use, a sheet of liner material 36 is fed from a roll 38 thereof at the upstream end of the in-feed conveyor 14. Material 40 (e.g. meat) to be portioned is fed onto the liner 36 at the upstream end of the in-feed conveyor 14 and passes therealong as the supply of material passes the cutting station 18. When the required amount of material 40 has passed, the cutter 18 is operated so that the cutting edge 30 severs a portion of the required weight.

The frictional characteristics of the belt (out-feed conveyor), and the speed of movement are selected such that the belt 16 allows slippage and speed of conveyor 16 is slightly higher than that of the conveyor 14 respectively. Also, conveyor 16 rotates continuously whereas conveyor 14 is momentarily stopped or slowed each time cutting device 18 is operated.

At a deposit station, upstream of the apparatus, there may be guide surfaces for centring and shaping the material.

The drives of conveyors 14,16 are controlled by a controller 22.

A dry/wet boundary exists to facilitate washing of the apparatus.

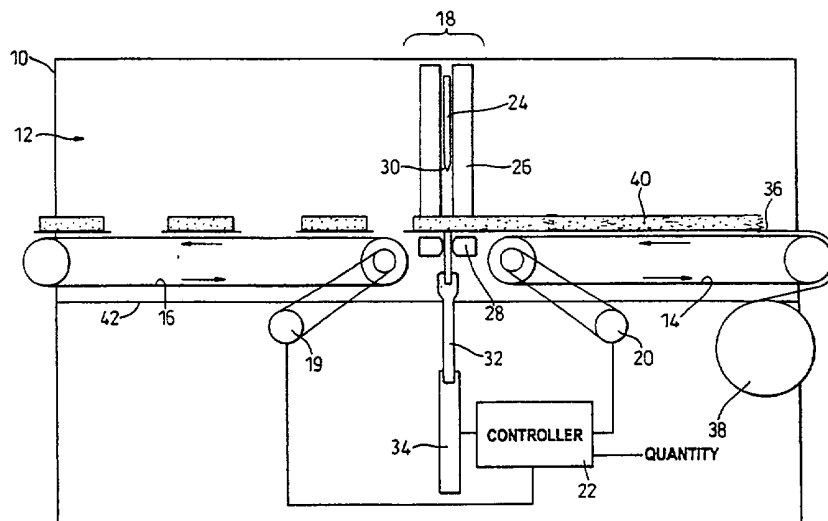


Fig. 1

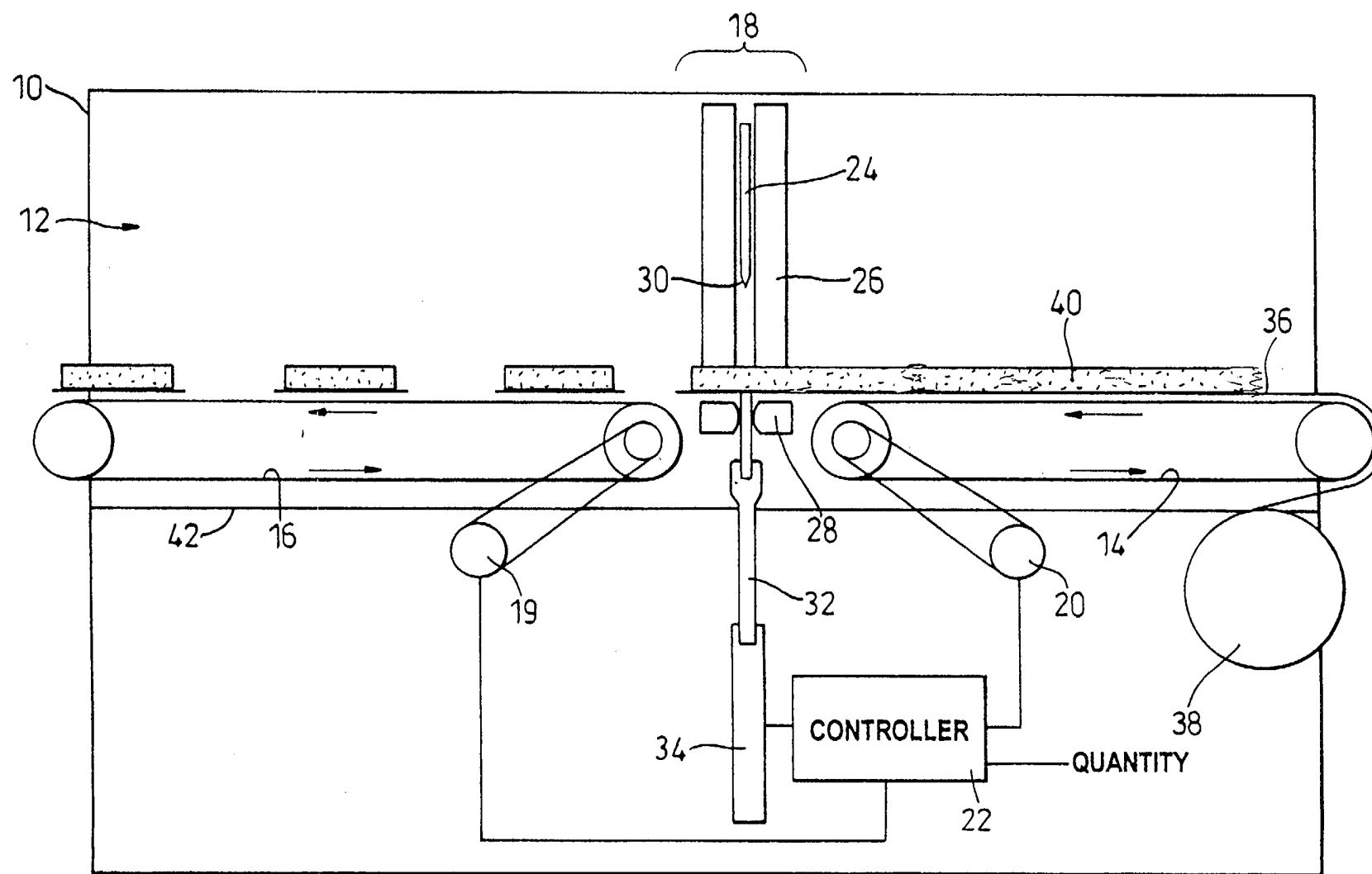


Fig. 1

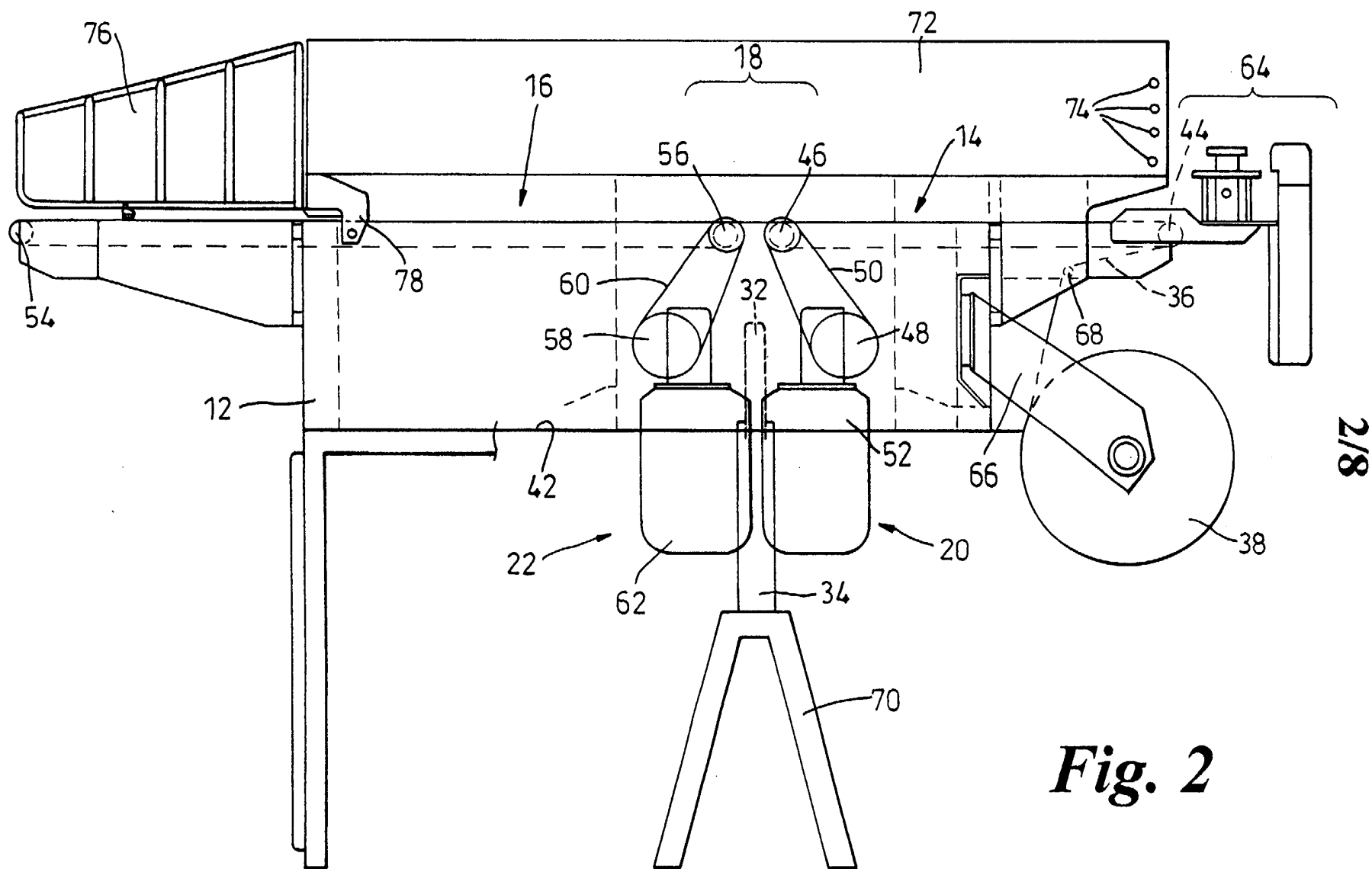


Fig. 2

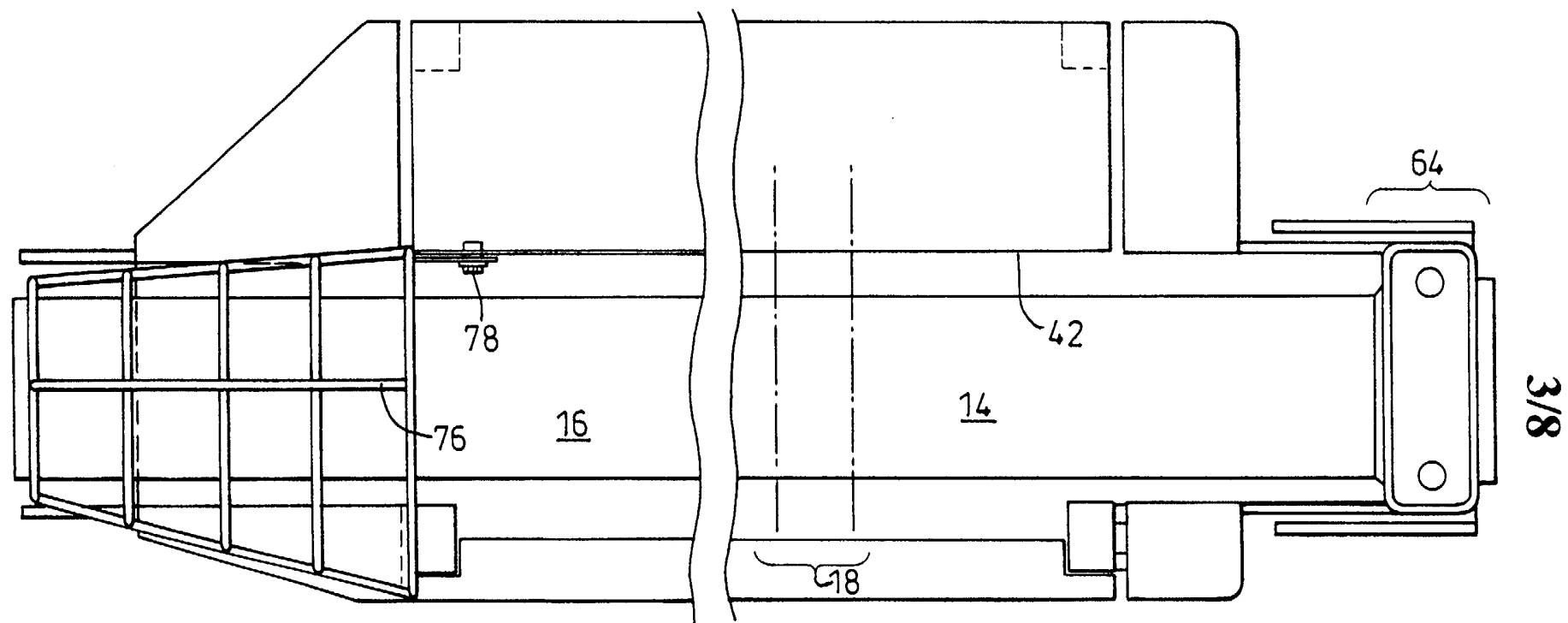


Fig. 3

4/8

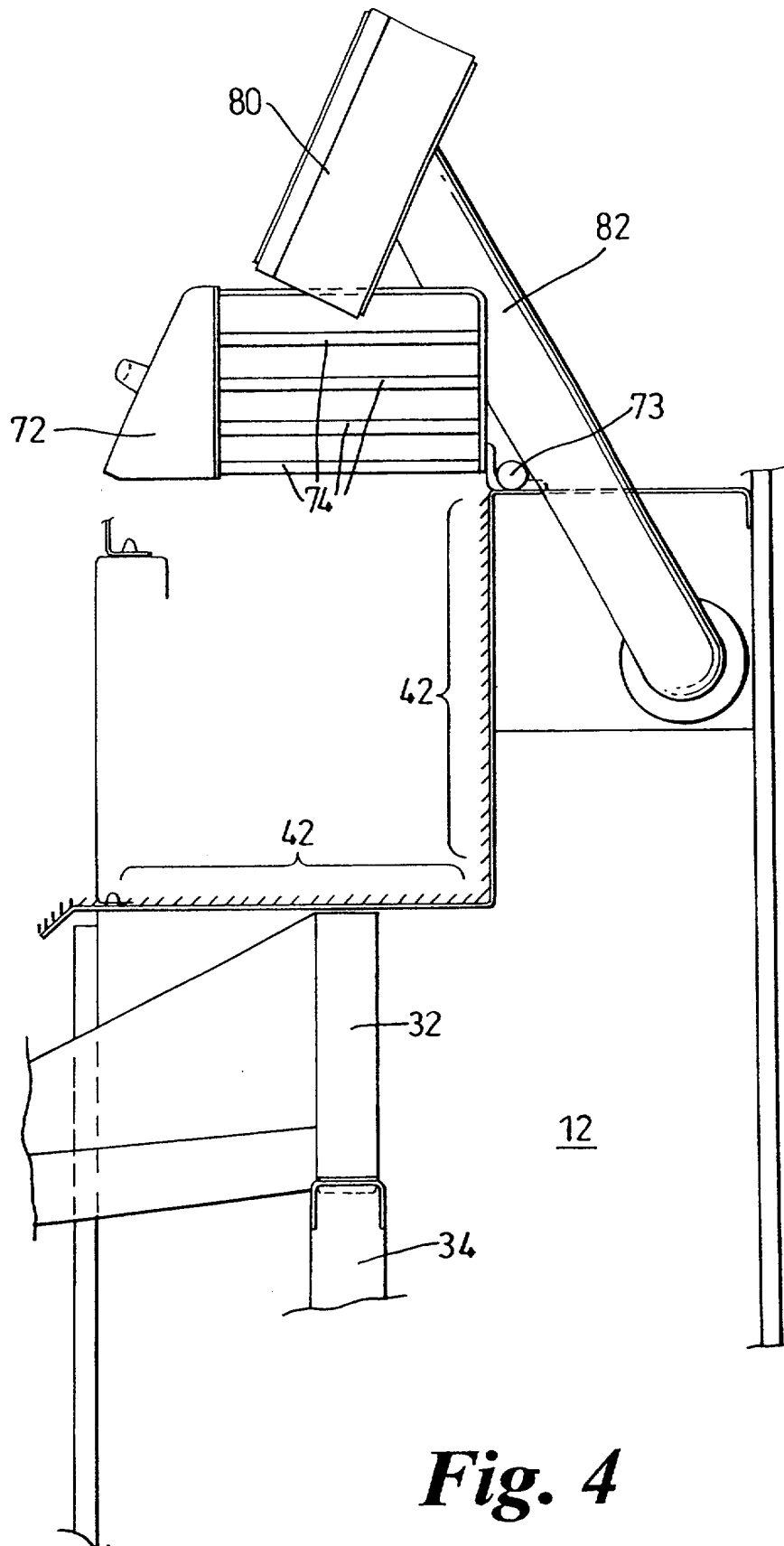
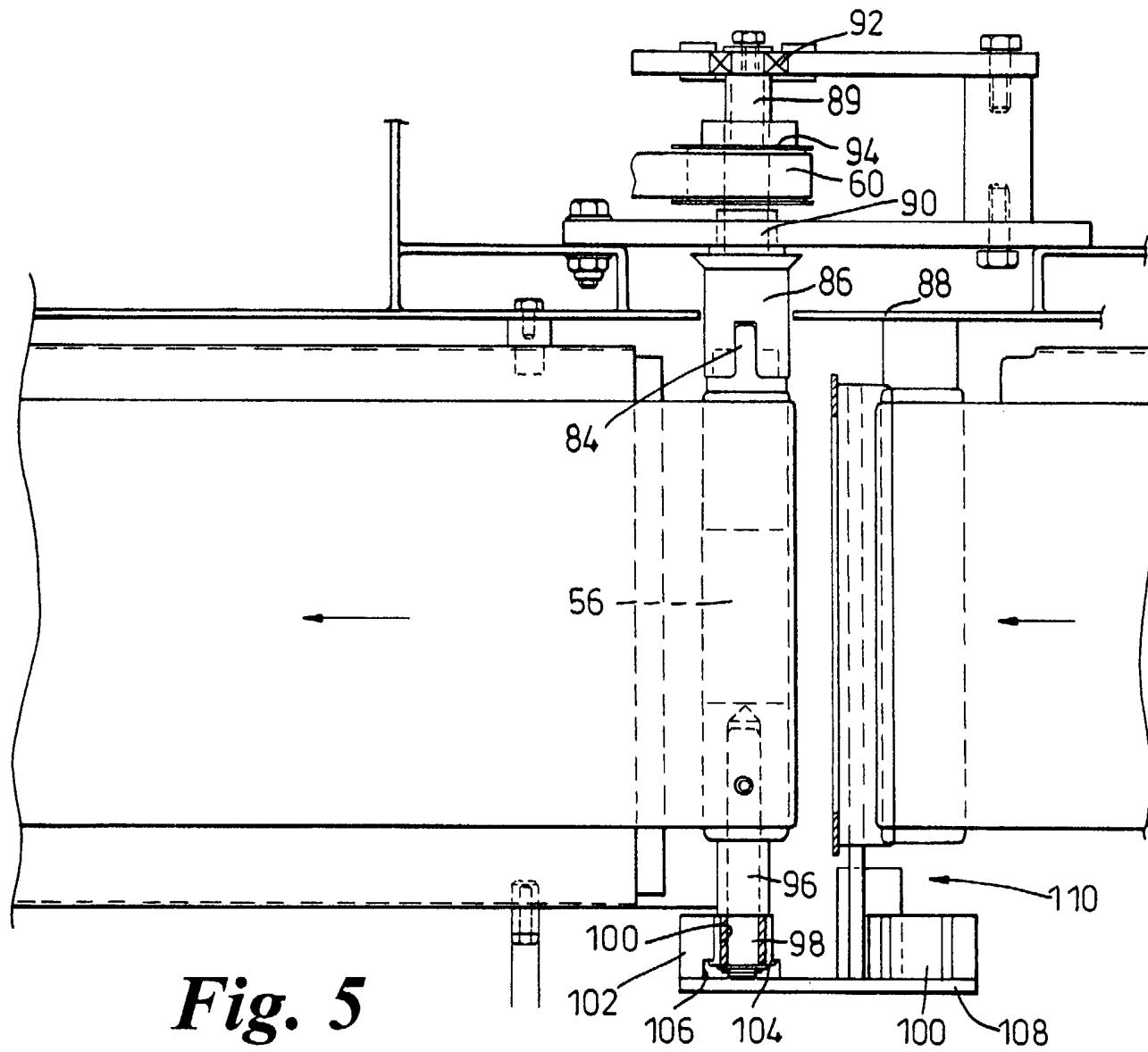


Fig. 4



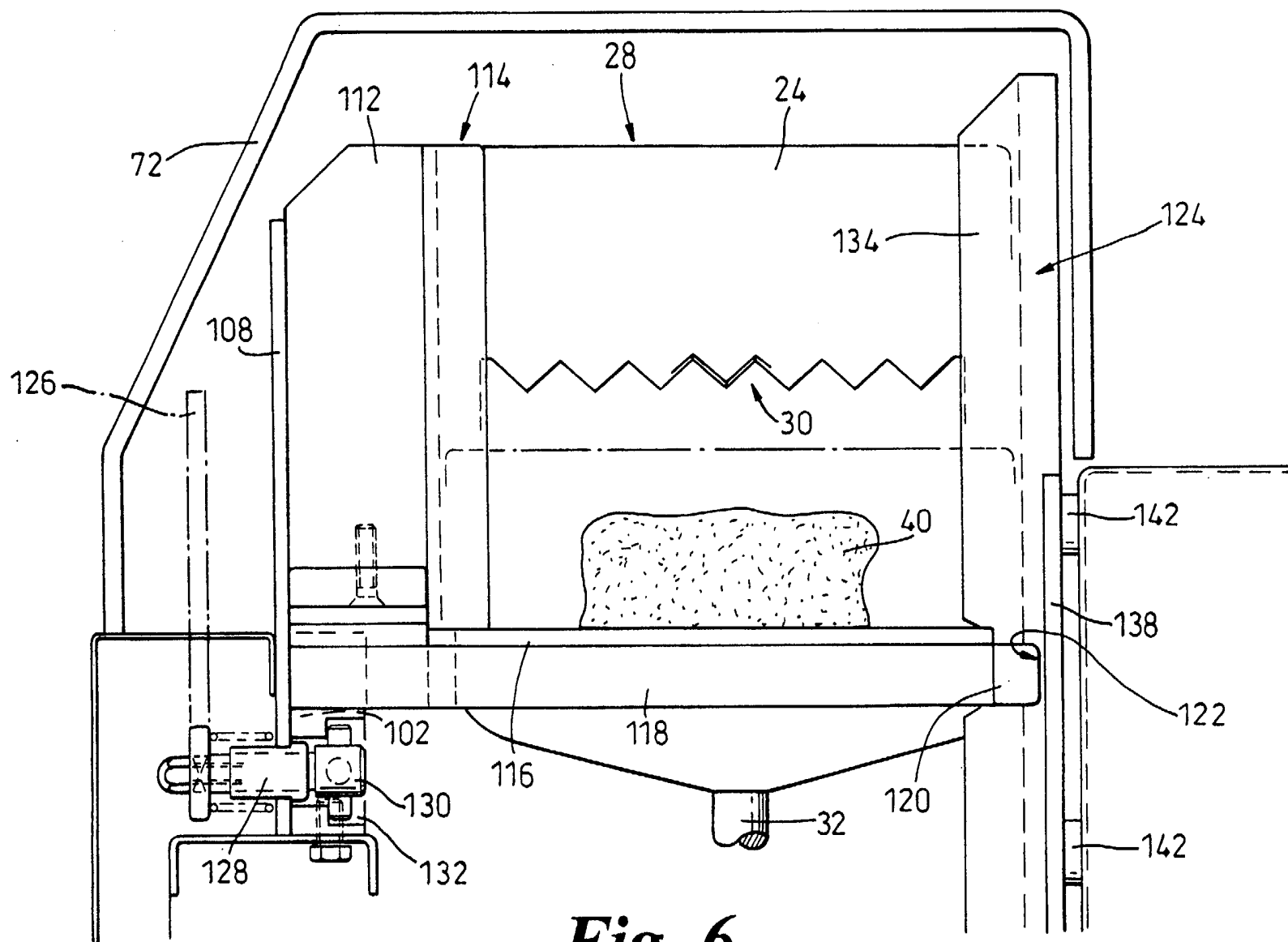


Fig. 6

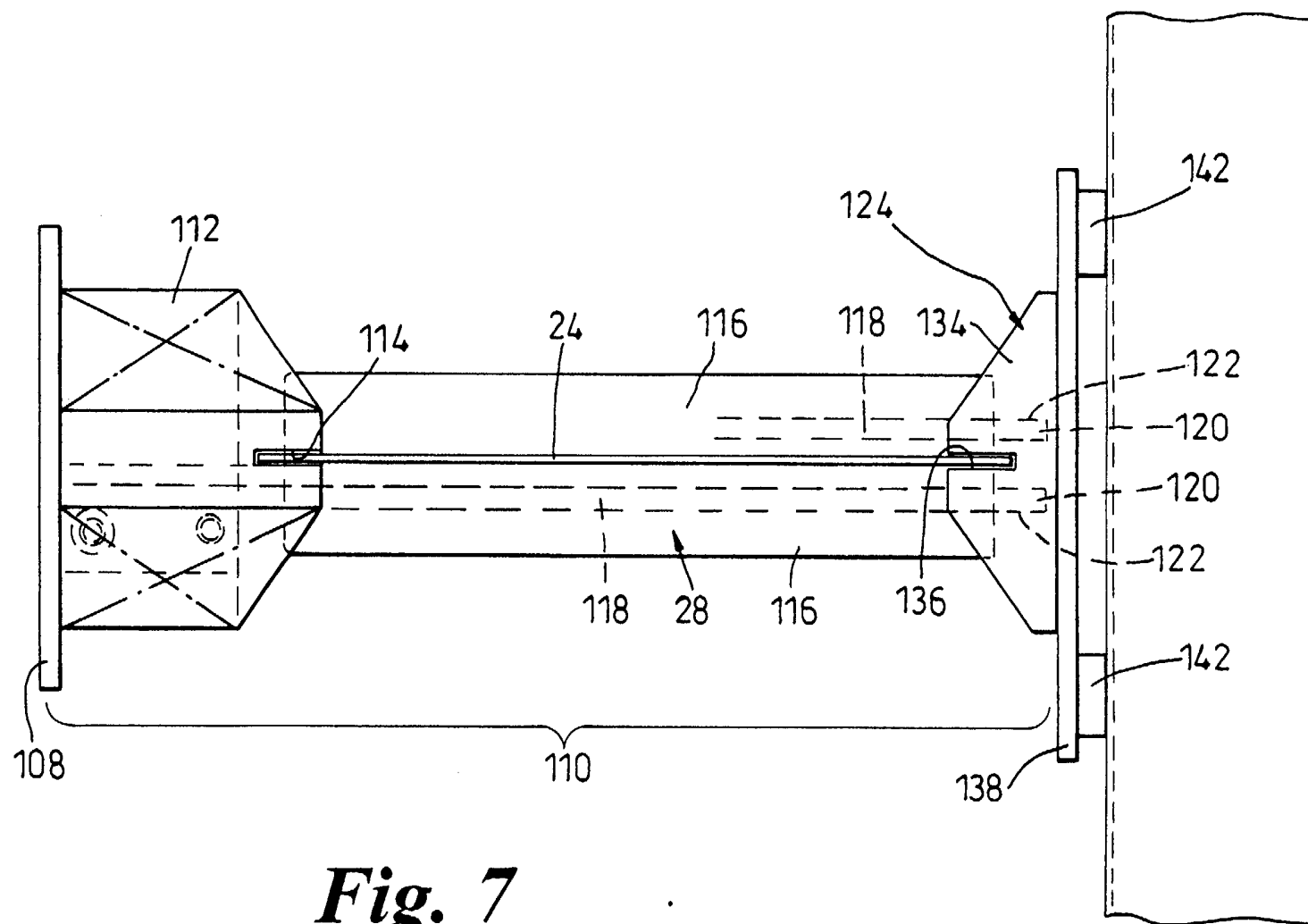


Fig. 7

8/8

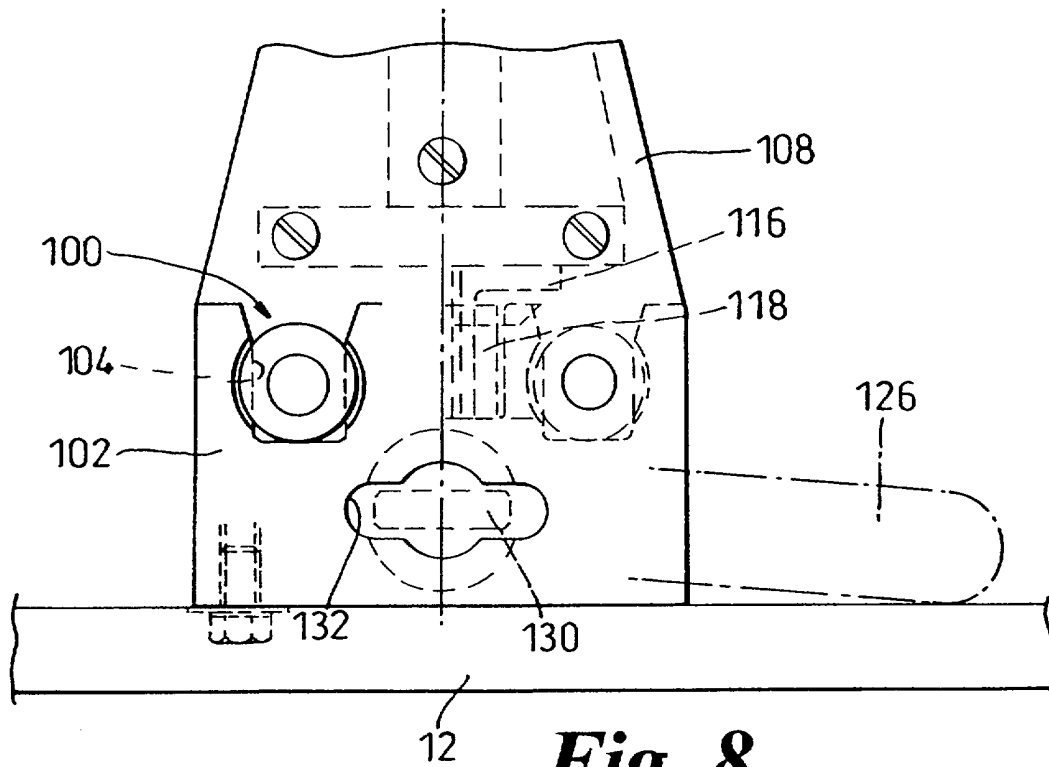


Fig. 8

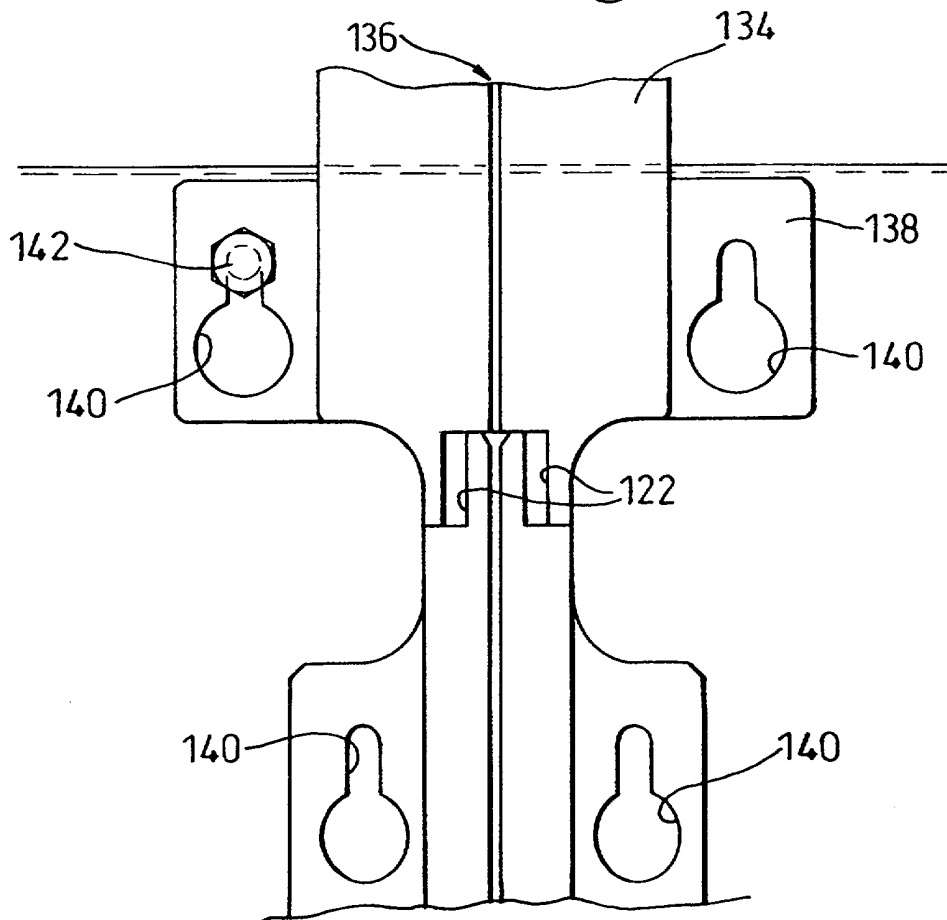


Fig. 9

Portioning Apparatus

This invention relates to portioning apparatus and in particular, but not exclusively, to portioning apparatus for the high-speed portioning of a semi-solid food product such as mince meat. The invention however extends to portioning apparatus for other solid or semi-solid materials outside the food industry.

The continuing demand for pre-weighed, pre-packed mince meat etc. in supermarkets has led to a demand for portioners capable of dividing a stream of material accurately into pre-determined portion weights at rapid speed. In addition food hygiene regulations require that food handling machinery is regularly and thoroughly cleaned.

There is therefore a need for a high-speed portioner which can provide portions of particular weight selected by the operator (within specified tolerances) and which can be stripped down for hygienic cleansing swiftly and easily.

Accordingly, in one aspect, this invention provides apparatus for dividing a stream of solid or semi solid material into portions, said apparatus comprising an infeed conveying means and an outfeed conveying means arranged end to end to define a path for conveying a stream of material through said apparatus in use, and a cutting means disposed between said conveying means and operable to sever said stream into portions.

Preferably, said infeed and outfeed conveying means each comprise respective infeed and outfeed conveyor belts.

Preferably the apparatus includes control means for interrupting the drive of said infeed conveying means when said cutting means is operating. The control means conveniently also controls operation of said cutting means and said outfeed conveying means. The control means may typically respond to a weight indicating signal from a vacuum pump which controls the density of the product, or other weighing device upstream to cut the stream of product into portions of the required weight.

10 The conveying speeds of the infeed and/or outfeed conveying means are preferably adjustable.

For a typical installation, it is preferred for the conveying speed of the outfeed conveying means to be greater than that of the infeed conveying means. Furthermore, whilst it is preferred for the infeed conveying means to slow or stop momentarily whilst the cutting means is operated, the out-feed conveying means advantageously operates substantially continuously.

It is preferred for the conveying surface of the infeed conveying means to have a relatively high co-efficient of friction and for the conveying surface of said outfeed conveying means to have a relatively low co-efficient of friction, whereby the relative slippage between the conveying means and the material upstream of said cutting station is nil or relatively low, whereas slippage downstream thereof is possible, for example while the cutting means is operating, to prevent "pulling" of the material being cut.

Preferably, said apparatus includes means for delivering to the infeed conveyor means a strip or sheet of flexible liner material or the like onto which in use said solid or semi-solid material is deposited. Said delivery
5 means preferably comprises means for supporting a roll of continuous strip or sheet material. The strip or sheet material may typically comprise a paper or paper-like material such as greaseproof paper, padding, or the like

The cutting means preferably comprises a knife or
10 cutting edge reciprocally moveable in a plane intermediate the two adjacent ends of the infeed and outfeed conveyor means. The cutting or knife edge is preferably driven by a pneumatic cylinder or the like. In a particularly preferred arrangement, the cutting/knife edge is defined by one side
15 region of an aperture in a metal plate or the like.

Preferably, said cutting means includes means for slideably locating the edges of said cutting element. Preferably, said cutting means also includes a split anvil means over which said material passes and through which said
20 cutting or knife edge may pass.

Preferably, said cutting guide means and said anvil means are removably supported within said apparatus. In one preferred arrangement, said knife guide means comprises two elongate guide means facing each other to either side of the
25 conveying path, with the anvil means extending between the guide means at or adjacent the level of the path. Preferably, the anvil means and one of said guide means form a removable item. In one embodiment, the anvil and guide

means are removably secured to a structural member of the apparatus by a quick release device such as a slot and key. Preferably said anvil and guide means prevent removal of the conveyor belts, when in position. The other knife guide is
5 preferably removably located on a structural member of the apparatus, for example by a key slot device.

Preferably, said apparatus includes a means dividing the apparatus into "wet" and "dry" areas whereby at least the major proportion of the drive elements for the conveying
10 means and the cutting means are located in the "dry" area whereas the "wet" area contains the components exposed to the stream of material, for example the conveying surfaces and the cutting means. This means that the parts of the machine which have contact with the material may be cleaned
15 thoroughly to satisfy food hygiene regulations etc. without exposing the drive means to water or cleaning fluid.

Whilst the invention has been described above, it extends to any inventive combination of the features set out above or in the following description.

20 The invention may be performed in various ways, and, by way of example only, an embodiment thereof will now be described by way of example only, reference being made to the accompanying drawings, in which:-

Figure 1 is a schematic view of a high-speed meat
25 portioner constructed in accordance with this invention;

Figure 2 is a detailed front view of a high-speed meat portioner, but with the cutting assembly removed;

Figure 3 is a top plan view of the high-speed meat

portioner of Figure 2, with the cutting assembly removed;

Figure 4 is an end view of the high-speed meat portioner of Figure 2, with the conveyors and cutting assembly removed;

5 Figure 5 is a more detailed top plan view of the cutting area of the high-speed meat portioner of Figure 2, but with the knife guides and part of the anvil removed;

Figure 6 is an end view of the cutting region of the high-speed portioner of Figure 2 with the knife guides and
10 anvil in position;

Figure 7 is a top plan view of the knife guide and anvil arrangement of the arrangements of Figures 2 to 6;

Figure 8 is a detailed view of the attachment of the anvil/outer knife guide assembly to the frame of the high-
15 speed portioner, and

Figure 9 is a detailed view of the attachment of the inner knife guide to the frame of the high-speed portioner.

Referring initially to Figure 1 the general principle of operation of the high speed meat portioner to be
20 described below in connection with Figures 2 to 9 will initially be described with reference to Figure 1. The high speed meat portioner 10 comprises a frame 12 and an infeed conveyor belt 14 and an outfeed conveyor belt 16 positioned end to end to either side of a cutting station 18. Both
25 conveyor belts 14 are made of hygienic food grade plastic belt material and the belts are driven by respective drives 18 and 20. The infeed conveyor belt has a relatively high coefficient of friction intended to prevent relative

slippage of the conveyed material whereas the outfeed conveyor belt 16 has a lower coefficient of friction, designed to allow a certain amount of slip. The conveyor drives 18 and 20 are controlled by means of a controller 22 and the infeed drive is operated generally at a constant speed but is momentarily stopped or slowed when a cutting operation takes place, whereas the outfeed conveyor operates at a generally constant speed but slightly higher than that of the infeed drive 18. Between the adjacent ends of the infeed and outfeed conveyors 14, 16 the cutting station 18 comprises a metal knife 24 mounted in spaced opposed knife guides 26 (only one of which is shown) and co operating with a split anvil 28. The knife comprises a plate with an aperture formed in it with a sharpened upper edge to define the knife edge 30. The lower portion of the knife 24 is connected to the piston 32 of a fluid operated ram 34. The fluid operated ram 34 is controlled by the controller 22.

In use, a liner sheet 36 of greaseproof paper or the like is passed from a roll 38 thereof over the entry end of the infeed conveyor 14 and a continuous supply of material 40 to be partitioned is deposited on the liner sheet 36, as the conveyors are driven. Accordingly the infeed conveyor receives a continuous stream of solid or semi-solid material on the liner 36 and this is driven towards the cutting station 18. The controller 22 also receives from a suitable sensor such as a weight sensor or a metering device a signal when the knife is to be operated. For example a sensor may measure or predict the quantity of material beyond the

cutting station and then request the controller to operate the blade to cut once a pre-set amount has passed. During the cutting operation, the drive to the infeed conveyor 14 is momentarily slowed or stopped whilst the fluid operated ram 34 is operated to drive the knife blade 24 downwardly so that the knife edge 30 severs the material 40 and the liner sheet 36 on which it is located. Throughout this operation the outfeed conveyor 16 continues to rotate at the usual speed. Because the outfeed conveyor has a lower rate of friction, the upstream end of a non-severed portion may pass onto the outfeed conveyor and the lower friction coefficient of the outfeed conveyor allows a certain amount of slippage, without pulling the material, as the knife is driven through to sever the portion.

The knife blade 24 then returns to its home position and the infeed conveyor returns to its normal speed until the next cutting operation. In addition to the particular design and control of the conveyors and the cutting blade, another important feature of the machine to be described below is that there is a clear boundary between the "wet" area which contains all the food contacting components which therefore need to be removed and hygienically cleaned at regular intervals, and the "dry" area which houses the various drives for the conveyor belts and the knife. This boundary is shown schematically at 42.

Referring now to the more detailed Figures 2 to 4, the infeed conveyor belt 14 is mounted on the frame 12 by means of parallel removable rollers 44 and 46, the latter being

connected to a drive pulley 48 by a drive belt 50. The drive pulley 48 is driven by a variable speed drive motor and gear box 52.

5 Likewise the outfeed conveyor belt 16 is supported on removable drive rolls 54 and 56, drive roll 56 being connected to an outfeed drive pulley 58 by means of a drive belt 60. The drive pulley 58 is driven by a variable speed drive motor and gear box 62.

10 At the upstream end of the portioner is a product deposit station 64 where the products to be partitioned is delivered to the upstream end of the infeed conveyor. If required, the deposit station may include guide surfaces or the like for centring and shaping the product.

15 The roll 38 of sheet material 36 is supported by a bracket 66 secured to the frame 12, and sheet material 36 from the roll passes around a guide roll 68 before meeting the conveyor belt at the upstream end and lying on the top thereof.

20 In Figure 2, the knife assembly comprising the knife blade 24, the knife guards 26 and the split anvil 28 are not shown, for clarity, but the fluid operated ram 34 is shown in the plane between the adjacent ends of the conveyors. The ram 34 is secured to the frame by means of a "A" frame cylinder mounting 70.

25 In order to provide safe operation, the section of the apparatus adjacent the cutting station, and a generous access region to either side thereof is covered by a transparent safety cover 72 which is hinged longitudinally

at 73 to the rear of the conveyor runs and, at the upstream end is provided with a series of guard bars 74 attached thereto.

There is a safety interlock arrangement (not shown) associated with the safety cover 72 to prevent operation of the machine when the cover is open.

At the outfeed end, there is an outfeed guard cage 76 which surrounds the outstream end of the conveyor and is pivotally secured to the frame 12 by a bracket 78.

The barrier between the wet and dry areas is shown at 42. It should be noted that the motor/gear box arrangements 52/62, the drive pulleys 48 and 58, the drive belts 50 and 60 and the drive region of the infeed and outfeed conveyor rolls 48 are disposed to the rear of the conveyor run, behind the wet/dry boundary.

Referring to Figure 4 a control panel 80 including controls, a display and a panic button is connected to the frame 12 by means of an L-shaped tubular arm 82.

Referring now to Figure 5, the interface between the outfeed drive roller and its drive system will now be described in detail. In this Figure, for clarity, most of the knife assembly 24 is not shown and the drive system for the driven roll 46 of the infeed conveyor is not shown in detail. However the latter essentially comprises a mirror image of that for the outfeed driven roller 56.

The driven roller 56 terminates at its rear end in a male drive portion 84 which is received in a complementary female recess in a drive quill 86 which projects through an

aperture in a wall 88 which forms part of the wet/dry boundary 42. The drive quill is mounted on a shaft 89 secured to the frame 12 by means of spaced bearing arrangements 90, 92. Between the spaced bearing arrangements is a drive pulley 94 around which the drive belt 60 passes to the driven pulley 58 and the motor/gear box arrangement 62 (neither of which are shown in Figure 5). The other, forward, end of the driven roll 56 is provided with a stub axle 96 which projects from the end of the drive roll 54 to carry a bearing shell arrangement 98. The bearing shell 98 is received in the left hand slot 100 of a datum block 102 which is secured to the frame 12. The bearing shell 98 has a circular outer flange 104 which fits within a correspondingly shaped recess 106 in the datum block 102, and the roll is locked in the block during normal use by means of the plate 108 of the anvil/outer knife guide assembly 110, as to be described below.

The drive roll for the infeed conveyor has the same structure.

Referring now to Figures 6 to 9, the anvil/outer knife guide assembly 110 comprises a plate 108, a guide block 112 made of suitable food grade resilient, low friction, plastics material. In the vertical edge of the block 112 facing the conveyor is a guide slot 114 which slideably receives the knife blade 24.

As seen more clearly in Figures 6 and 8, a split anvil 28 projects from the lower part of the anvil/knife guide assembly 110 (only the right hand half of the split anvil is

shown in Figure 8). The anvil comprises two inverted L-shaped sections 116 spaced by just a bit more than the width of the knife blade 24 and secured to a metal reinforcing member 118. The ends 120 of the reinforcing members in use
5 locate in respective recesses 122 in the rear knife guide assembly 124.

The assembly 110 comprising the split anvil and the outer knife guide is secured to the datum block 102 by means of a key arrangement comprising a lever 126, a shaft 128 and
10 a key member 130. The datum block has a key aperture 132 formed therein through which the key member may pass and the arrangement locked thereafter by turning the lever to turn the key member through approximately 90°. As indicated above, when the guide/anvil assembly is secured in
15 position, the plate 108 retains the driven rolls of the infeed and outfeed conveyors.

Referring now to Figure 9, the rear knife guide assembly 124 comprises a guide block 134 of food grade low friction plastics material having a slot 136 therein for
20 receiving the other edge of the blade 24. The guide block 134 is secured to a mounting plate 128 which has four keyhole slots 140 therein which allow the guide to be attached to the frame by offering the slots up to four suitably shaped pegs 142 secured to the frame, and then
25 sliding the arrangement downwardly so that the pegs are located in the stem of the key slots. As noted previously, the inner guide assembly includes recesses 122 for receiving the free ends of the anvil reinforcing members.

As indicated previously, the machine has a clear dry/wet boundary designed to facilitate regular washing down of the machine. To do this, the outer knife guide/anvil assembly is first removed by assembly 110 rotating the lever 5 126 and withdrawing the anvil/outer knife guide. This action exposes the outer ends of the driven rollers of the conveyors so that these may now be released by pulling outwardly and then lifting to disengage the inner end from the drive quill 86. The non-driven rollers of the conveyor 10 are also releasable so that the belts can be removed completely from the machine. If required, the inner guide assembly can then be removed by lifting it so that the pegs 142 enter the circular portion of the keyhole slot 140 and then pulling forwardly. The knife blade 24 may also be 15 disconnected from the piston rod 32 of the fluid operated ram 34. These operations will leave the machine in a stripped down state which allow it to be washed down easily with little or no dirt traps.

Claims

1. Apparatus for dividing a supply of solid or semi-solid material into portions, said apparatus comprising an in-feed conveying means and an out-feed conveying means arranged end
5 to end to define a path for conveying a supply of material through said apparatus in use, and a cutting means disposed between said conveying means and operable to sever said supply into portions of material.
2. Apparatus according to Claim 1, wherein said in-feed
10 and out-feed conveyor means each comprise respective in-feed and out-feed conveyor belts.
3. Apparatus according to Claim 1 or Claim 2, wherein the apparatus includes control means for interrupting the drive of said in-feed conveying means to slow or stop linear
15 movement thereof when said cutting means is operating.
4. Apparatus according to Claim 4, wherein said control means also controls operation of said cutting means and said out-feed conveying means.
5. Apparatus according to Claim 3 or Claim 4, wherein said
20 control means responds to a weight indicating signal from an upstream monitoring device to cut the stream of product into portions of the required weight.
6. Apparatus according to Claim 5, wherein said upstream monitoring device is a weighing device.
- 25 7. Apparatus according to Claim 5, wherein said upstream monitoring device monitors the density of the material and said control means determines the weight of a portion based on said density.

8. Apparatus according to any of the preceding Claims, wherein the conveying speed of at least one of the in-feed and out-feed conveying means is adjustable.

9. Apparatus according to any of Claims 3 to 8, wherein
5 said control means is operable to control the conveying speed of the out-feed conveying means to be greater than that of the in-feed conveying means.

10. Apparatus according to any of Claims 3 to 9, wherein
10 said control means is operable to maintain the out-feed conveying means operating substantially continuously during the period that the in-feed conveying means is slowed or stopped as the cutting means is operated.

11. Apparatus according to any of the preceding Claims,
15 wherein the conveying surface of the in-feed conveying means has a relatively high coefficient of friction and the conveying surface of said out-feed conveying means has a relatively low coefficient of friction, whereby the relative slippage between the conveying means and the material upstream of said cutting station is nil or relatively low,
20 whereas slippage downstream thereof is possible.

12. Apparatus according to any of the preceding Claims,
which further includes means for delivering to the in-feed conveyor means a strip or sheet of flexible liner material or the like onto which in use said solid or semi-solid
25 material is deposited.

13. Apparatus according to Claim 12, wherein said delivery means comprises means for supporting a roll of continuous strip or sheet material.

14. Apparatus according to any of the preceding Claims, wherein said cutting means comprises a cutting edge reciprocally moveable in a plane intermediate the two adjacent ends of the in-feed and out-feed conveyor means.

5 15. Apparatus according to Claim 14, wherein the cutting edge is driven by a pneumatic cylinder.

16. Apparatus according to Claim 14 or Claim 15, wherein the cutting edge is defined by one side region of an aperture in a metal plate.

10 17. Apparatus according to any of Claims 14 to 16, wherein said cutting means includes means for slideably locating the edges of a cutting element.

18. Apparatus according to any of Claims 14 to 17, wherein said cutting means includes a split anvil means over which
15 said material passes and through which said cutting edge may pass.

19. Apparatus according to Claim 18, wherein said cutting guide means and said anvil means are removably supported within said apparatus.

20 20. Apparatus according to Claim 19, wherein said cutting guide means comprises two elongate guide means facing each other to either side of the conveying path with the anvil means extending between the guide means at or adjacent the level of the path.

25 21. Apparatus according to Claim 20, wherein the anvil means and one of said guide means form a removable item.

22. Apparatus according to Claim 21, wherein the anvil means and said one guide means are removably secured to a

structural member of the apparatus by a quick release device.

23. Apparatus according to Claim 22, wherein said quick release device comprises a co-operating slot and key arrangement.

24. Apparatus according to any of Claims 21 to 23, wherein said anvil and guide means prevent removal of the conveyor belts, when in the operative position.

25. Apparatus according to any of Claims 21 to 24, wherein the other guide means is removably located on a structural member of the apparatus.

26. Apparatus according to Claim 25, wherein said guide means is secured to the structural member by means of a co-operating slot and key arrangement.

27. Apparatus according to any of the preceding Claims, including means dividing the apparatus into "wet" and "dry" areas whereby at least the major proportion of the drive elements for the conveying means and the cutting means are located in the "dry" area whereas the "wet" area contains the components exposed to the stream of material.

28. Apparatus substantially as hereinbefore described, with reference to, and as illustrated in, any of the accompanying drawings.



Application No: GB 9908743.9
Claims searched: 1-28 (selectively)

Examiner: Monty Siddique
Date of search: 24 November 2000

Patents Act 1977 Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.R): B5A (AT20P)

Int Cl (Ed.7): A22C

Other: Online: WPI EPODOC JAPIO

Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
X, Y	GB 2268874 A (DALGETY) page 6 lines 1-13 etc	X:1 at least Y:6
X, Y	GB 2122072 A (NORRIS) entire document	X:1 at least Y:6
X, Y	GB 2064419 A (VEB...) in-feed and out-feed conveyors and cutting device	X:1 at least Y:6
X, Y	GB 2027383 A (HANS LINGL ANLAGENBAU) drawing etc, feed and discharge conveyors and cutter	X:1 at least Y:6
X, Y	GB 1263486 (SMIDTH) figure 1 etc, conveyors 1 and 23 and cutter 13	X:1 at least Y:6
X, Y	DE 3434135 A (HOLZ) see abstract	X:1 at least Y:6
Y	AU 4790596 A (MEAT IND...) see abstract	6 at least

X Document indicating lack of novelty or inventive step
Y Document indicating lack of inventive step if combined with one or more other documents of same category.
& Member of the same patent family

A Document indicating technological background and/or state of the art.
P Document published on or after the declared priority date but before the filing date of this invention.
E Patent document published on or after, but with priority date earlier than, the filing date of this application.



INVESTOR IN PEOPLE

Application No: GB 9908743.9
Claims searched: 1-28 (selectively)

Examiner: Monty Siddique
Date of search: 24 November 2000

Category	Identity of document and relevant passage	Relevant to claims
X	US 5713256 (THE LANGSTON) drawing etc.	X:1 at least y: 6
X	CA 993326 A (MELTZER see abstract	X: 1 at least Y: 6

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
		E	Patent document published on or after, but with priority date earlier than, the filing date of this application.
&	Member of the same patent family		