United States Patent [19]

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[11] **3,716,893**

[45] **Feb. 20, 1973**

[54] MEAT TENDERIZER

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[22] Filed: **April 14, 1971**

[21] Appl. No.: **133,838**

[52] **U.S. Cl.**.....**17/26**, 74/421 R, 200/61.62, 335/205

[51] **Int. Cl.**.....**A22c 09/00**

[58] **Field of Search**.....17/26; 74/421 R, 421 A; 192/135; 200/61.62; 335/205

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[57] **ABSTRACT**

Meat tenderizer including a U-shaped frame with operating elements mounted thereon and enclosed by a U-shaped housing. The operating elements include a reduction gear box having three shafts, one input and two outputs. A knife frame assembly having knife blade assemblies is supported directly on said gear box to assure proper alignment with clutch members of the gear box and knife blade assemblies. The housing includes a cover enclosing the knife frame assembly and having a magnet thereon coacting with a magnet in the housing to operate a proximity switch and prevent running of the tenderizer when the cover is displaced from closed position.

6 Claims, 10 Drawing Figures

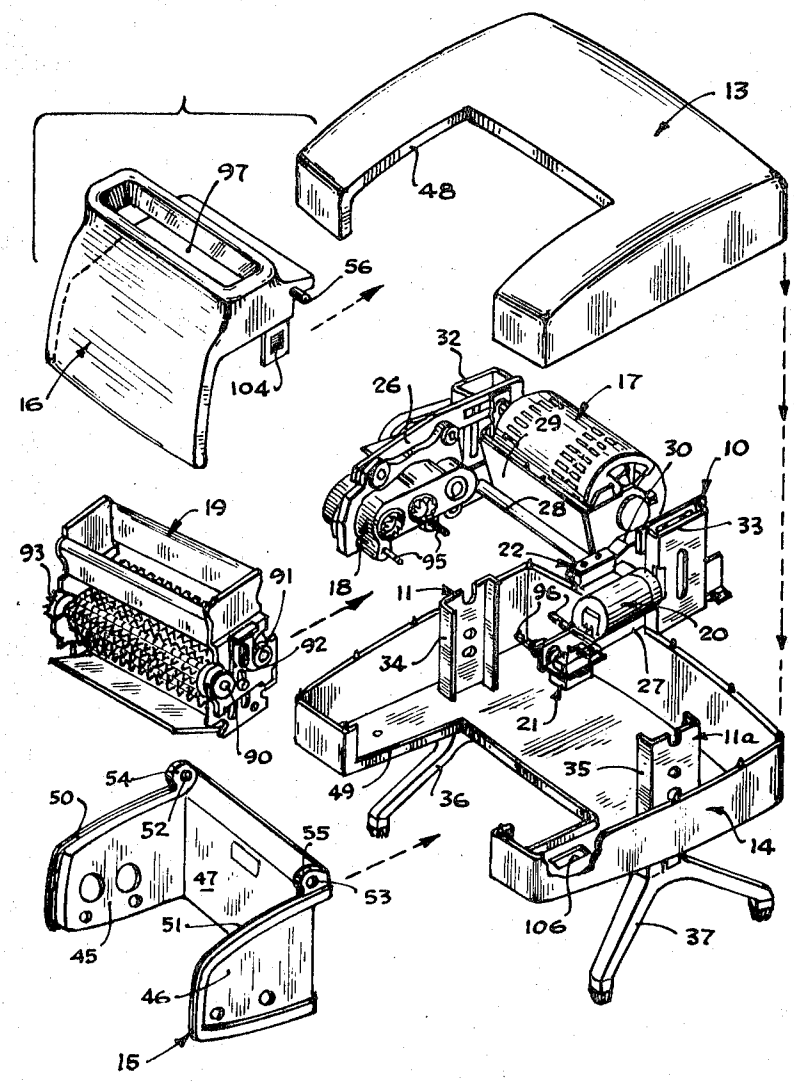
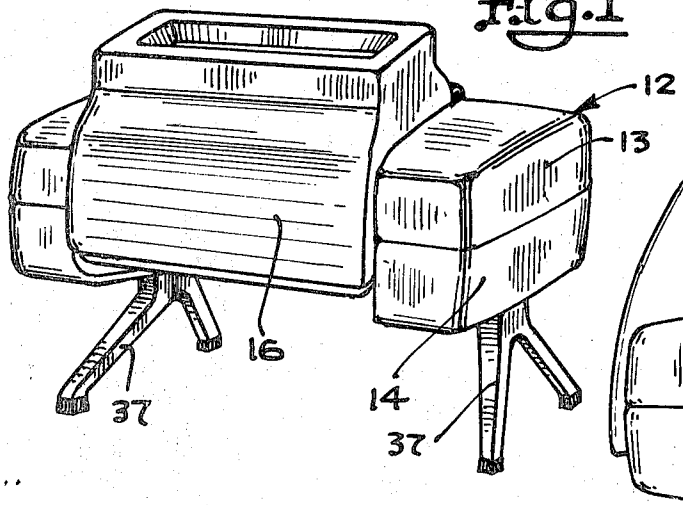


Fig.1



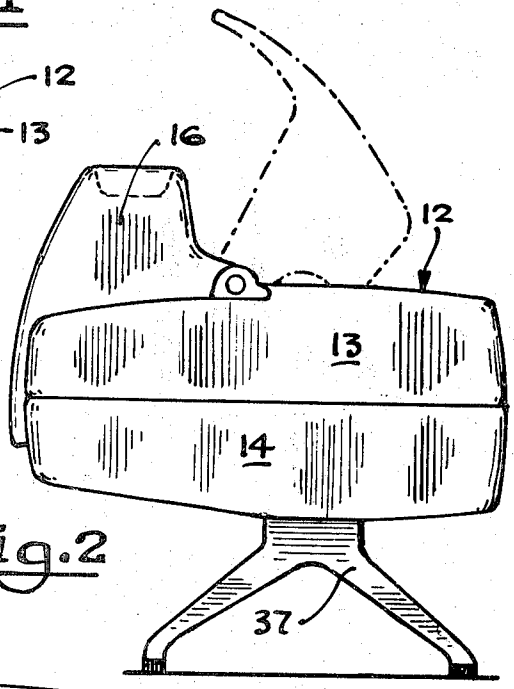


Fig.2

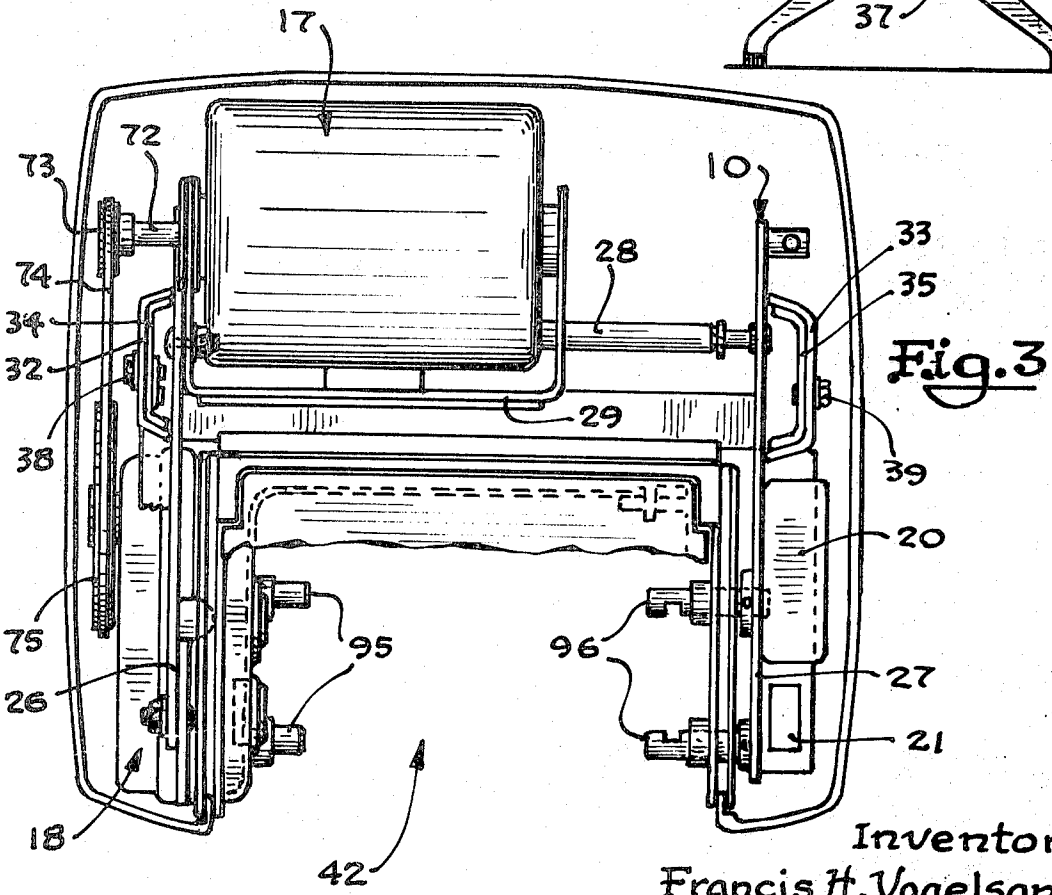
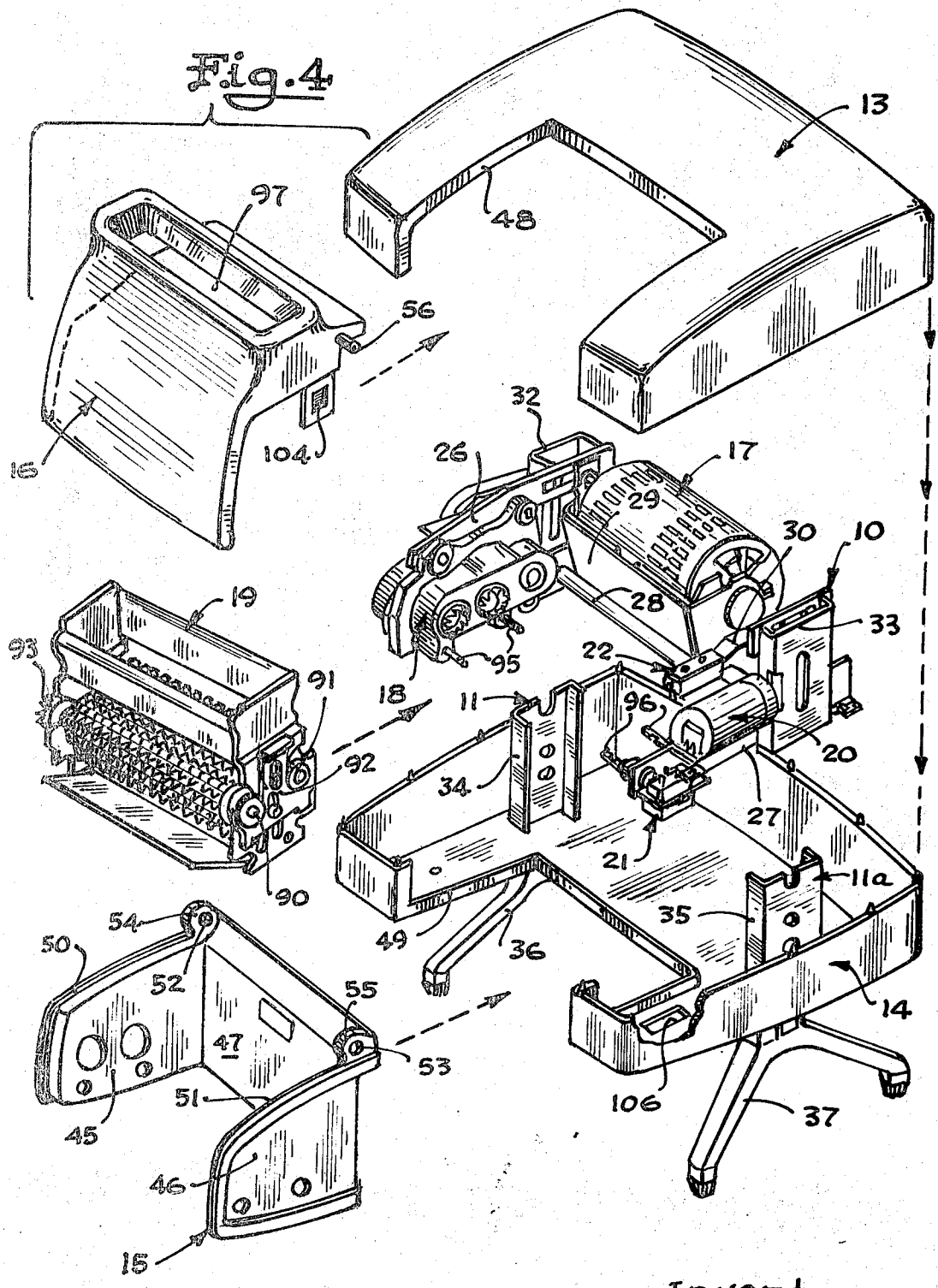


Fig.3

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Fig. 4



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Fig. 5

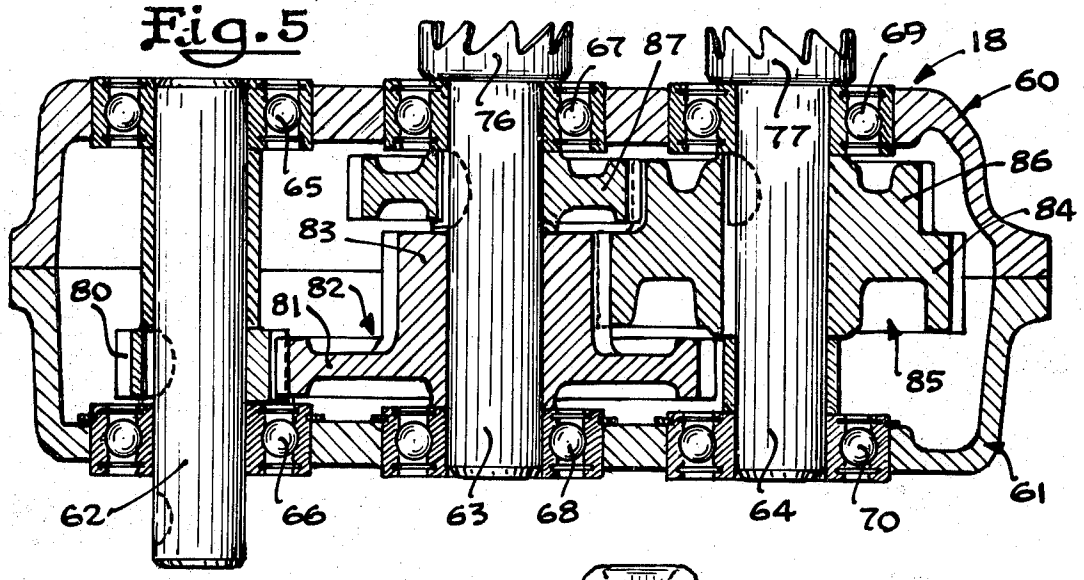


Fig. 7

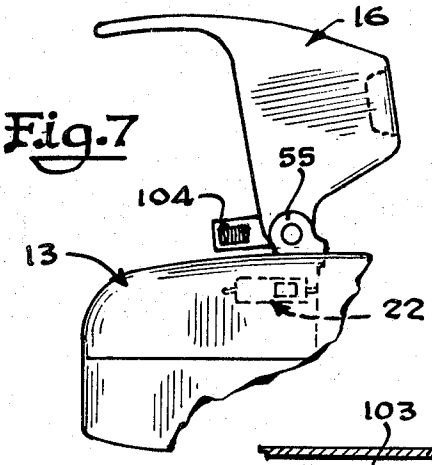


Fig. 8

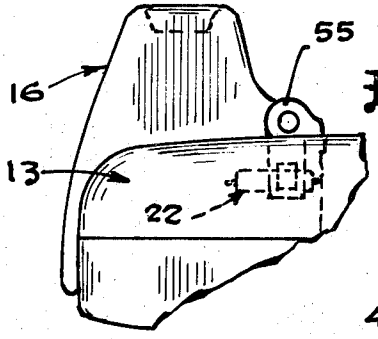


Fig. 8A

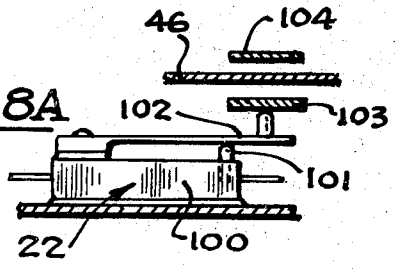


Fig. 7A

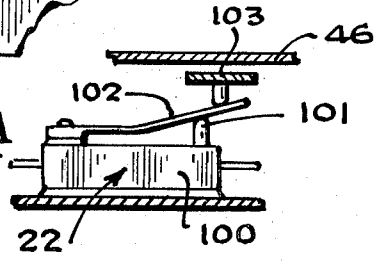
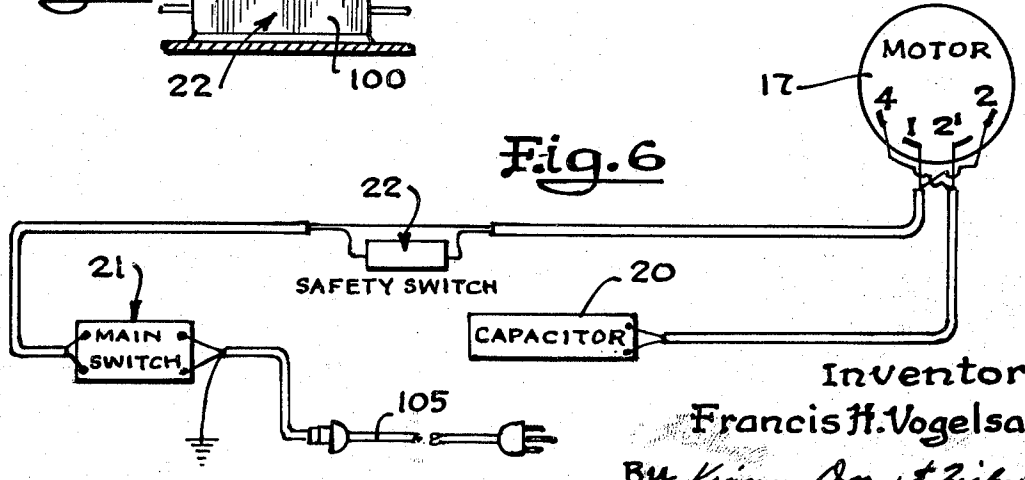


Fig. 6



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MEAT TENDERIZER

This invention relates in general to a meat processing machine, and more particularly to a machine for tenderizing meat, although the machine may also be employed to improve or enhance the edibility of vegetables and other foods. Still more particularly, the invention relates to a meat tenderizer wherein meat is directed through a pair of coacting knife rolls or knife blade assemblies to effect certain cutting operations thereon.

While meat tenderizers have long been known, such as in U.S. Pat. No. 2,886,845, certain problems have been encountered. For example, the knife frame assembly having knife blade assemblies thereon is usually mounted in operative position on support pins carried by the housing of the tenderizer, such as in the aforesaid patent, and this has led to problems in aligning the clutch members of the knife blade assemblies with the clutch members of the gear box due to tolerances encountered in manufacturing of the housings. Another problem encountered relates to the safety switches employed in connection with the cover which must be in closed position before the safety switch is to be conditioned "On." Many times the safety switches have been readily accessible and thereby subject to being deactivated by an operator, at which time operation of the machine can be hazardous when the cover is in open position. Further, the gear box has been of such a large size as to cause a large housing.

The present invention overcomes the problems above-mentioned and provides a meat tenderizer which includes a frame assembly that is rugged and solid in character, and which mounts the gear box and motor, and wherein support pins for the knife frame assembly are carried at one end by the gear box and at the other end by the frame, wherein the support pins at the gear box assure proper alignment between clutch members of the gear box and the knife frame assembly regardless of the manufacturing tolerances employed in the housing assembly. The gear box is compact in nature to facilitate the housing arrangement, wherein the gear box includes an input shaft and two output shafts interconnected with gearing that substantially reduces the speed of the knife blade assemblies over the speed of the motor. A unique magnetically operable proximity or safety switch precludes operation of the tenderizer unless the cover is closed, thereby eliminating hazardous conditions that would be dangerous to the operator if the tenderizer could operate with the cover in open position. The proximity switch is essentially tamper-proof in that its elements are enclosed within the housing, and it includes a magnet mounted on the cover which coacts with a magnet arranged within the housing and mounted to operate the proximity switch in response to the position of the magnet on the cover. It should be appreciated this switch arrangement can be equally well used on other machines having cover members adapted to keep an operator's hands and body away from running knives or parts.

It is therefore an object of the present invention to provide a new and improved meat tenderizer.

Another object of this invention is in the provision of a meat tenderizer including a knife frame assembly having knife blade assemblies with clutches releasably engageable with clutches on a gear box, wherein support pins for the knife frame assembly are mounted directly on the gear box to assure proper alignment of the clutch members.

Still another object of the invention is to provide a proximity switch for machines having cover members adapted to cover knives or running parts that if exposed would be hazardous to an operator.

A further object of this invention is in the provision of a meat tenderizer including a meat tenderizing chamber encloseable by a cover member, and a proximity switch that is magnetically operable to allow energization of the tenderizer when the cover member is in closed position, thereby eliminating hazardous operating conditions.

Another object of this invention is in the provision of a compact gear box for use with the meat tenderizer that includes an input shaft and a pair of output shafts all interconnected by gearing, and wherein a large reduction of speed is obtained by the input and output shafts.

Other objects, features and advantages of the invention will be apparent from the following detailed disclosure, taken in conjunction with the accompanying sheets of drawings, wherein like reference numerals refer to like parts, in which:

FIG. 1 is a front perspective of the meat tenderizer of the present invention;

FIG. 2 is a side elevational view of the tenderizer, illustrating the cover member in dotted lines when it is open;

FIG. 3 is a top plan view of the tenderizer with the cover member and upper housing section removed to show underlying parts;

FIG. 4 is an exploded, perspective view of the tenderizer according to the invention;

FIG. 5 is a greatly enlarged horizontal, sectional view taken through the gear box of the tenderizer;

FIG. 6 is a somewhat diagrammatic block diagram of the electrical circuitry for the motor of the tenderizer;

FIG. 7 is a fragmentary side, elevational view of the tenderizer, illustrating the cover member in open position, and the relationship between the magnet on the cover member and the magnet at the proximity switch;

FIG. 7A is a somewhat diagrammatic top plan view of the proximity switch in open position corresponding to the position it will take when the cover member is in open position as shown in FIG. 7;

FIG. 8 is a view similar to FIG. 7, but illustrating the cover member in closed position; and

FIG. 8A is a view similar to FIG. 7A, but illustrating the condition of the switch when the cover member is in closed position, wherein the switch is closed.

Referring now to the drawings, and particularly to FIGS. 1 to 4, the meat tenderizer of the invention includes generally a frame assembly 10 of U-shape arranged in a horizontal plane, and supportable above a work surface by a pair of leg assemblies 11 and 11A. A housing assembly 12, including an upper housing section 13, a lower housing section 14, an intermediate housing section 15 and a cover member 16 is supported on the leg assemblies and encloses the frame assembly 10. An electric motor 17 and a gear box 18 are mounted on a frame assembly 10 which also supports a knife frame assembly 19. Additionally, a motor capaci-

tor 20, a main switch 21, and a safety or proximity switch 22 are mounted on the frame assembly 10.

The frame assembly 10 is U-shaped and includes parallel opposed, forwardly extending side arms 26 and 27 interconnected by a rear cross arm 28. The motor 17 is carried by a motor mount 29 that is in turn mounted on the side arm 26, and the gear box 18 is also mounted on the side arm 26. The capacitor 20 and the main switch 21 are mounted on the side arm 27, while the proximity switch 22 is carried on an extension 30 that is secured to the side arm 27.

Vertically arranged channel-shaped brackets 32 and 33 are respectively carried by side arms 26 and 27, and coact with slightly smaller in size channel-shaped brackets 34 and 35 of leg assemblies 11 and 11a. Inverted V-shaped leg members 36 and 37 complete the leg assemblies with the brackets 34 and 35, and may be received on a support surface for the tenderizer. As seen in FIG. 3, the brackets 34 and 35 of the leg assemblies telescope within the brackets 32 and 33 of the frame assembly, and are connected thereto by suitable bolt assemblies 38 and 39.

The frame assembly 10 is made of a suitable rigid metal, and as can be readily appreciated, is supported directly through the leg assemblies onto the work surface of the tenderizer.

The housing assembly 12, which includes the upper housing section 13, the lower housing section 14, the intermediate housing section 15, and the cover 16, is suitably secured to the leg assemblies 11 and 11*a*, and therefore not supported in any way by the frame assembly 10 other than through the leg assemblies. The housing is preferably molded of a suitable plastic, but could be cast of a suitable metal, if so desired. The upper, lower and intermediate housing sections are fitted together to define a bottomless meat tenderizing chamber 42, FIG. 3. Accordingly, the housing sections 13, 14 and 15 are U-shaped, and serve to completely enclose the frame assembly 10 with the component parts mounted thereon. As seen in FIG. 4, the upper and lower housing sections are somewhat dish-shaped, and when brought together close all except the area immediately bounding the meat tenderizing chamber 42, which is closed by the intermediate housing section 15. Opposed side walls 45 and 46 and a back wall 47 define the intermediate housing section 15. Lip 48 on the upper housing section 13 and a lip 49 on the lower housing section 14 coact with peripheral grooves 50 and 51 formed on the side walls 45 and 46 of the intermediate housing section 15 when the housing sections are in assembled relation. Pin holes 52 and 53 formed in ears 54 and 55 at the upper end of the back wall 47 of the intermediate housing section coact with insertable pins 56 on the cover 16, whereby the cover is hingedly mounted to enclose the top and front of the meat tenderizing chamber 42.

The gear box 18 includes a casing defined by casing sections 60 and 61 suitably held together by an adhesive or the like, and which support first, second and third shafts 62, 63 and 64, FIG. 5. The first shaft 62 constitutes an input shaft, while the second and third shafts 63 and 64 constitute output shafts. The shafts are arranged in parallel spaced relation and along a single plane extending longitudinally through the casing. Shaft 62 is supported at opposite ends by bearings 65 and 66 which are respectively carried in casing sections 60 and 61. Similarly, shaft 63 is supported at opposite ends by bearings 67 and 68 respectively carried in casing sections 60 and 61, while shaft 64 is supported on opposite ends by bearings 69 and 70.

Power is transmitted to the gear box by the motor 17 through its output shaft 72 having a pulley 73 thereon, and a belt 74 trained over the pulley 73 and a pulley 75 mounted on the input shaft 62 of the gear box, FIG. 3. A speed reduction is effected between the motor and the input shaft by virtue of the small pulley 73 on the motor shaft and the large pulley 75 on the input shaft. Clutch members 76 and 77 are fixed to output shafts 63 and 64 for the purpose of engaging clutch members on the knife rolls of the knife frame assembly 19. It is noted that the power out of the gear box is taken from the opposite side from the power input.

The gear train within the gear box includes a pinion gear 80 fixed to the input shaft 62 and meshing with a pinion gear section 81 of an idler gear member 82 rotatably mounted on the output shaft 63. A speed reduction is effected between the input shaft 62 and the idler gear member 82 since the pinion gear 80 has a much smaller diameter than the pinion gear section 81. The idler gear member 82 also includes a pinion gear section 83 of smaller size than the pinion gear section 81, and is in meshing engagement with a pinion gear section 84 of a gear member 85 mounted on the output shaft 64 for rotation therewith. A further speed reduction is effected between the idler gear member 82 and the output shaft 64 since the pinion gear section 84 is larger than the pinion gear section 83. A second pinion gear section 86 is included on the gear member 85 which is in meshing engagement with a pinion gear 87 fixed to for rotation with the output shaft 63. The pinion gear section 86 is of the same size as the pinion gear 87, whereby the output shafts 63 and 64 rotate in opposite directions at the same speed. It may therefore be appreciated that a substantial speed reduction is effected through the gear train between the input shaft 62 and the output shafts 63 and 64, yet the gear box is extremely compact and eliminates the need for additional counter shafts by the unique gearing arrangement.

The knife frame assembly 19, FIG. 4, is essentially the same as that shown in the aforesaid patent, and includes coacting knife blade assembly or knife rolls 90 or 91 carried by a frame 92. Each knife roll is provided at one end with a clutch member such as illustrated by the clutch member 93 of knife roll 90 capable of mating engagement with the clutch members 76 and 77 on the output shafts of the gear box in a manner disclosed in the aforesaid patent. The knife frame assembly 19 must be removable in order to facilitate cleaning following usage, and accordingly the clutch members of the knife rolls are easily disconnectible from the clutch members of the gear box shafts. The knife frame assembly 19 is supported in the meat tenderizing chamber 42, wherein the frame 92 engages supporting pins 95 extending from the gear box 18, and supporting pins 96 extending from the frame side arm 27, FIGS. 3 and 4. The exact manner in which the knife frame assembly 19 engages the supporting pins and is locked in place by the coacting clutch members and the pins is the same as in the aforesaid patent, and forms no part

of the present invention. However, the supporting pins heretofore, as in the aforesaid patent, were mounted on the housing, and due to manufacturing tolerances difficulty was often encountered in aligning the coacting clutch members. By mounting the supporting pins **95** directly to the gear box, difficulty in obtaining proper meshing between the coacting clutch members is eliminated. Similarly, the situation is improved by mounting the supporting pins **96** directly to the frame assembly **10**. With the knife frame assembly **19** in position within the meat tenderizing chamber **42**, and the cover closed, meat is inserted into a meat receiving opening or slot **97** formed in the cover **16** which directs it into the bight of the knife rolls. Following cutting and conditioning of the meat by the knife rolls, the meat is discharged therebelow onto a pan or tray.

The electrical circuitry of the motor **17** is illustrated in FIG. **6** wherein, both the main switch **21** and the proximity or safety switch **22** must be closed before the motor will run. The safety switch **22** is mounted within the housing behind the wall **46** of the intermediate housing section **15**, FIGS. 7A and 8A, and includes a microswitch **100** having a plunger **101** spring biased to the out position and being open as shown in FIG. 7A and depressible to the in position and being closed as shown in FIG. 8A by a switch arm **102**. The switch arm **102** may be in the form of a leaf spring. At the outer end of the switch arm **102**, a magnet **103** is mounted which is positioned directly behind the wall **46**. A magnet **104** is carried by and movable with the cover **16** so that when the cover is in completely closed position the magnet aligns directly opposite to magnet **103** and when the cover is closed the orientation of the polarities of the magnets are such that they repel. Since the magnet has a polarity such that it will cause repelling of the magnet **103** when aligned therewith, the resulting action will move the switch arm **102** toward the switch **100** and depress the plunger **101** closing the switch. Similarly, a slight movement of the cover toward open position will displace magnet **104** from alignment with the magnet **103** and allow the spring biased plunger **101** and spring switch arm **102** to move toward the wall **46** and open the switch **100**. Accordingly, it is not possible to operate the tenderizer when the cover is in any position but closed, thereby eliminating the hazards to the operator of having the knife rolls running when the cover is in the up position. When the cover is closed, the tenderizer may be started by operating the main switch **21** in the service cord **105**, FIG. **6**. The switch **21** is accessible inasmuch as it protrudes through an opening **106**, FIG. **4**, in the lower housing section **14**.

While the proximity switch is illustrated herein for use on a meat tenderizer, it should be appreciated it can be used on any machine having running parts coverable by a movable cover, where it is mandatory, safetywise, to prohibit the running of the coverable parts when the cover member is displaced from closed position.

It will be understood that modifications and variations may be effected without departing from the scope of the novel concepts of the present invention, but it is understood that this application is to be limited only by the scope of the appended claims.

The invention is hereby claimed as follows:

1. A meat tenderizer comprising, a horizontally extending U-shaped frame having a pair of forwardly extending parallel opposed side arms interconnected by a rear cross arm, a vertically extending channel-shaped bracket mounted on each side arm, legs extending downwardly from the frame and including channel-shaped bracket portions on their upper ends in mating connected engagement with the brackets on the side arms to support the tenderizer on a work surface, a motor mounted on the rear arm, a gear box mounted on one of the side arms having an input and a pair of outputs, clutch members carried by the outputs, means connecting the motor to the input, a horizontally extending U-shaped housing secured to said legs and enclosing said frame, motor and gear box and leaving said legs extending therebelow, said frame and housing being aligned to define a vertically extending bottomless meat tenderizing chamber, a cover hinged to said housing for closing the top and front of said chamber and leaving the bottom open, said cover having a meat receiving opening through which meat may be delivered to said meat tenderizing chamber, a knife frame assembly adapted to be mounted in said tenderizing chamber and to be covered by said cover having a pair of rotatable knife rolls with a clutch member on one end of each roll and aligning with the meat receiving opening, support pins extending from said gear box to support one side of said knife frame assembly and align the clutch members of said knife rolls to the clutch members of the outputs, and support pins extending from the side arm opposite the gear box to support the other end of the knife frame assembly.

2. A meat tenderizer as defined in claim **1**, and a proximity switch for said motor having a first magnet coacting with a second magnet on said cover to prevent operation of the motor when the cover is not in the closed position.

3. A meat tenderizer as defined in claim **2**, wherein said proximity switch includes a switch arm movable between an out position near the meat tenderizer chamber where the switch is open and an in position away from the chamber where the switch is closed, and said first magnet being carried on said switch arm with polarities opposite those of said second magnet when aligned therewith and the cover being closed, wherein the switch arm will be moved to the in position when the cover is closed and said first magnet is under the influence of said second magnet and the switch arm will move to the out position when the magnets are displaced from each other.

4. A meat tenderizer comprising, a horizontally extending U-shaped frame having a pair of forwardly extending parallel opposed side arms interconnected by a rear cross arm, legs extending downwardly from the frame to support the tenderizer on a work surface, a motor mounted on the rear arm, a gear box mounted on one of the side arms having an input and a pair of outputs, clutch members carried by the outputs, means connecting the motor to the input, said gear box including first, second and third parallel spaced shafts, said first shaft corresponding to said input and said second and third shafts corresponding to said outputs, a pinion gear fixed on said first shaft for rotation therewith, an idler gear member freely rotatable on said second shaft having a first pinion gear section in meshing engage-

ment with the pinion gear on said first shaft and a second pinion gear section, a gear member fixed on said third shaft having a first pinion gear section in meshing engagement with the second pinion gear section of said idler gear member and a second pinion gear section, and a pinion gear fixed on said second shaft for rotation therewith and in meshing engagement with said second pinion gear section of said third shaft gear member, said gears and gear sections being sized to provide an output speed substantially less than the input speed, a horizontally extending U-shaped housing secured to said legs and enclosing said frame, motor and gear box and leaving said legs extending therebelow, said frame and housing being aligned to define a vertically extending bottomless meat tenderizing chamber, a cover hinged to said housing for closing the top and front of said chamber and leaving the bottom open, said cover having a meat receiving opening through which meat may be delivered to said meat tenderizing chamber, a knife frame assembly adapted to be mounted in said tenderizing chamber and to be covered by said cover having a pair of rotatable knife rolls with a clutch member on one end of each roll and aligning with the meat receiving opening, support pins extending from said gear box to support one side of said knife frame assembly and align the clutch members of said knife rolls to the clutch members of the outputs, and support pins extending from the side arm opposite the gear box to support the other end of the knife frame assembly.

5. A meat tenderizer as defined in claim **4**, wherein the size of the first pinion gear section of the idler gear member is substantially larger than the first shaft pinion gear, the size of the second pinion gear section of the idler gear member is smaller than the first pinion gear section thereof, the size of the first pinion gear section of the third shaft gear member is larger than the second pinion gear section of the second shaft idler gear member, and the size of the second pinion gear section of the third shaft gear member is equal to said second shaft pinion gear.

6. A meat tenderizer as defined in claim **5**, and a proximity switch for said motor having a first magnet coacting with a second magnet on said cover to prevent operation of the motor when the cover is not in the closed position, said proximity switch including a switch arm movable between an out position near the meat tenderizer chamber where the switch is open and an in position away from the chamber where the switch is closed, and said first magnet being carried on said switch arm and being repelled by said second magnet when aligned therewith and the cover being closed to close the switch.

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