Sept. 24, 1957 J. D. BROWN 2,807,055

MEAT TENDERIZING MACHINE

Original Filed Oct. 2, 1946 7 Sheets-Sheet 1

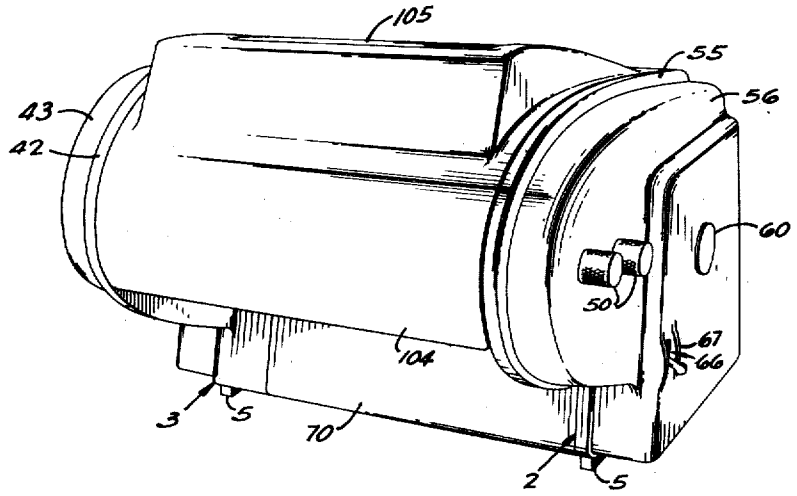


Fig. I

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MEAT TENDERIZING MACHINE

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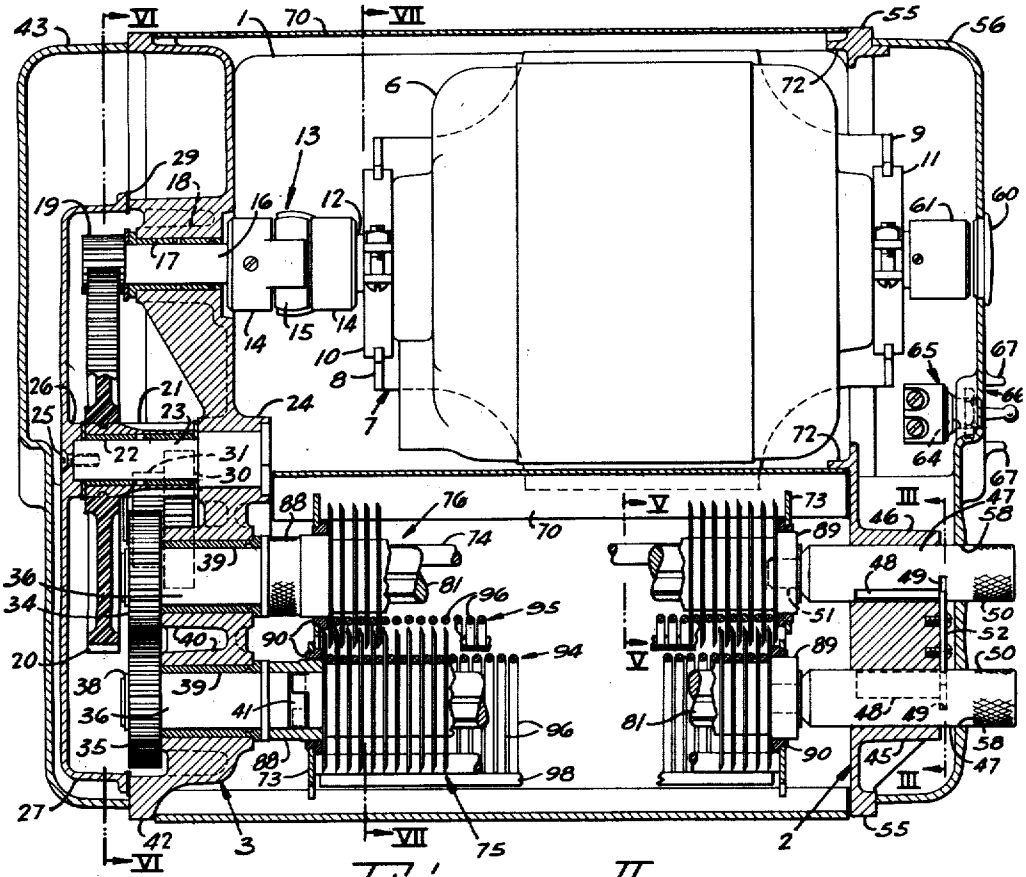


Fig. II

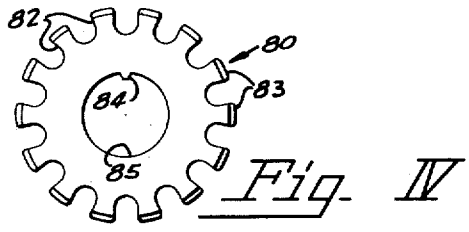


Fig. IV

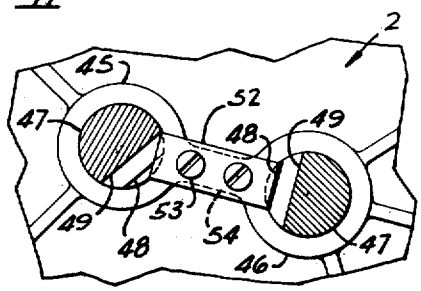


Fig. III

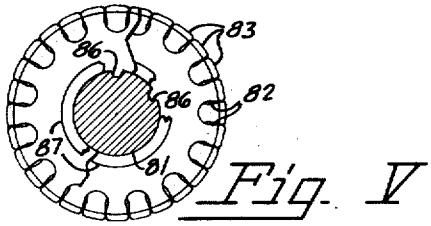


Fig. V

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MEAT TENDERIZING MACHINE

Original Filed Oct. 2, 1946 7 Sheets-Sheet 3

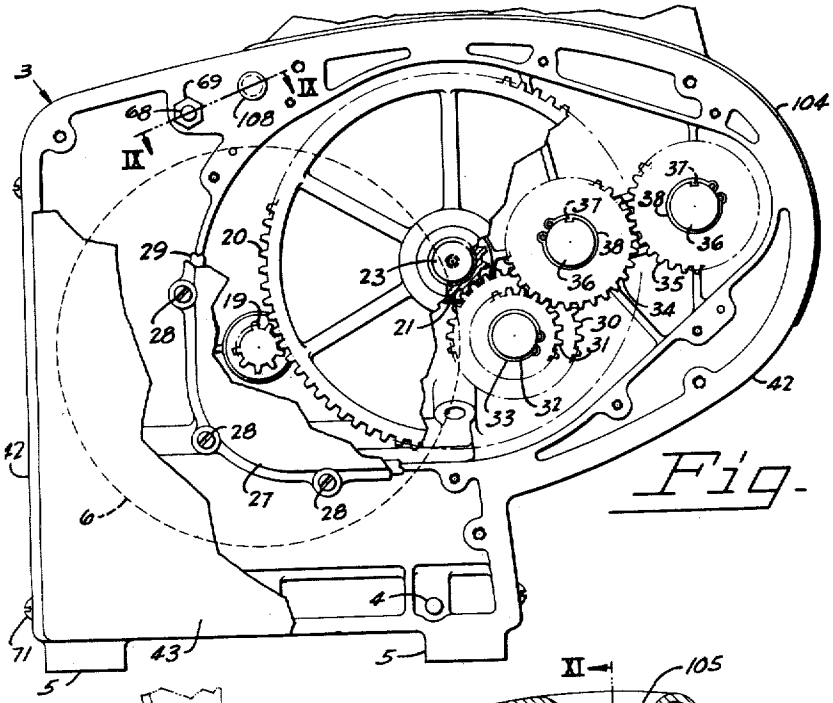


Fig. VI

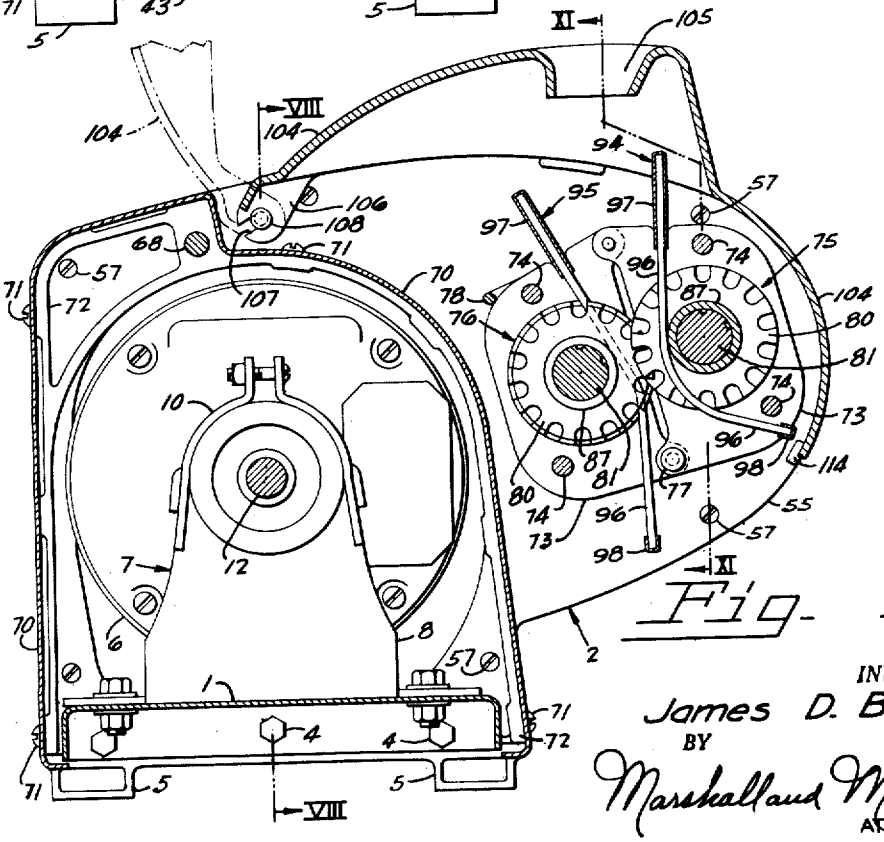


Fig. VII

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MEAT TENDERIZING MACHINE

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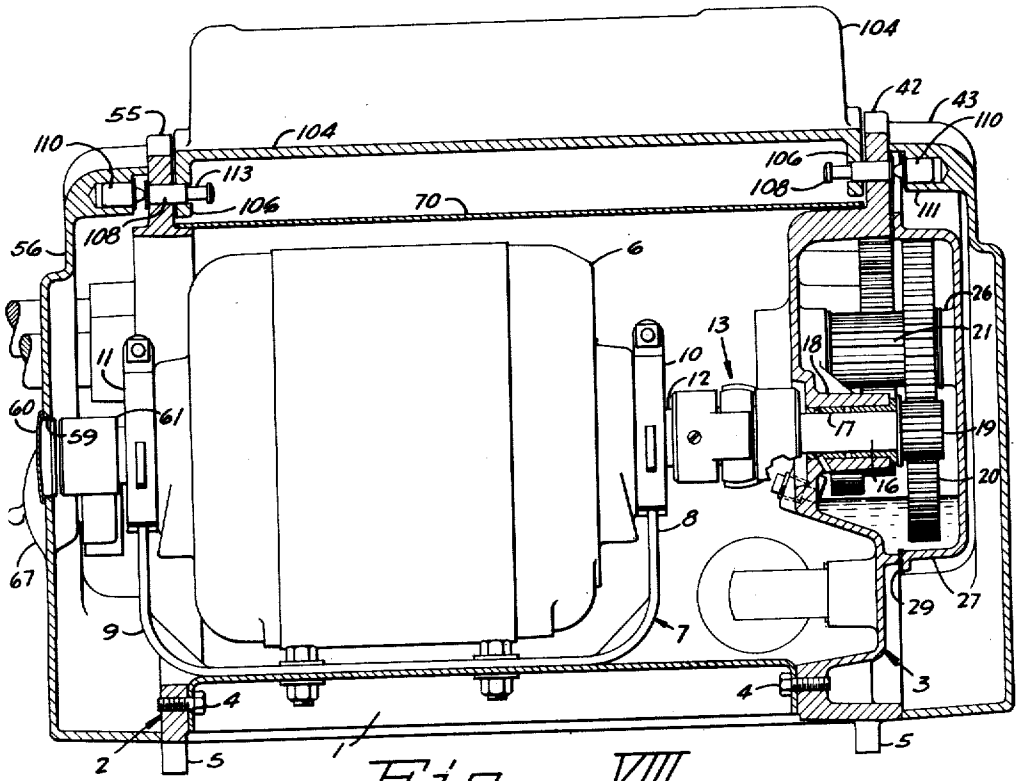


Fig. VIII

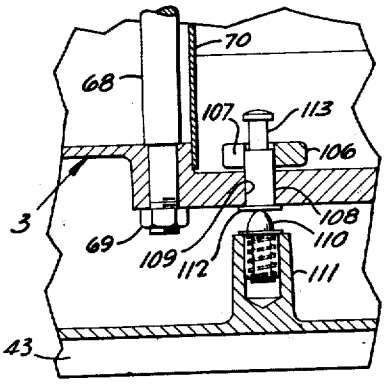


Fig. IX

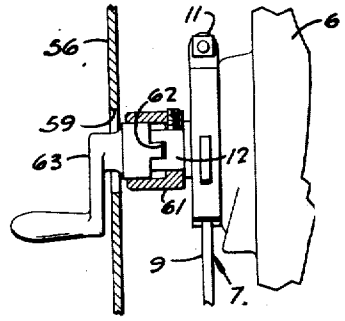


Fig. X

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MEAT TENDERIZING MACHINE

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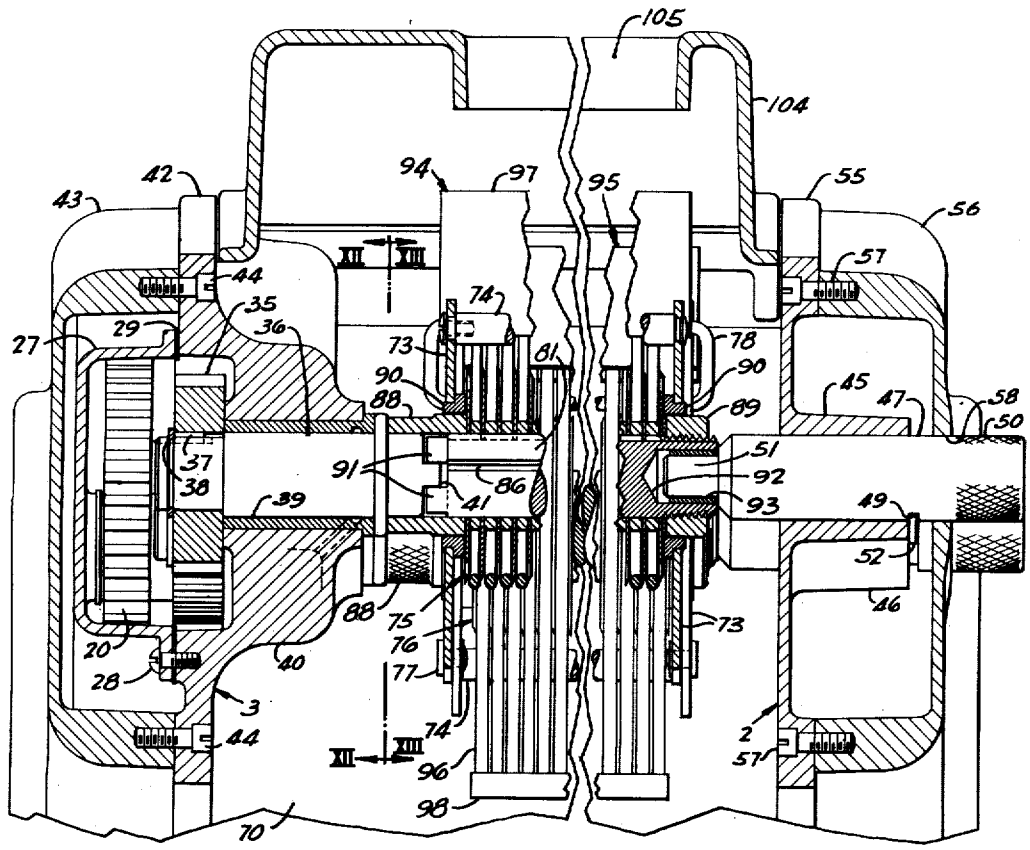


Fig. XI

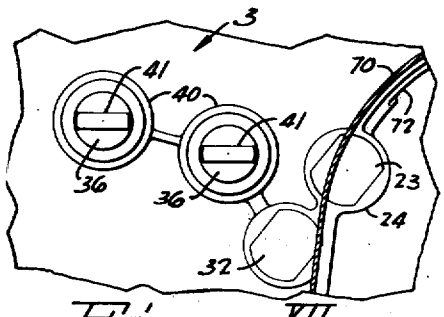


Fig. XII

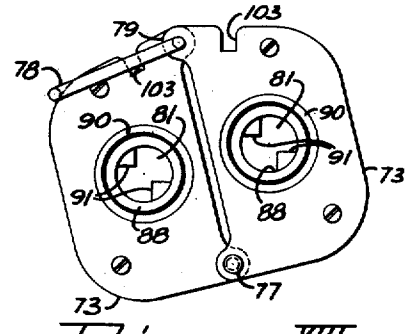


Fig. XIII

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MEAT TENDERIZING MACHINE

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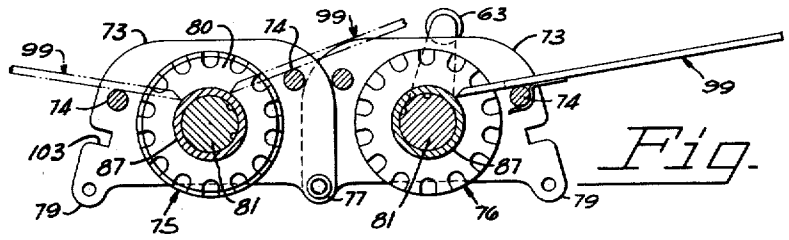


Fig. XV

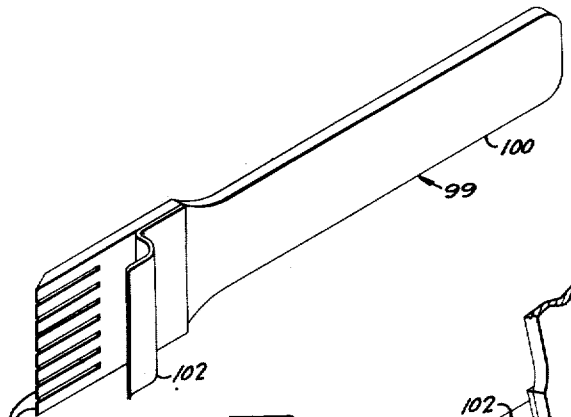


Fig. XVI

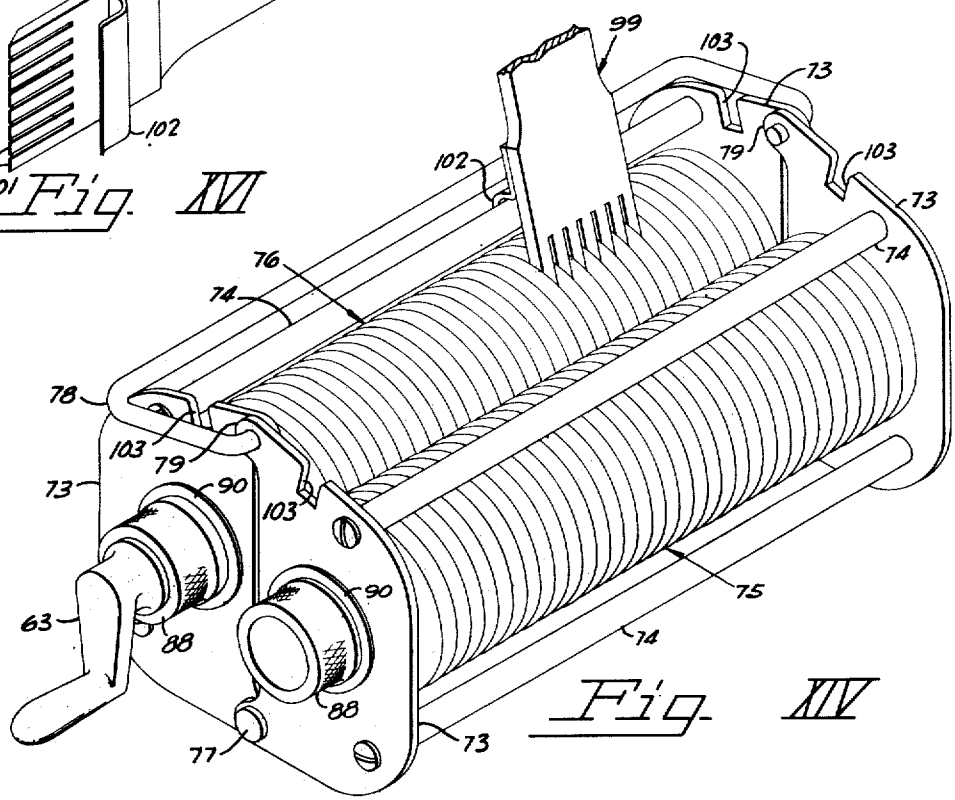


Fig. XIV

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MEAT TENDERIZING MACHINE

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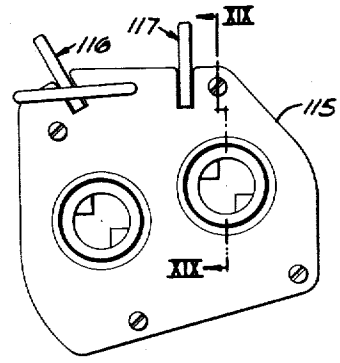


Fig. XVII

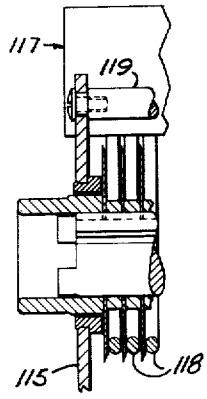


Fig. XIX

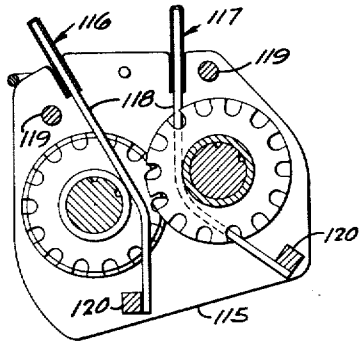


Fig. XVIII

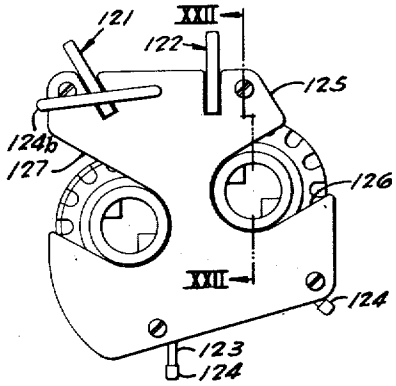


Fig. XX

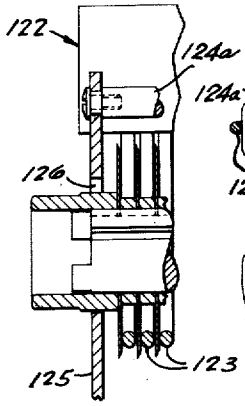


Fig. XXII

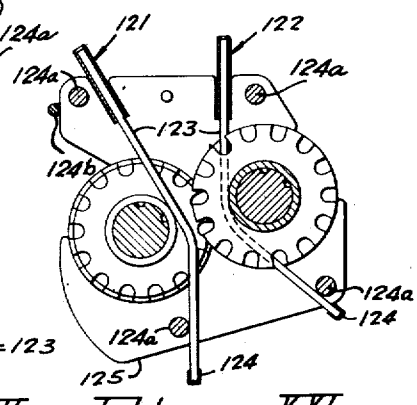


Fig. XXI

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United States Patent Office 2,807,055 Patented Sept. 24, 1957

2,807,055

MEAT TENDERIZING MACHINE

James D. Brown, Toledo, Ohio, assignor to Toledo Scale Company, Toledo, Ohio, a corporation of New Jersey

Continuation of application Serial No. 700,813, October 2, 1946. This application July 25, 1952, Serial No. 300,910

12 Claims. (Cl. 17—26)

This invention relates to meat tenderizing machines of the type employed for tenderizing boneless steaks and for knitting small pieces of boneless meat together to form larger steaks.

This is a continuation of application Serial No. 700,813, filed October 2, 1946.

The principal problem in the construction of machines of this general type has to do with the necessity for maintaining a high degree of cleanliness not only of the machine and its component parts but also of the finished meat product. Experimentation has shown that the most effective method of tenderizing a piece of meat is to subject it to a multiplicity of short cuts. These short cuts sever the fibrous portions of the meat, for example tendons, muscle sheaths, cell connections and so forth and, therefore, the resulting steak is comparable in palatability to a much higher quality of meat.

It has been found that the best method of delivering the multiplicity of short cuts to the meat consists in running the meat between a pair of meat tenderizing rolls each of which comprises a plurality of serrated edge disk-shaped cutting knives. Two such rolls are most frequently employed with their knives staggered and intermeshed so that when the meat passes between them it is subjected to an extremely high number of short cuts on both sides. The nature of this action usually results in ripping or tearing the meat sufficiently to withdraw portions of the tough stringy fibrous connecting tissues from the meat. The fibrous connecting tissue has a tendency to wrap tightly around the rolls on which the cutting knives are mounted and in some instances has the tendency to be thrown away from the rolls onto surrounding portions of the machine housing.

Because it is necessary to remove the debris which gathers around the knives and their mounting structure, the tenderizing rolls should preferably be removable from the machine so that they can be cleaned and sterilized. The toothed peripheries of these knives are, of course, extremely sharp so that they can easily penetrate the surfaces of the meat. Consequently, the handling of the knife rolls can be a dangerous operation if the operator's hands must come in contact with the knife edges. In the instant invention, means are provided whereby the rolls may be removed from the machine for cleaning without having the sharp knife edges come in contact with the operator's hand.

Some form of guide means should also be provided to guide the meat between the rolls and prevent it from wrapping around the rolls. Such guide means usually are formed as combs which have their teeth extending between adjacent ones of the disk-shaped knives starting above the junction of the knives and carrying through and beyond the intermeshed portion of the knives so that the meat which has passed between the knives is peeled away from the knives by the guides and thereby released so that it can be grasped by the operator.

Because of the extreme elasticity and toughness of the sinuous fibers forming the connecting tissues in some meats, it often happens that a sinew will be caught on one of the teeth of a tenderizing knife and will gradually be withdrawn from the meat as the meat progresses between the rolls. At the time the meat leaves the rolls and the guide means, the sinew snags and pulls the meat around the end of the guide means and back into contact with one of the tenderizing rolls. This occurrence has frequently been observed especially where less desirable pieces of meat are being tenderized or blended. The degree to which sinews and tendons are withdrawn from the meat depends to a large extent upon the relative angle between the teeth of the knives and the guide means which pass between them.

Because the knives on the tenderizing rolls are staggered and intermeshed the structure is extremely difficult to assemble in prior art machines. Each of the knife rolls must be held in one hand while it is placed in the machine and often must be juggled to fit it properly in the machine.

It is an object of this invention to provide a meat tenderizing machine having a meat tenderizing device which is removable as a unit from the machine.

Another object of this invention is to provide a unitary structure which will not interfere with the operation of the tenderizing machine, i. e. the rotation under power of the tenderizing rolls and the passage of the meat therebetween, but which will enable the tenderizing rolls and the guides to be removed from the machine as a unit without any danger to the operator.

It is a further object of this invention to provide a carrying frame which supports and carries the tenderizing rolls when they are removed from the machine as a unit and yet which does not interfere in any way with the operation of the machine when the tenderizing rolls are in their operative position on the machine.

It is still another object of this invention to provide a unitary carrying frame which will surround the tenderizing rolls when in their operative position and prevent meat from escaping lengthwise from between the tenderizing knives where it might become entangled in the tenderizing roll drive shafts and be mangled or made otherwise unfit for sale.

It is a still further object of this invention to provide guide means for tenderizing machine having intermeshed knife rolls which prevents pieces of meat from being drawn around the ends of the guides and back into the tenderizing rolls.

Still another object of this invention is to provide a tenderizing unit so designed as to permit quick and easy removal of guide means extending between adjacent knives of each of two tenderizing rolls mounted in the unit even when such guide means comprise guide wires rigidly fixed in cross members at both ends.

More specific objects and advantages are apparent from the following description in which reference is made to the accompanying drawings.

In the drawings:

Figure I is a front perspective view of a tenderizing machine embodying the invention.

Figure II is a horizontal sectional view on an enlarged scale taken substantially on the center line of the meat tenderizing rolls.

Figure III is a fragmentary vertical sectional view on an enlarged scale taken substantially on the line III—III of Figure II.

Figure IV is a detail view in elevation of one of the knife blades used in the machine embodying the invention.

Figure V is a fragmentary detail vertical sectional view taken substantially on the line V—V of Figure II.

Figure VI is a vertical sectional view taken substantially on the line VI—VI of Figure II.

Figure VII is a vertical sectional view taken substantially on the line VII—VII of Figure II.

Figure VIII is a vertical sectional view taken substantially on the line VIII—VIII of Figure VII.

Figure IX is a fragmentary detail sectional view on a still further enlarged scale taken substantially on the line IX—IX of Figure VI.

Figure X is a fragmentary view on an enlarged scale of a portion of the mechanism shown in Figure VIII and illustrating a means for manually driving the machine.

Figure XI is a vertical sectional view taken substantially on the line XI—XI of Figure VII.

Figure XII is a fragmentary vertical sectional view taken substantially from the position indicated by the line XII—XII of Figure XI.

Figure XIII is a detail view in elevation of one end of the meat tenderizing unit and carrying frame and taken substantially from the position indicated by the line XIII—XIII of Figure XI.

Figure XIV is a greatly enlarged isometric view of the meat tenderizing unit and carrying frame with the guide members removed and showing a cleaning device in use.

Figure XV is a vertical sectional view on a smaller scale of the meat tenderizing unit shown in Figure XIV with its hinged carrying frame opened to permit easy access to the tenderizing rolls for cleaning purposes.

Figure XVI is an isometric view of the cleaning device shown in use in Figure XIV and XV.

Figure XVII is an end elevation of a modified form of meat tenderizing unit and carrying frame.

Figure XVIII is a transverse vertical sectional view of the unit shown in Figure XVII.

Figure XIX is a fragmentary vertical sectional view taken substantially on the line XIX—XIX of Figure XVII.

Figure XX is a view of another modification of the tenderizing unit and carrying frame.

Figure XXI is a cross-sectional view of the mechanism shown in Figure XX.

Figure XXII is a fragmentary vertical sectional view taken substantially on the line XXII—XXII of Figure XX.

The present embodiment of the invention which is illustrated in the drawings is a structure comprised of several component parts secured together and erected around a formed motor base 1 (Figure II and VII) which extends horizontally between a pair of upright end frames 2 and 3 which are secured at their lower ends to the end flanges of the motor base 1 by a plurality of bolts 4 (Figure VII). A set of feet 5, on which the machine is supported, are cast as integral parts of the end frames 2 and 3. A motor 6 (see also Figure VIII) is mounted in a substantially U-shaped frame 7 which is bolted to the motor base 1 and has two upstanding arms 8 and 9, the upper ends of which cooperate with rubber-lined clamps 10 and 11 that are tightened around cylindrical bosses formed at the ends of the motor 6.

A shaft 12 of the motor 6 extends longitudinally from the motor and carries on its end extending toward the end frame 3 a universal connection 13 (Figures II and VIII) which consists of a pair of oppositely directed spiders 14, the arms of which closely embrace a resilient webbed member 15 to transmit power. One of the spiders 14 is secured on the motor shaft 12 and the other is fixed on the innermost end of a jackshaft 16 which is journaled by a sleeve bearing 17 in a boss 18 cast in the end frame 3. A pinion 19 is fixed on the end of the jackshaft 16. The pinion 19 (see also Figure VI) is in mesh with a large gear 20 which is mounted on the hub of a pinion 21. The pinion 21 is journaled by a pair of sleeve bearings 22 turning on a shaft 23 which

is in turn fixedly mounted in a second boss 24 of the end frame 3. The shaft 23 is secured in place not only in the boss 24 but also by a screw 25 threaded into its outermost end and fixing it to a boss 26 cast on the inner surface of a dish-shaped gear cover 27. The gear cover 27 is held in place on the end frame 3 by a plurality of screws 28 (Figure VI) which clamp it tightly against a gasket 29 located between the flanges of the gear cover 27 and the end frame 3. The gasket 29 seals this joint to prevent the escape of a lubricant placed within the gear cover 27 to lubricate the gear train enclosed therein.

The pinion 21 on which the large gear 20 is mounted is in mesh with the larger of a pair of gears 30 and 31 (Figure VI) which are fixed to each other and which are rotatably journaled on a stub shaft 32 projecting from another boss cast in the end frame 3. The gears 30 and 31 are held on the shaft 32 by a retaining ring 33. The gear 31 is in mesh with one of a pair of driving gears 34 and 35, the gear 34 being in mesh with the gear 35. The gears 34 and 35 are keyed on the outermost ends of a pair of rotatable shafts 36 by keys 37 held in place by retaining rings 38. The shafts 36 are rotatably journaled by sleeve bearings 39 in bosses 40 mounted in the end frame 3. The innermost ends of the shafts 36 are cut to flattened tenons 41 which extend considerably beyond the innermost wall of the end frame 3 of the main frame to form a pair of mounting means in the frame for one end of the shafts of meat tenderizing rolls 75 and 76.

The end frame 3 has a flange 42 which extends around its edge and is visible from the exterior of the machine thus forming a part of the exterior design. An end bell 43 overlies the gear cover 27 being secured to the outside of the end frame 3 by a plurality of bolts 44 (Figure XI) which are threaded through the end frame 3 and into bosses cast on the interior of the end bell 43. The end bell 43 forms the exterior cover for the left end of the machine as viewed in Figure I.

The end frame 2 of the main frame has the same contour around its edges as the end frame 3 and generally serves a similar purpose, i. e. forming one end of the machine and mounting certain portions of the mechanism. The rear portion of the end frame 2 is shaped as an open framework and the right end (Figure II) of the motor 6 extends through the opening in the frame 2. The upper forward portion of the frame has two heavy bosses 45 and 46 which are axially aligned with the bosses 40 formed in the end frame 3. Two displaceable tenoned journals 47 are slidably mounted in the bosses 45 and 46. Each of the journals 47 has a flat 48 milled part way along its length and a deeper transverse slot 49 cut at the outermost end of the flat 48. Each of the journals 47 has a knurled section 50 at its outermost end and a cylindrical tenon 51 on its innermost end so that each tenon forms a mounting means in the frame for the end of the shaft of one of the meat tenderizing rolls 75 and 76 opposite the shaft end supported on an aligned tenon 41. A locking plate 52 is fixed by screws 53 to a web 54 extending between the two bosses 45 and 46. The plate 52 has squared ends which project over the lips of the bosses 45 and 46 into the space made available by the flats 48 which are milled on the sides of the journals 47. Thus, when the journals 47 are turned as shown at the right of Figure III they are longitudinally slidable in their bosses but when in their inserted position as shown in Figure II and at the left in Figure III they can be rotated slightly until the slot 49 engages around the edge of the plate 52 to lock the journal in place.

The end frame 2 has a flange 55 around its edge similar to the flange 42 on the edge of the end frame 3 and an end bell 56 similar to the end bell 43 is secured to the outer side of the end frame 2 by a plurality of screws 57 threaded into bosses formed on its inner surface.

The end bell 56 has two holes 58 through which the knurled ends 50 of the journals 47 extend. An opening 59 (Figures VIII and X) is formed in the end bell 56 concentrically with the motor shaft 12. The opening 59 normally is closed by a resilient cap 60 which is removable to permit access to the motor shaft 12. A cup-shaped socket 61 is fixed on the end of the shaft 12 and a transverse slot 62 is milled in the end of the shaft 12. The socket 61 and slot 62 are shaped to receive the end of a hand crank 63 (shown in place in Figure X) by means of which the motor may be turned over manually when desired as, for example, if a piece of bone or other obstruction inadvertently is introduced into the machine, the bone may be released by backing up the machine manually. An opening 64 (Figure II) is formed in the end bell 56 to mount a motor switch 65 and a vertical recess 66 which is flanked by two curved flanges 67 accommodates the switch toggle, the flanges 67 minimizing accidental operation of the switch.

The end frames 2 and 3 are secured not only to the motor base 1 but also are tied together at their upper rear by a rod 68 which extends horizontally between the frames 2 and 3 and is securely held in place by nuts 69 tightened on its threaded ends. The rod 68 holds the two end frames 2 and 3 rigidly in position with respect to each other. A formed cover 70 extends horizontally between the end frames 2 and 3 overlying the motor 6 and the rod 68 and completely encloses the rearward portion of the space between the end frames 2 and 3. The cover 70 is secured by screws 71 (Figure VII) to a flange 72 (Figure II) formed around the opening in the end frame 2 and to a similar flange formed on the end frame 3.

The cover 70 and the inner walls of the end frames 2 and 3 completely enclose all of the mechanism so far described and the machine when viewed from above with the cover 70 in place is substantially U-shaped, the inner walls of the end frames 2 and 3 forming the arms of the U which extend horizontally forward from the base of the U formed by the cover 70. The portions of the inner walls of the end frames 2 and 3 which extend forwardly of the cover 70 are solid except for the protrusion therethrough of the ends of the shafts 36 and the ends of the tenoned journals 47.

The steak tenderizing machine comprising the instant invention is equipped with a removable meat tenderizing unit and carrying frame which is shown in place in Figures II, VII and XI and which is shown removed from from the machine in Figure XIV.

The preferred form of removable meat tenderizing unit is illustrated most clearly in Figure XIV. This unit has two sets of end plates 73 which are tied together in pairs by means of tie rods 74. Each pair of end plates 73 which is tied together by two of the tie rods 74 loosely journals one of a pair of meat tenderizing rolls 75 and 76. The four end plates 73 are identical, having the same size and shape. Each pair of end plates is assembled with its pair of tie rods around the associated tenderizing roll, for example, 75. This structure is then connected to the similar structure comprising the other two end plates 73, tie rods 74 and tenderizing roll 76, for example, by means of rivets 77, one of which is located at each end of the tenderizing unit serving to tie the two left end plates 73 together and the two right end plates 73 together. The rivets 77 serve as hinge pins so that the entire tenderizing unit comprising both tenderizing rolls 75 and 76 and the associated end plates 73 and tie rods 74 can be opened like a book as shown in Figure XV. The tenderizing unit is kept in assembled relationship with respect to the end plates 73 and tie rods 74 with the tenderizing rolls 75 and 76 in intermeshed or interdigitated position by a bale 78, the ends of which are engaged in holes drilled through ears 79 formed on the upper ends of the end plates 73. The end plates with their connecting tie rods and the bale thus constitute a carrying frame which is removably mounted in the machine. By means of the bale 78 the entire tenderizing unit can be carried from the machine to a cleaning sink for example, or from the machine to a refrigerator where it can be stored between uses or overnight to maintain the unit in sanitary condition and prevent contamination of the meat contacting portions of the tenderizing machine.

The tenderizing unit comprises the tenderizing rolls 75 and 76 and the carrying frame comprises the end plates 73, the tie rods 74, and the bale 78. Together, they may be spoken of as a tenderizing unit and carrying frame.

Each of the meat tenderizing rolls 75 and 76 consists of a plurality of cutters or disk-shaped toothed cutting knives 80 (Figure IV) which are mounted on a knife bearing arbor or shaft 81. The knives 80 have a plurality of teeth 82 formed around their circumferences. Each of the teeth 82 has a sharpened arcuate circumferentially extending edge 83. Adjacent sides of adjacent teeth are parallel so that each tooth in actuality is slightly wider at its outermost end than at its innermost end. This particular tooth shape has been found very effective both for tenderizing in which the sharpened edges 83 sever sinews and connecting tissues in the meat rendering the meat more palatable and for knitting in which smaller pieces of meat are made to adhere one to another to form a larger finished tenderized steak. In this operation the teeth act somewhat like punches and force a portion of each piece of meat into the other piece of meat to which it is being knitted. It will be noted in Figure IV that the spaces between the teeth 82 are approximately the same width as the teeth. This permits each tooth to operate on the steak separately so that the cuts made by successive teeth are not continuous but are spaced from each other.

Each of the knives 80 has a key 84 which extends into a central aperture 85 in the knife body. The arbor or shaft 81 has two longitudinally milled keyways 86 which are spaced circumferentially from each other. As the knives 80 are assembled on the arbor 81, the keys 84 are alternately placed in the two keyways 86 thus staggering successive knives with respect to each other (see Figure V). The knives 80 alternate on the arbor 81 with spacing collars 87. At the left end of each of the arbors 81 there is fixed a collar 88 which forms a shoulder against which the first of the knives 80 is assembled. A nut 89 is threaded onto the other end of the arbor 81 to clamp the entire set of knives 80 and collars 87 tightly in position on the arbor 81. A bushing 90 loosely surrounds each of the collars 88 and nuts 89 and is press-fitted into a hole provided therefor in each of the end plates 73. It will be noted in Figure II that the collar 88 which is associated with the tenderizing roll 75 is shorter than the collar 88 which is associated with the tenderizing roll 76 and, conversely, the nut 89 of the tenderizing roll 75 is longer than the nut 89 of the tenderizing roll 76. This results in staggering the knives 80 on the tenderizing roll 75 with respect to the knives 80 on the tenderizing roll 76 so that they can be intermeshed with the peripheries of the knives on one roll extending into the spaces between the knives on the other roll.

The left end of each of the arbors or shafts 81 has two raised triangular projections 91 (see Figures XI and XIII) which are engageable with one of the flattened tenons 41 formed on the shafts 36 to provide a separable coupling for the tenoned end of each shaft 81. The sides of each of the projections 91 are parallel to corresponding sides of the other one of the projections 91 and their apexes are spaced from each other so that the tenon 41 can easily be inserted between them with a certain amount of lost motion before coming up against the sides of the projections 91 to rotate the arbors 81 and the tenderizing

knives assembled thereon. The interior diameter of the collars **88** is slightly larger than the exterior diameter of the ends of the shafts **36** over which the collars **88** fit when the tenderizing rolls are in place in the machine. This permits the collars **88** to be slid over the ends of the shafts **36** to guide the tenons **41** between the projections **91** and to form a separable mounting means for the tenoned end of the respective shaft **81**. The right ends of the arbors **81** are counterbored, each forming a socket **92** in which is fitted a sleeve bearing **93** for the reception of one of the tenons **51** formed on the inner ends of the journals **47**. The cooperating sockets **92**, tenons **51**, and sleeve bearings **93** (shown in detail in Fig. XI) form a pair of separable mounting means for the adjacent ends of shafts **81** remote from the adjacent ends of those shafts having the drive couplings.

Guides **94** and **95** are provided for each of the tenderizing rolls **75** and **76** respectively. Each of the guides **94** and **95** consists of a plurality of wires **96** which are secured in an upper cross bar **97** and a lower cross bar **98**. The wires **96** extend parallel to each other, each wire passing between adjacent ones of the knives **80** and lying (see Figure VII) on the periphery of one of the collars **87**. In Figure VII it can be seen that the guide wires **96** are so curved that they diverge before leaving the area delineated by tenderizing knives between which they extend. The rear guide **95** extends substantially vertically down from its associated tenderizing roll **76** whereas the front guide **94** curves forwardly to diverge from the guide **95**. The rear guide also leaves its tenderizing roll **76** sooner than the front guide **94** leaves its tenderizing roll **75**. The purpose of this design is to peel the steak being tenderized away from the rear tenderizing roll **76** before it is peeled away from the front tenderizing roll **75**. This is designed particularly with the knitting operation in mind since the successive departure from the tenderizing rolls of the two sides of the meat tends to prevent the two pieces of meat which have been knitted together from being pulled apart as the tenderizing knives diverge from each other.

Tying the lower ends of guide wires **96** together with the cross bars **98** not only prevents meat from being drawn around and back into the tenderizing rolls as was earlier discussed but also considerably strengthens the guide structure itself by bracing the guide wires **96** and maintaining them parallel to each other. As can be seen most clearly in Figure XI the space between adjacent guide wires **96** is just large enough to allow the passage therebetween of one of the rotating knives **80**. The guide wires **96** thus serve another purpose in that they straighten any teeth on the knives **80** which may become bent laterally due to encountering small bone particles or other obstructions which may inadvertently be introduced into the machine. In many prior art devices where the tenderizing wires are not braced at their lowermost ends, if a tooth on one of the tenderizing knives becomes bent it will often engage one of the tenderizing wires and bend it thus tangling the lower ends of the tenderizing wires and causing damage to the wires and to the tenderizing knives.

After the machine has been used for tenderizing meat and it is desired to remove and clean the tenderizing unit the operator grasps the bale **78** in one hand and with the other turns the journals **47** to disengage the slots **49** from the plate **52**. The journals **47** can then be slid to the right until the ends of the flats **48** engage the plate **52** thus disengaging the tenons **51** from the sleeve bearings **93**. The entire tenderizing unit and carrying frame which is supported by the bale **78** is then moved to the right to disengage the collars **88** from the ends of the shafts **36** and the triangular projections **91** from the tenons **41** on the ends of the shafts **36** and lifted from the machine to complete its removal as a unit.

If the tenderizing unit is to be cleaned, the cleaning may be facilitated by springing the bale **78** outwardly so that its ends can be removed from the holes drilled through the ears **79** and the tenderizing unit and carrying frame opened. With the unit opened the guides **94** and **95** can be lifted easily, removing their wires **96** from between the knives **80**. The cleaning process can then be carried out directly in a sink where hot water is available. The unit can either be placed in the position shown in Figure XV or in the position shown in Figure XIV. For use in either case there is provided a cleaning fork **99** (see Figure XVI) which comprises a handle **100**, a plurality of sharp ended scraping teeth **101** and a formed clip **102** which is adapted to be snapped onto any of the tie rods **74** thus permitting leverage to be exerted to press the scraping teeth **101** against the peripheries of the collars **87** to remove sinuous material wrapped thereabout.

The hand crank **63** (Figure X), which was employed for rotating the motor by hand, also is employed for rotating the tenderizing rolls **75** and **76** during the cleaning operation. As can be seen in Figures XIV and XV it is directly insertable in the collars **88** and engageable with the raised projections **91** on the ends of the arbors **81**. This provides extra leverage so that the tenderizing rolls can be rotated while being scraped with the teeth **101** of the cleaning fork **99**.

The tenderizing unit and carrying frame is replaced in the machine by a reversal of the steps outlined above. After the guides have been replaced with their upper cross bar **97** engaged in notches **103** formed in the end plates **73**, the tenderizing unit is swung together and the ends of the bale **78** are re-inserted in the holes in the ears **79**. The unit and carrying frame is then lifted by the bale **78** which is so located as to balance the unit in substantially the position it occupies in the machine, and moved into the space between the forward portions of the end frames **2** and **3**. The collars **88** are slid over the ends of the shafts **36** and moved to the left as far as they will go. In a great majority of attempts the tenons **41** will enter the collars **88** between the projections **91** but in the event that either of the tenons **41** strikes its respective projections **91** the particular tenderizing roll which is obstructed can be rotated slightly by turning the collar **88** which is knurled on its exterior to facilitate such turning. The tenderizing unit after being moved to the left with the tenons **41** inserted between the projections **91** is held in position by the bale **78** while the displaceable tenoned journals **47** are slid to the left inserting their tenons **51** into the sleeve bearings **93** and being locked in place by a slight rotation to have the slots **49** engage around the locking plate **52**.

The machine is equipped with a hinged cover **104** which overlies the tenderizing unit when it is in place in the machine and which can be swung upwardly out of the way to permit the removal of the tenderizing unit. The cover **104** is provided with a chute **105** located above the space between the guides **94** and **95** when the tenderizing unit is located in the machine. At the rear corners of the cover **104** there are formed two downwardly extending lugs **106** in which are cut keyhole shaped slots **107**. The slots **107** are each engageable with a hinge pin **108** (Figures VII, VIII and IX). Each of the pins **108** is located in a horizontal bore **109** in one of the end frames **2** or **3**. The pin **108** is pressed inwardly by the resiliently extended plunger of a bullet clip **110** located in a boss **111** formed on the inner surface of the end bell **43** or **56**. The pin **108** has a flange **112** at its outermost end which limits its movement inwardly and a turned-down section **113** of the proper size to pass through the smaller section of the keyhole slot **107**. Thus, by pressing the two hinge pins **108** outwardly (Figure VIII) their turned-down sections **113** are brought in line with the narrow parts of the keyhole slots **107** and the cover **104** can be lifted from the machine. When the cover **104** is in place the bullet clips **110** hold the pins **108** inwardly and their

larger sections fit into the larger portion of the keyhole slots **107** to form hinges for the cover **104**. When the cover **104** is in place on the machine its forward lower edge is supported by a pair of lugs **114** (see Figure VII) which are formed on the exterior walls of the end frames **2** and **3**.

Figures XVII, XVIII and XIX illustrate a modified form of tenderizing unit and carrying frame which employs end plates **115** and guides **116** and **117** which do not have cross bars at the lower ends of their guide wires **118**. In this construction the two end plates **115** are held together by a pair of round tie rods **119** and a pair of square tie rods **120** to form the carrying frame. The square tie rods **120** are so located that the lower ends of the guide wires **118** lie closely adjacent one of their flat sides. In this structure the guides **116** and **117** are removed and inserted from above and because the lower ends of their wires **118** lie adjacent the square tie rods **120**, the danger of meat being pulled around the ends of the guide wires and back into the tenderizing rolls is substantially eliminated although this structure may not be as satisfactory as the preferred embodiment because the tenderizing wires are not braced and strengthened by the lower tie bar.

Figures XX, XXI and XXII illustrate a third modification of a tenderizing unit and carrying frame for use in the instant machine. This structure is designed to permit the employment of stripper units or guides **121** and **122** having guide wires **123** which are tied together at their lower ends by cross members **124**. In this structure the tenderizing unit has single end frames or plates **125** connected by tie rods **124***a* and a bale or lifting handle **124***b* which plates **125** are provided with two upwardly and oppositely directed notches or U-shaped sockets **126** and **127** in which the two parallel and cooperating rotary cylindrical meat tendering members or tenderizing rolls loosely lie. In this structure the tenderizing rolls are removed by lifting them out of the open U-shaped sockets **126** or **127** and then the guides **121** and **122** can be removed. This design facilitates the removal of the tenderizing rolls from their carrying frame but is less advantageous for cleaning the tenderizing rolls directly in a sink because they are not as firmly held in the bottoms of the U-shaped sockets in the end plates as they are in the preferred embodiment of the invention or in the structure shown in Figures XVII, XVIII and XIX. These modified versions of the tenderizing unit and carrying frame permit the principal objectives of the invention to be achieved and while they may be more or less satisfactory with respect to some of the less important objectives of the invention than the preferred embodiment shown in Figure XIV, these latter forms are advantageous in themselves and represent distinct improvements over the structure of the prior art.

The embodiments of the invention which have been disclosed may be modified to meet various requirements.

Having described the invention, I claim:

1. In a meat tenderizing machine, in combination, a main frame, a pair of shafts mounted in the frame, power means mounted in the frame and drivingly connected to the shafts, a pair of knife bearing arbors each having an end supported by and drivingly connected to one of said shafts, the ends of said arbors being separable from said shafts, and a carrying frame removably assembled in the machine and adapted to support said arbors when the arbors are removed from the machine, said carrying frame comprising end members engaging the ends of the arbors and means for holding said end members in spaced apart relation, said end members having openings therein, the arbors extending through the openings in the end members and positioning and supporting the carrying frame in the machine, said pair of arbors being rotatably supported by said pair of shafts independently of said carrying frame when the arbors are in operative position in the machine.

2. In a meat tenderizing machine, in combination, a main frame, a pair of shafts mounted in the frame, power means mounted in the frame and drivingly connected to the shafts, a pair of knife bearing arbors each having an end disengageably engaged with and supported by one of said shafts, means mounted in the frame for disengageably journaling the ends of the arbors remote from the shafts, a carrying frame for the arbors which carrying frame is removably assembled in the machine, said carrying frame comprising end members loosely journaled on and supported by the arbors and holding the arbors in place when disengaged from said shafts and journaling members, and means holding the end members in spaced apart relation, said pair of arbors being rotatably supported by the means for disengageably journaling the ends of the arbors and by said pair of shafts independently of said carrying frame when the arbors are in operative position in the machine.

3. In a meat tenderizing machine having a housing, in combination, a power source mounted in the housing, shafts journaled in the housing and operatively connected to the power source, knife bearing meat tenderizing rolls having ends disengageably engaged with the shafts, displaceable journals axially aligned with the shafts and disengageably engaging the ends of the rolls remote from the shafts, and a carrying frame removably assembled in the machine and having end portions loosely journaled on and supported by end portions of said tenderizing rolls for holding said rolls in place when disengaged from said shafts and journals and for supporting said rolls when the rolls and frame are removed from the housing, said tenderizing rolls being supported by said journals and said shafts independently of said carrying frame when the tenderizing rolls are in operative position in the machine.

4. In a meat tenderizing machine, in combination, a housing, a power source mounted in the housing, shafts journaled in the housing and operatively connected to the power source, knife bearing arbors having ends disengageably engaged with the shafts, displaceable journals axially aligned with the shafts and disengageably engaged with the ends of the arbors remote from the shafts, guide members having wire-like portions interdigitating with the knives on the arbors, and a carrying frame removably assembled in the machine, said carrying frame including end portions loosely journaled on the arbors for supporting the carrying frame in the machine when the arbors are in operative position and for holding said arbors in place when their ends are disengaged from said shafts and when said journals are displaced, said guide members having portions engaged with said end portions of the carrying frame for supporting the guide members, said arbors being supported by said journals and said shafts independently of said carrying frame when the arbors are in operative position in the machine.

5. In a meat tenderizing machine, in combination, a housing, a power source mounted within the housing, a pair of shafts journaled in the housing and drivingly connected to the power source, a pair of knife bearing arbors, said arbors each having an end disengageably engaged with and driven by one of the shafts, displaceable journals mounted in the housing in axial alignment with the shafts and disengageably engaged with the arbors, and a carrying frame for the arbors removably assembled in the machine, said carrying frame including an end plate loosely journaled on each end of each arbor to hold said arbors in place when their ends are disengaged from said shafts and when said journals are displaced, means for holding the end plates on opposite ends of each arbor in spaced-apart relation, and hinge means joining the end plates on adjacent ends of the arbors, said carrying frame being supported on the arbors when the arbors are in operative position in the machine.

6. A device according to claim 5 in which the hinge means have an axis parallel to the axes of the arbors and displaced from the plane containing the axes of the arbors.

7. In a meat tenderizing machine according to claim 5, a pair of guide members having wire-like portions interdigitating with the knives of the arbors, and having portions engaged with the carrying frame for supporting the guide members in the frame.

8. A lifting basket for use in a meat tendering machine having two relatively long, parallel and cooperating rotary cylindrical meat tendering members each having axially disposed shaft ends extending outwardly thereof, comprising two spaced and parallel end plates, means connecting the end plates and including a lifting handle connected at its ends to the plates, and supporting abutments at the bottoms of open U-shaped sockets in the end plates for receiving said shaft ends and lifting said two members simultaneously as a unit.

9. The lifting basket defined in claim 8 plus two stripper units for cooperating with said cylindrical members supported at their ends on said end plates and spanning the gap therebetween.

10. A meat tendering machine comprising a frame, a pair of relatively adjacent cylindrical members each including a shaft and one having a plurality of cutting discs in spaced relation on and along the shaft, driving means including two rotary clutch elements in the frame for receiving and drivingly supporting the inner ends of the shafts, two bearings in the frame for receiving and rotatably supporting the outer ends of the shafts, the members being parallel and in cooperating relation as thus supported, and a removable basket in the frame having end portions disposed beneath the ends of the shafts and adapted to lift the two members as a unit from said bearings and clutch elements, the ends of the shaft extending outwardly beyond the basket and supported by said clutch elements and in said bearings.

11. A meat tenderizing machine comprising a main frame, a pair of power driven meat tenderizing rolls having interdigitated cutters thereon, said rolls having shafts,

two pairs of mounting means in said main frame for said shafts, said shafts being separably associated with said pairs of mounting means, and a carrying frame having enlarged openings defined by walls, said walls being engaged with the end portions of said rolls whereby when one of said pairs of mounting means has been separated from the rolls, the rolls can be removed from the main frame by said carrying frame.

12. A meat tenderizing machine comprising a main frame, a power source mounted on said main frame, a pair of meat tenderizing rolls having interdigitated cutters thereon, said rolls having shafts, two pairs of mounting means in said main frame for said shafts, a pair of couplings between said power source and said shafts, said shafts being separably mounted with said pairs of mounting means, said couplings coupling said shafts to said power source when said shafts are mounted in said mounting means for driving said shafts in rotation, and a carrying frame having enlarged openings defined by walls, said walls being engageable with the end portions of said rolls whereby one of said pairs of mounting means has been separated from the rolls, the rolls can be removed from the main frame by said carrying frame and said coupling means can be uncoupled.

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