United States Patent

[11] 3,596,433

[72] Inventor Guido D. Bertoglio
Lugano-Viganello, Switzerland

[21] Appl. No. 831,192
[22] Filed June 6, 1969
[45] Patented Aug. 3, 1971
[73] Assignee Centra Anstalt
Vadox, Liechtenstein
[32] Priority Oct. 30, 1968
[33] Switzerland
[31] 16.300/68

[54] **MACHINE WITH MECHANISMS PLACED IN DISPLACEABLE BOXES FOR THE MANUFACTURING AND DELIVERY OF PLASTIC BAGS OF DIFFERENT LENGTHS STARTING FROM A TUBULAR SHEET**
6 Claims, 22 Drawing Figs.

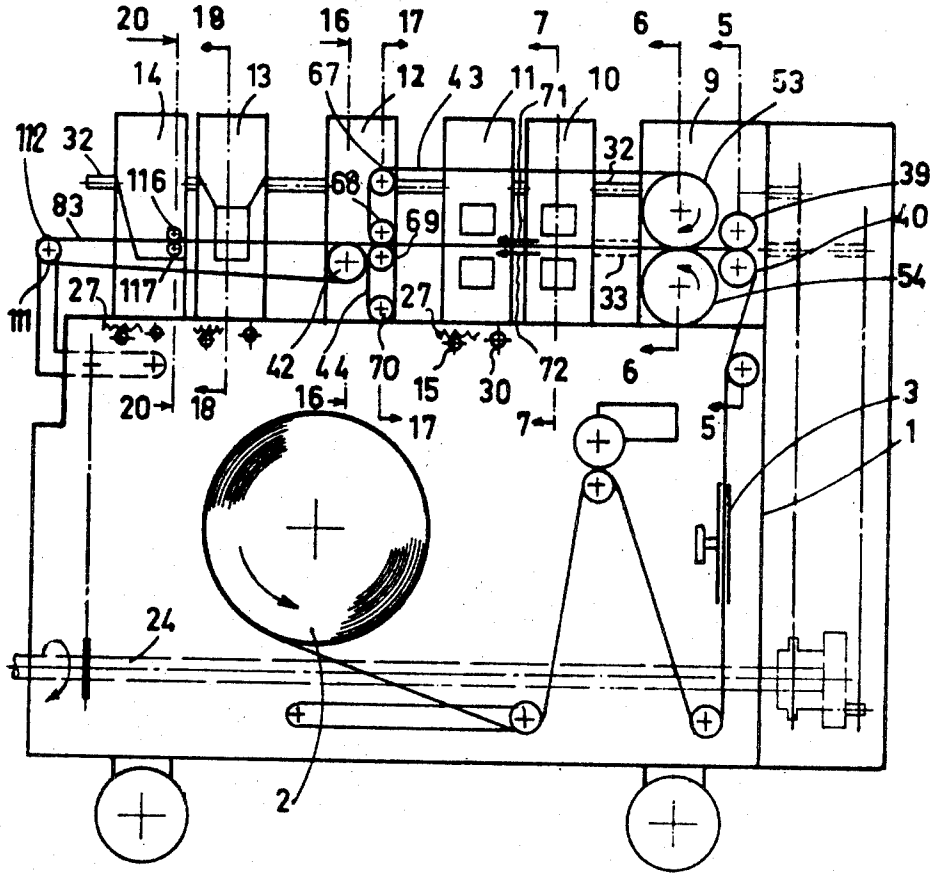
[52] U.S. Cl. 53/183
[51] Int. Cl. B65b 9/10
[50] Field of Search 53/28, 180, 29, 183

[56] References Cited
UNITED STATES PATENTS

3,508,374	4/1970	Bertoglio	53/29
3,389,534	6/1968	Pendelton	53/180
3,453,797	7/1969	Soto	53/29 X

Primary Examiner—Theron E. Condon
Assistant Examiner—E. F. Desmond
Attorney—Sparrow and Sparrow

ABSTRACT: A machine for manufacturing of plastic bags from a tubular web having a plurality of mechanisms for performing the various necessary operations, such as feeding the tubular web from a roll into the machine, thermowelding the web for forming bag portions, cooling the weldments with provisions for preventing deformations of the welded web, inserting a straw into the tubular web at each bag portion, cutting the finished bag portions off the tubular web and delivering the finished bags, whereby each one of the operating mechanisms is enclosed in a box and whereby some of the boxes are manually displaceable for varying the length of the bag portions.



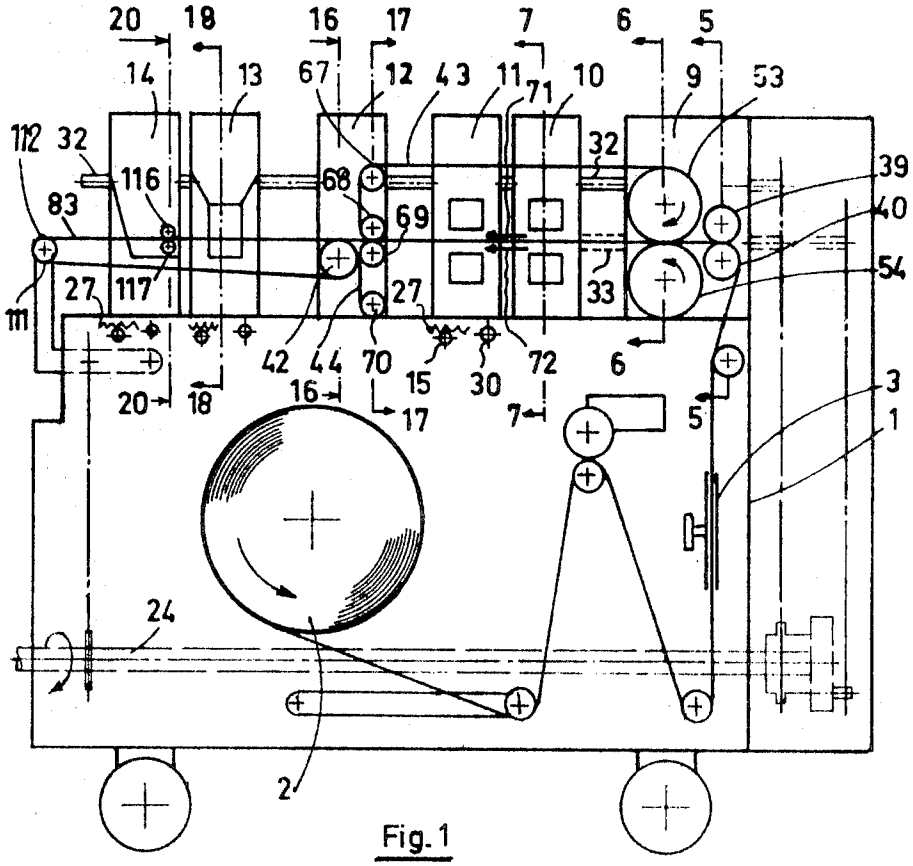


Fig. 1

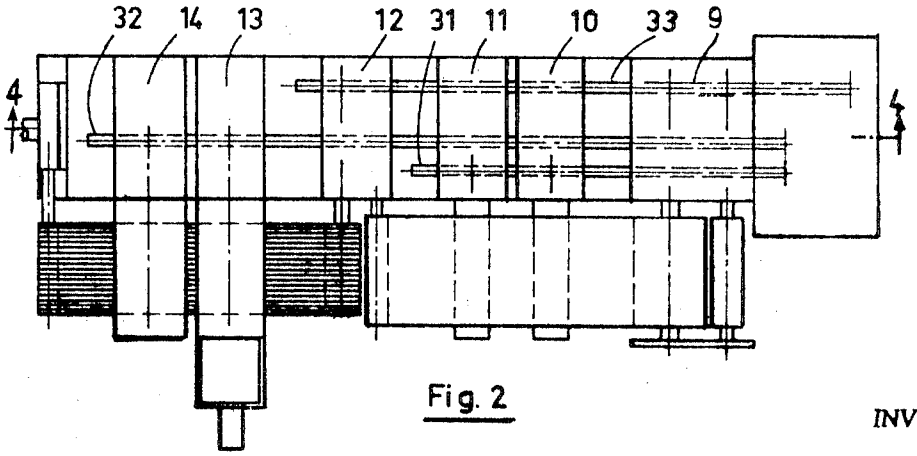


Fig. 2

INVENTOR

Guido Bertoglio

BY Sparrow and Sparrow

ATTORNEYS

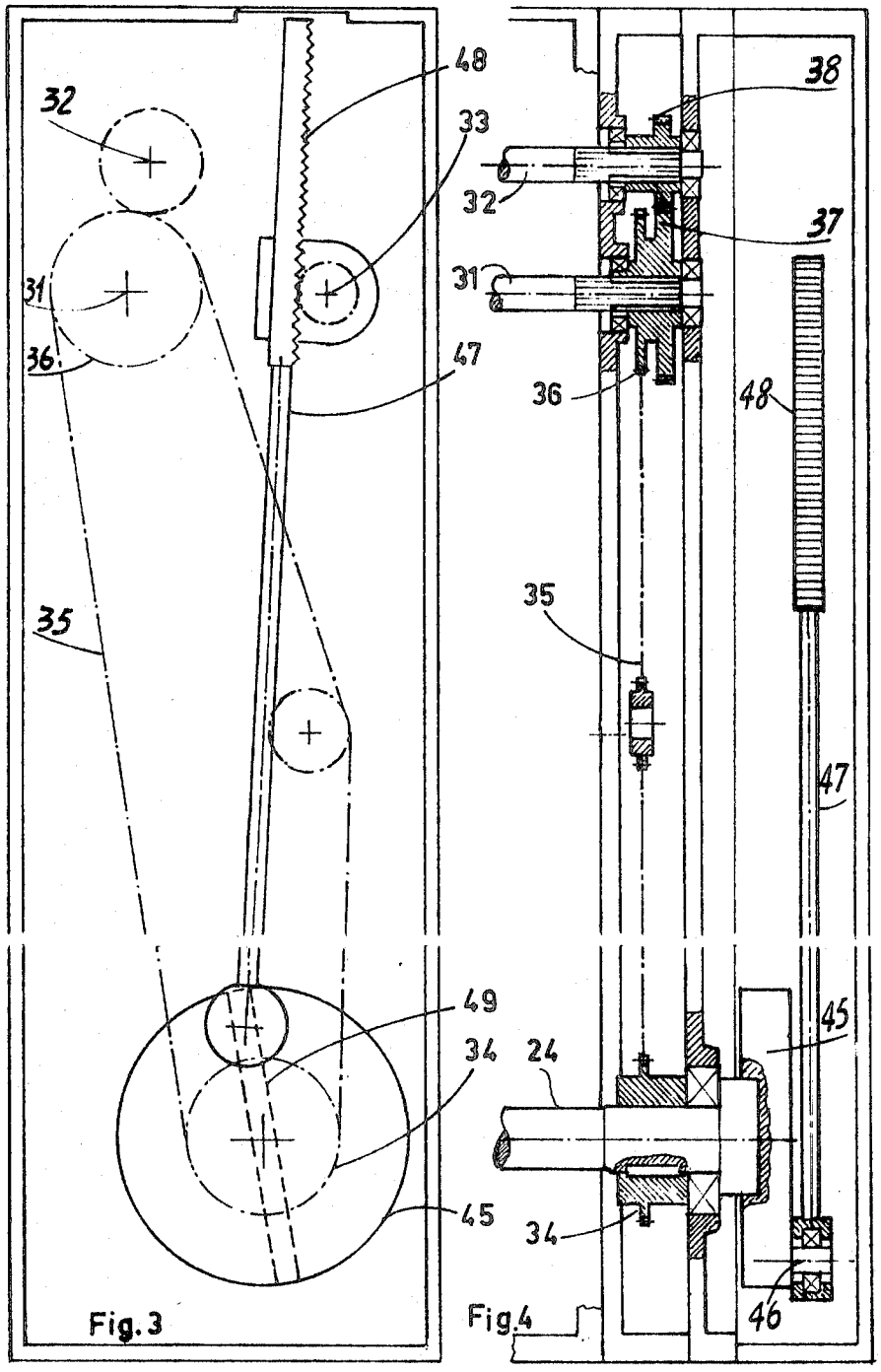


Fig. 3

Fig. 4

INVENTOR

Guido Bertoglio

BY Sparrow and Sparrow

ATTORNEYS

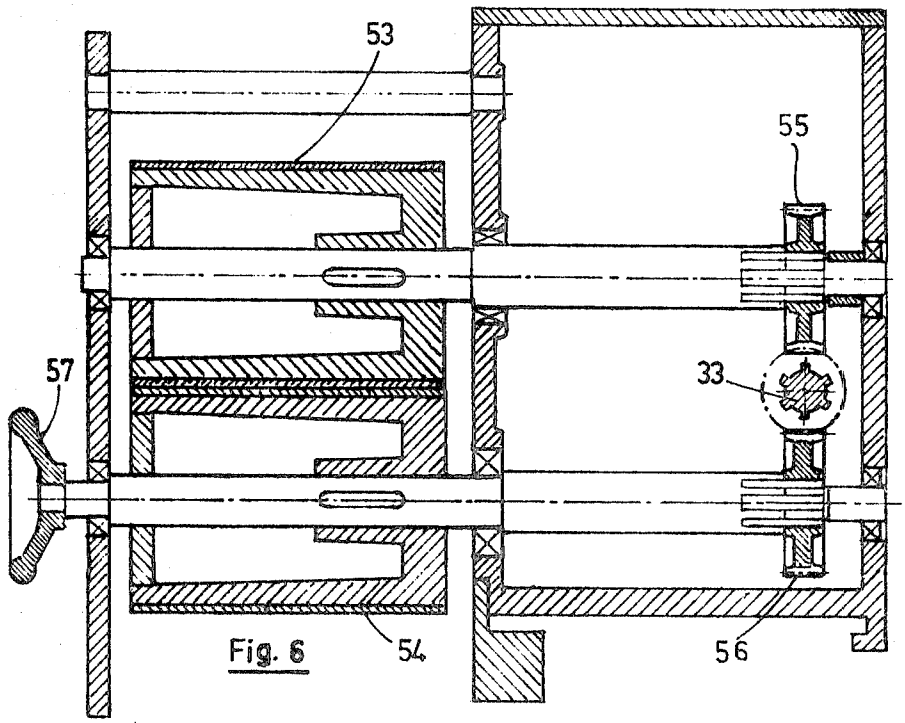


Fig. 6

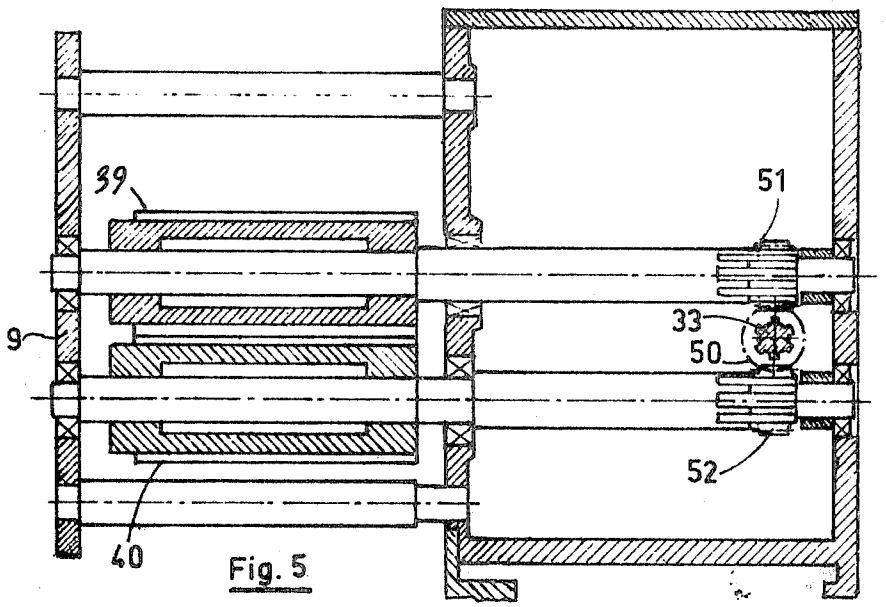


Fig. 5

INVENTOR

Guido Bertoglio

BY Sparrow and Sparrow

ATTORNEYS

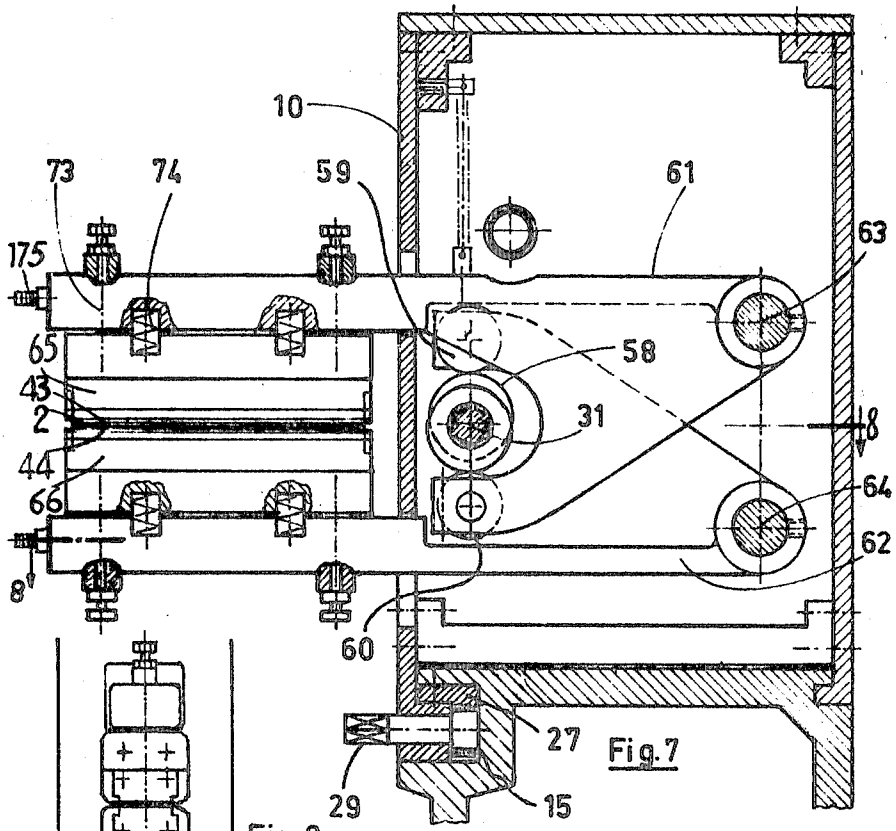


Fig. 7

Fig. 9

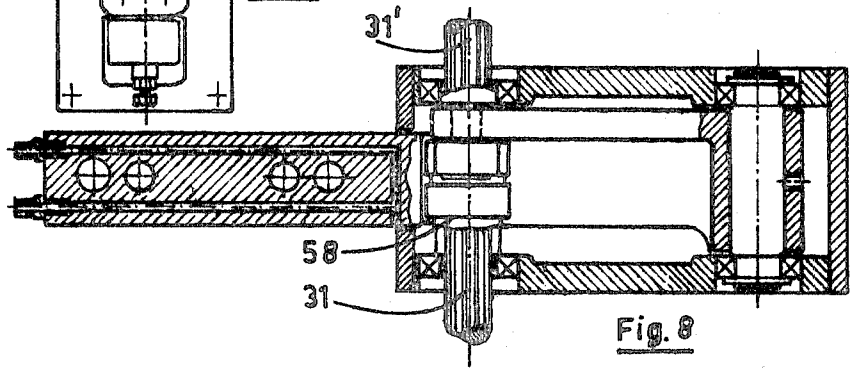


Fig. 8

INVENTOR

Guido Bertoglio

BY Sparrow and Sparrow

ATTORNEYS

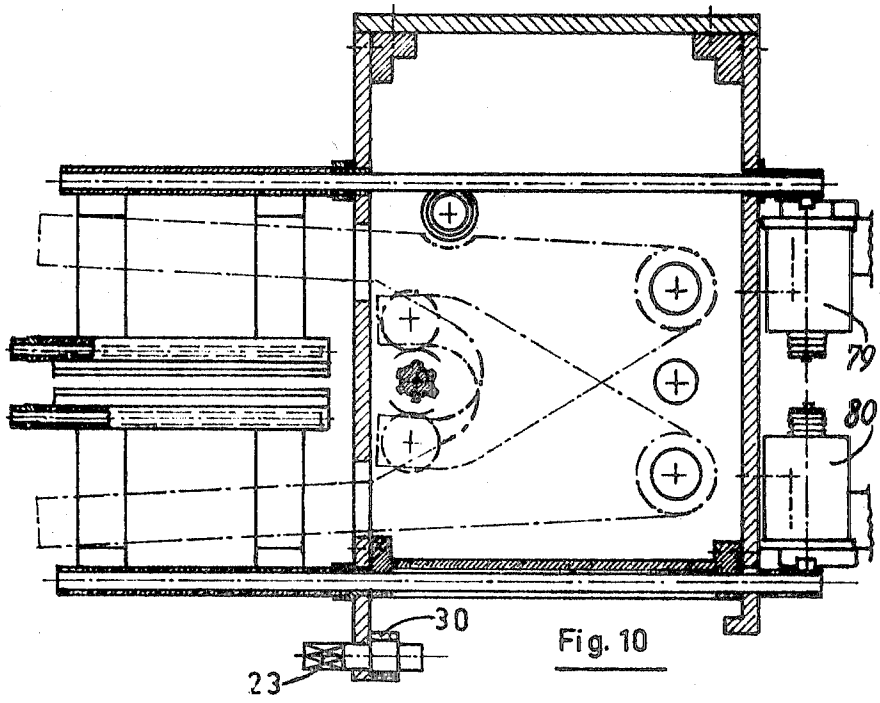


Fig. 10

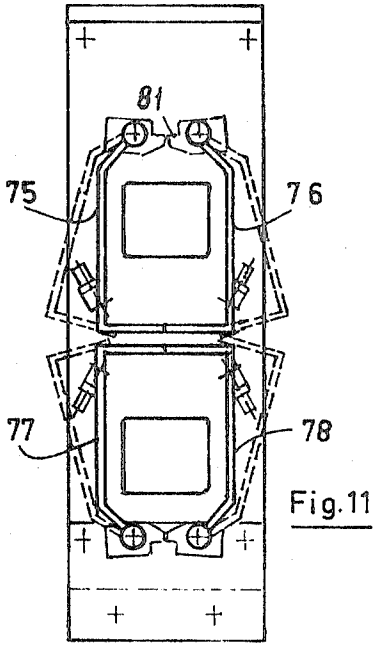


Fig.11

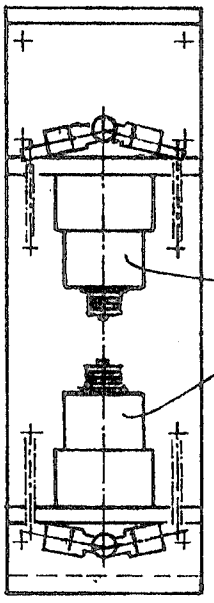


Fig.12

INVENTOR

Guido Bortoglio

BY Sparrow and Sparrow

ATTORNEYS

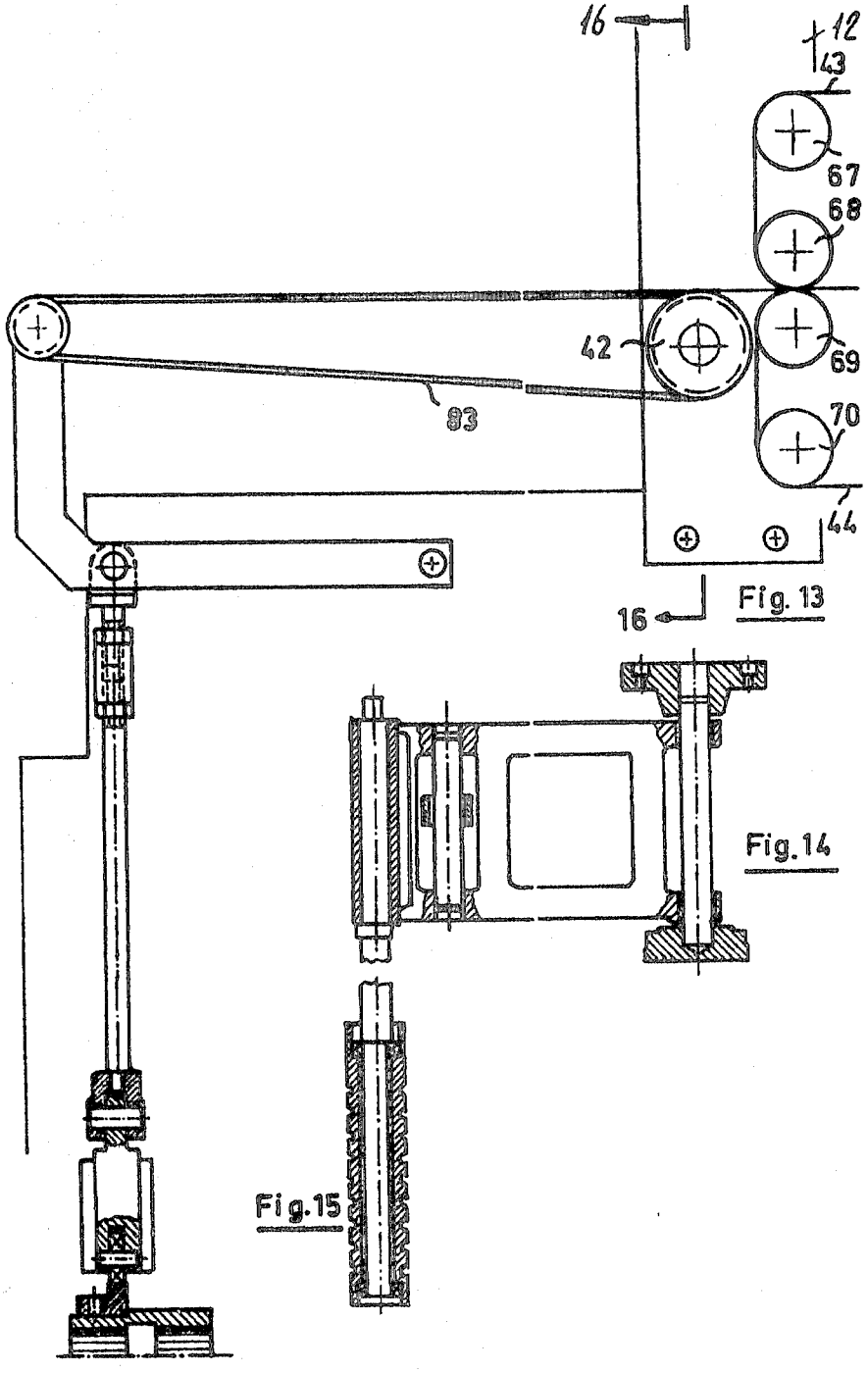


Fig. 13

Fig. 14

Fig. 15

INVENTOR

Guido Bertoglio

BY Sparrow and Sparrow

ATTORNEYS

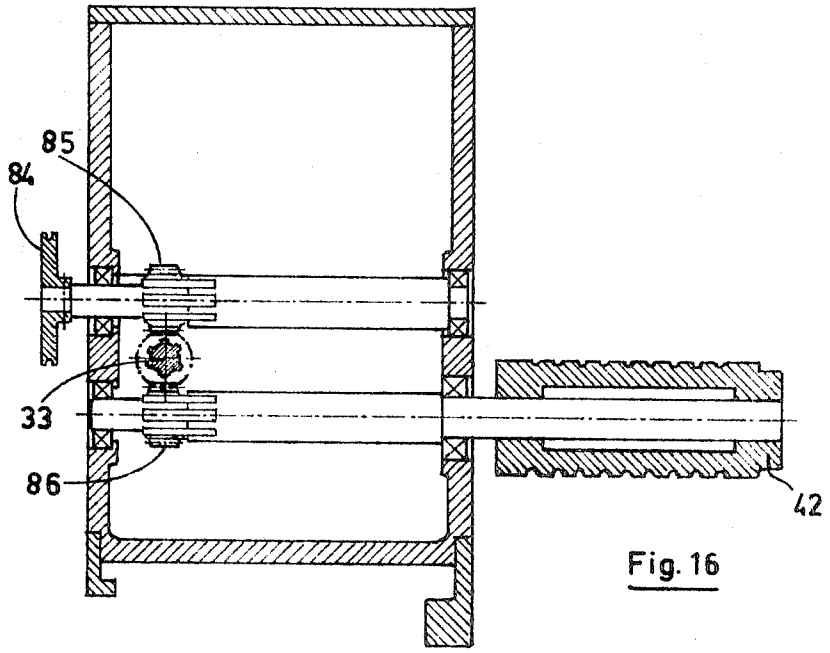


Fig. 16

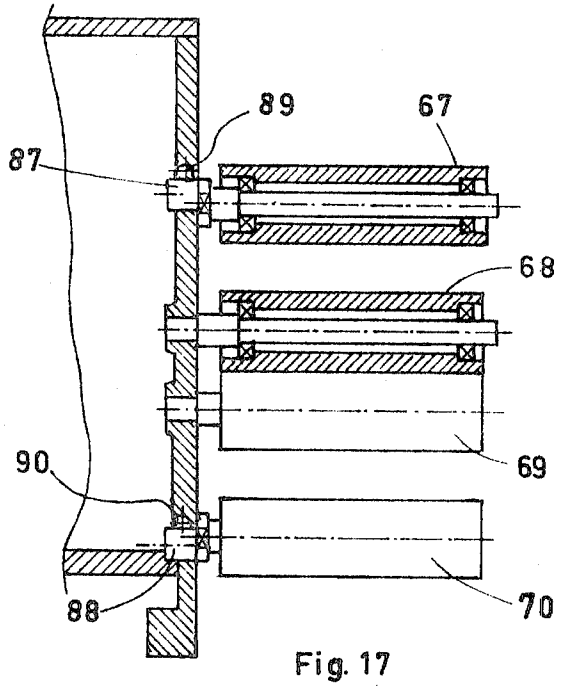


Fig. 17

INVENTOR

Guido Bertoglio

BY Sparrow and Sparrow

ATTORNEY

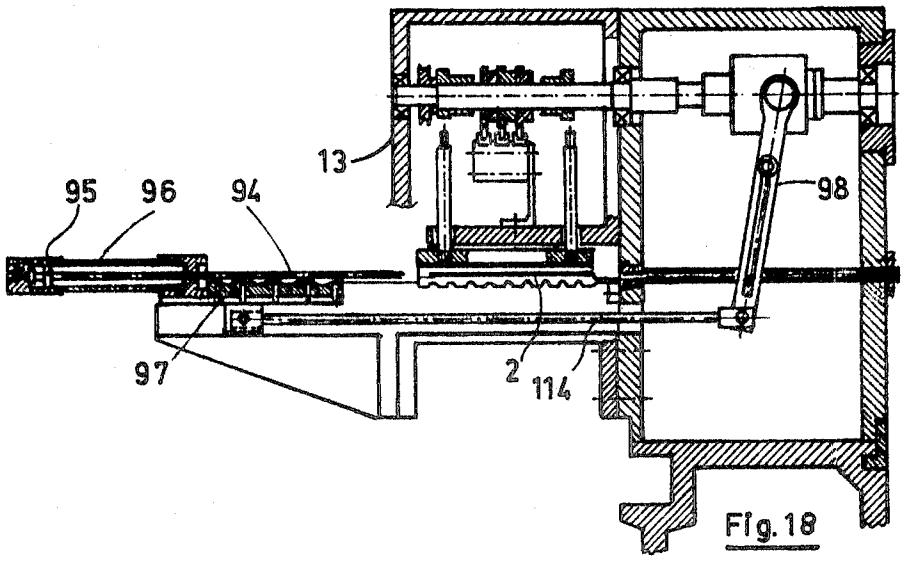


Fig. 18

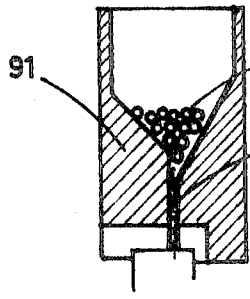


Fig. 19

INVENTOR

Guido Bertoglio

BY Sparrow and Sparrow

ATTORNEY

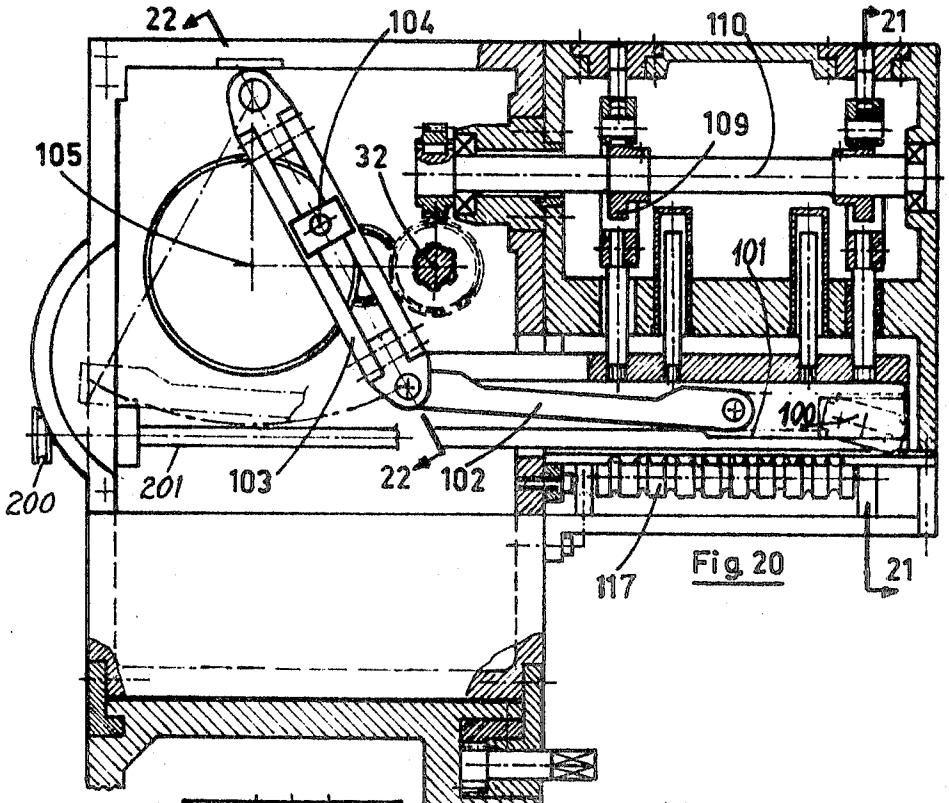


Fig 20

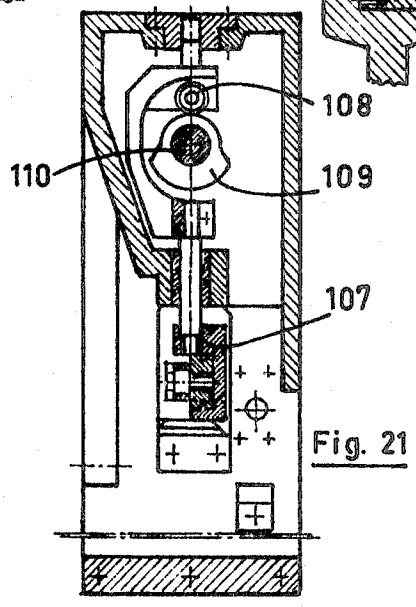


Fig. 21

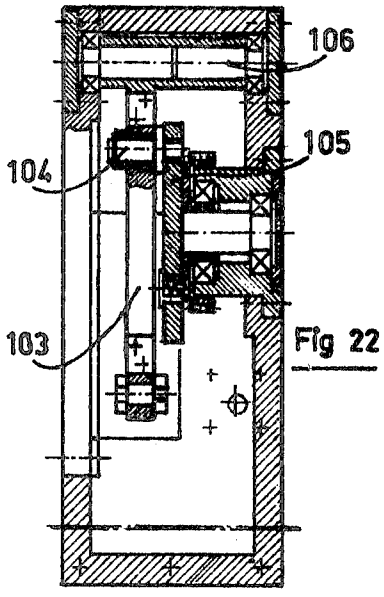


Fig 22

INVENTOR

Guido Bertoglio

BY

Sparrow and Sparrow

ATTORNEYS

MACHINE WITH MECHANISMS PLACED IN DISPLACEABLE BOXES FOR THE MANUFACTURING AND DELIVERY OF PLASTIC BAGS OF DIFFERENT LENGTHS STARTING FROM A TUBULAR SHEET

The present invention relates to a machine for manufacturing and delivering plastic bags of different lengths starting from a tubular sheet and comprising:

means for introducing in the machine the flattened tubular sheet;

at least a pair of jaws for thermowelding the tubular sheet;

at least a pair of cooling jaws for the thermowelded portions;

a pair of endless conveying belts provided with transmission rollers and adapted to accompany the tubular sheet during its travel from the thermowelding jaws to the cooling jaws in such a manner that the thermowelded, hot and therefore deformable portions of said sheet are prevented from undergoing deformations;

transmission means;

mechanisms for introducing a straw into the tubular sheet at each bag section;

means for cutting the bags away from the tubular sheet.

Said machine is characterized in that the mechanism controlling: the means introducing the tubular sheet, the thermowelding jaws, the cooling jaws, the conveying means, the transmission means, the mechanism for introducing the straw and the cutting or separating means are located in just as many separated boxes spaceable at different distances with respect to each other during the functioning of the machine in order to obtain bags of different lengths and furthermore in that said cutting means are disposed at the end of the travel of the tubular sheet, so that each bag may be separated from said tubular sheet when the bag is already finished, with the straw already introduced therein.

To make the invention better understood a preferred and nonlimitative embodiment thereof will be described hereinafter by way of example only and with reference to the accompanying drawings, in which:

FIG. 1 is a diagrammatic front view of the machine of the invention;

FIG. 2 is a plan view of same;

FIG. 3 is a lateral diagrammatic view of the members transmitting the motion from the motor shaft to the grooved shafts actuating the mechanisms of the various displaceable boxes;

FIG. 4 is a partial longitudinal sectional view taken along the plane passing through 4—4 of FIG. 2, wherein the members of FIG. 3 are shown in a position successively reached during the working;

FIG. 5 is a partial cross-sectional view through the machine of FIG. 1 taken along a plane passing through 5—5 i.e. through the rollers provided for the introduction of the tubular sheet;

FIG. 6 is a further partial cross-sectional view of the machine of FIG. 1 taken along the plane passing through 6—6 i.e. through the rollers actuating the pairs of endless conveying belts;

FIG. 7 is a partial cross-sectional view of the machine of FIG. 1 taken along the plane passing through 7—7 i.e. through the box containing the thermowelding jaws for the tubular sheet;

FIG. 8 is a horizontal sectional view taken along the plane passing through 8—8 of FIG. 7;

FIG. 9 is a front view of the said thermowelding jaws;

FIG. 10 is the diagrammatic cross-sectional view of the cooling device for the thermowelding jaws at rest and a safety device which prevents the interposed endless conveying belt made of heat-resistant material from being damaged when the jaws are closed;

FIG. 11 is a front view of the thermowelding box showing the details of said safety device;

FIG. 12 is a back view on the thermowelding box showing a pair of electromagnets controlling said safety device;

FIG. 13 is a diagrammatic front view of the box containing the transmission members i.e. the means feeding the tubular sheet where this last leaves the conveying belts to be taken up by further transport means and finally reaches the cutting means;

FIGS. 14 and 15 are partial plan views of the members located at the end of the travel of the tubular sheet;

FIG. 16 is the cross section through the box comprising the feeding members i.e. a section taken along the plane 16—16 in FIG. 1 and in FIG. 13;

FIG. 17 is the cross-sectional view of the same box but taken along the plane passing through 17—17 of FIG. 1;

FIG. 18 is the cross section of the box containing the members introducing the straw in each bag i.e. the section taken along the vertical plane passing through 18—18 in FIG. 1;

FIG. 19 is a detail view of the hopper containing the straws;

FIG. 20 is the cross section taken along the plane passing through 20—20 in FIG. 1 i.e. through the box comprising the cutting means;

FIG. 21 is a cross section of FIG. 20 taken along a plane passing through 21—21 to show the members blocking the tubular sheet to allow for the cutting;

FIG. 22 is a section of FIG. 20 taken along the plane passing through 22—22 i.e. through the lever controlling the cutting operation.

With reference to FIG. 1: the machine of the invention comprises the frame 1 supporting the bobbin 2 having wound thereon the flattened tubular sheet which will be used for manufacturing the bags. Said tubular sheet is made to pass between the guide means 3 and successively through the introductory members of the box 9 and, finally, through the various groups of the following members contained in just as many boxes: 10—11—12—13—14.

The box 10 comprises the members performing the thermowelding of the tubular sheet to form the bottom of each bag. The box 11 comprises the members adapted to operate the cooling of the thermowelded and still hot portions of the bag so as to prevent the deformation thereof.

The box 12 contains the transmission members for the endless belts which serve to feed the thermowelded and cooled tubular sheet to the successive groups of members constituting the boxes 12 and 14.

The box 13 contains the members adapted to introduce the straw into each bag while still attached to the tubular sheet.

The box 14 contains the members operating the cross-cutting of the tubular sheet at the opening side of each bag as well as delivering the finished and cut bag to the (non-represented) machine that will take it up for automatically filling and closing it.

The basic characteristic of the machine according to the present invention consists in that the groups of members forming a part of the boxes indicated with 9—10—11—12—13—14 are displaceable at variable mutual distances and may be fixed in the desired position to permit the manufacturing of bags of different lengths.

A second basic characteristic directly depending from the first one consists in that the bags are not cut right away from the tubular sheet at the moment they enter the box 9 but only at the end of the travel of said tubular sheet i.e. when they enter the box 14 so that they maintain their perfect reciprocal disposition and rigidity up to their delivery to the filling machine.

The machine according to the present invention differs therefore considerably from the conventional machines in which bags of different lengths are obtained by varying the speed of introduction of the tubular sheet and by cutting each bag at the very moment the tubular sheet is introduced in the machine i.e. before the thermowelding has been effected.

In said conventional machines, contrarily to what is done according to the present invention, the cutting members, the thermowelding means, the cooling means, the means for introducing the straw and the delivery means maintain unchanged their reciprocal position.

In the following there will be described the basic members of the machine of the invention.

First of all it should be pointed out that the mutual displacement of the various boxes to have the machine produce bags of different lengths is obtained, for each box, by means of a gear 15 (see FIGS. 1 and 7) engaging a rack 27 which extends throughout the whole length of the machine and is fixed to the frame 1.

The rotation of the gear 15 is effected by introducing a wrench at the end of the shaft 29 (FIG. 7) having a square cross section.

Each box is fixed again by means of an eccentric means 30 (FIGS. 1 and 10) coaxial to the shaft 23 (FIG. 10) similar to the preceding one and adapted to be rotated by a similar wrench. Some boxes, such as box 9 and 12, may also stay stationary since the variation of the reciprocal distance between the various boxes may be obtained even if some of them are stationary. Of course these stationary boxes will be provided with no gear 15 or eccentric means 30.

There will be now described the means transmitting the motion from the drive shaft 24 (FIGS. 1 and 2) to the mechanisms contained in the various boxes 9—10—11—12—13—14.

These members comprise essentially three splined shafts 31, 32, 33 (FIGS. 1 and 2), two of which and namely shafts 31 and 32 receive a rotary and uniform motion while the third one 33 is subjected to intermittent rotary motion to control the intermittent feeding displacements of the tubular sheet. To this scope, as it is shown in FIGS. 3 and 4, the uniform rotary motion is transmitted from the drive shaft 24 to the toothed wheel 34, to the chain 35 to the toothed wheel 36 coaxial to the grooved shaft 31 and to the pair of transmission gears 37 and 38 so as to actuate in a uniform manner the two splined shafts 31 and 32. The first shaft 31 is intended to operate the cams which, in the boxes 10 and 11 (FIGS. 1 and 2), are responsible for opening and closing the thermowelding and cooling jaws while the second shaft 32 is adapted to control the cutting members and the means for introducing the straw, all of them being contained in the boxes 13 and 14.

The third splined shaft intermittently operating, in the box 9, the rollers 39—40 introducing the tubular sheet (FIG. 1) and, in the box 12, the transmission drum 42 feeding the tubular sheet as well as the pair of conveying belts 43, 44 (FIG. 1) receives its intermittent motion from the drive shaft 24 (FIGS. 3—4) over a flywheel 45, the eccentric 46, the connecting rod 47 and the rack 48 engaging a toothed portion at the periphery of the end of said shaft 33. This mechanism is also known as a rack-and-pinion slider crank motion whereby the pinion (in this case the shaft 33) has a conventional overrunning clutch (not shown in the drawing), so that the shaft is not rotated during the return stroke of the rack. The amplitude of the intermittent motion i.e. the length of the intermittent travel of the tubular sheet which corresponds to the length of each bag is adjustable by varying the position of the pivot 46 in the radial groove 49 of the flywheel 45.

There will now be described the members making up the various boxes. Besides the introductory rollers 39, 40 shown in FIG. 1 and better visible in FIG. 5 which have the intermittent motion imparted thereto by the splined shaft 33 over the endless screw 50 and the two complementary wheels 51, 52, the box 9 also contains the two drums 53—54 (FIG. 6) which have the two heat-resistant belts 43, 44 of carbon tetrafluoride or any other suitable synthetic resin wound thereon as shown in FIG. 1.

Actuation of the two drums 53, 54 also by the shaft 33 takes place over the endless screw and the two complementary wheels 55, 56. The handwheel 57 (FIG. 6) serves to initially introduce by hand the tubular sheet 2 (FIG. 1).

FIG. 7 shows the members contained in the box 10. They comprise the cam 58 angularly fixed to its splined drive shaft 31, but axially slidable with respect to same over the longitudinal splines or grooves 31' (FIG. 8) of said shaft 31 so as to allow for the displacement of the box 10.

Said cam 58 controls the rollers 59, 60 (FIG. 7) acting as tappet means and carried by the arms 61, 62 pivoted on 63, 64, said arms supporting the thermowelding jaws 65, 66.

Through operation of the arms 61, 62 the jaws 65, 66 are closed and opened. During the closing of same the tubular sheet 2 is thermowelded at the bottom of each bag since the temperature of the jaws is brought by means of electrical resistance to a value corresponding to the thermowelding temperature of the thermoplastic material making up the tubular sheet 2. To prevent the jaws from sticking to the tubular sheet 2, the sheet and the jaws will have two strips 43, 44 of carbon tetrafluoride or similar resin (see also FIG. 1) interposed therebetween and wound in a closed circle about the drums 53, 54 and the rollers 66, 68, 69, 70 which are mutually displaceable to adjust the tension of the strips so as to constitute two endless conveying means movable in the direction of the arrows 71, 72. Beside preventing the adhering or sticking of the thermowelding jaws to the tubular sheet said strips also have the main task of accompanying the thermowelded and hot portion of the tubular sheet 2 up to the cooling jaw contained in box 11.

In FIG. 7 there are indicated pressure adjusting means 73, pressure springs 74, connections 175 for the circulation of a fluid for cooling the supports of the thermowelding jaws and the protection arms 75, 76, 77, 78 illustrated in FIG. 11. These arms are provided for protecting the elastic strips 43, 44 from the thermal radiation of the thermowelding jaws when same are open (FIG. 10). Said protection arms are actuated by electromagnetic pistons 79, 80 (FIGS. 10, 12) which keep said arms open as indicated with dash line in FIG. 11 when the jaws 65, 66 effect the thermowelding operation and close them when the jaws open again.

Should the electromagnetic pistons 79, 80 fail to work a mechanical system of levers 81 (FIG. 11) receiving the movement from the members controlling the opening of the jaws 65, 66 will provide for the closing of the arms 75, 76, 77, 78 as illustrated in FIG. 11.

The cooling jaws in box 11 (FIG. 1) are quite similar to the thermowelding jaws in box 10 except that they are cooled by a cooling liquid instead of being thermoheated and that they do not have any protection jaws. Therefore they will not be described any further.

The transmission members of the box 12 comprise, as illustrated in FIG. 13, the transmission rollers 67, 68 for the conveying plastic strip 43, the transmission rollers 68, 70 for the conveying plastic strip 44 and the drum 42 (see also FIG. 16) which is provided with grooves adapted to receive just as many thin belts 83 (FIGS. 13 and 1) forming, as a whole, an elastic carpet adapted to receive the tubular sheet 2 moving thereon as it comes from the conveying strips 43, 44. The motion is imparted to the drum 42 by the splined shaft 33 (FIGS. 1, 16) over the two complementary wheels 85, 86 (FIG. 16).

The pulley 84 connected to the shaft of the wheel or gear 85 is adapted to receive a (nonrepresented) belt leading from a pulley 200 at the end of a cross-shaft 201 (FIG. 20) imparting a supplementary motion to the pair of rollers 116, 117 (FIG. 1) feeding the tubular sheet 2 on the belt carpet 83.

The axes of rollers 67, 70 (see FIGS. 13 and 17) are displaceable with respect to the ones of rollers 68, 69 to vary the tension of the conveying strips 43, 44 (FIG. 13). This is obtained by means of pivots 87, 88 which are eccentric with respect to the blocking bushes 89, 90 (see FIG. 17).

The members for introducing the straw into each bag and forming a part of box 13 (FIG. 1) comprise: a hopper 91 (FIG. 19) adapted to receive the straws 92 which, one by one, are made to fall by gravity through the passage 93.

The bottom of the passage 93 has a needle 94 (FIG. 18) placed thereon, said needle having its inner diameter corresponding to the outer diameter of each straw. The needle is fixed to a slide member 97 sliding within two guides.

The arm 98 actuates the slide member 97 over a bar 114 which provides for the introduction of the needle into the tubular sheet 2.

Operation takes place as follows:

The piston 95 is initially displaced completely to the left. A straw 92 coming down from the hopper 91 may therefore

enter into the needle **94** in front of the piston **95** driven by a cam. The lever **95** drives to the right the needle **94** together with the straw **92**, thereby perforating the tubular sheet **2** which is opened by an air jet coming from a side of the needle itself and blowing into a pocket portion suitable to receive the straw. The needle penetrates into the tubular sheet up to about one-fourth of its length. The introduction is effected by the compressed air acting on the piston **95** and displacing same completely to the right so that the straw penetrates into the pocket of the tubular sheet **2** while the needle **94** stays stationary.

After this operation has taken place, a further air jet acts on the piston **95** from the right to the left taking same back to its initial position while the lever **98** takes the needle back to the position suitable to receive a further straw. The needle has therefore to: to perforate the tubular sheet, provide for the opening of the pocket, penetrate for about one-fourth of its length into the pocket and guide the straw during its penetration into the said pocket.

FIG. **20** is a view of the cutting device in the box **14** (FIG. **1**). Same comprises the blade **100** carried by the slide **101** which is made to move on the whole width of the tubular sheet **2** by the arm **102** actuated by the link member **103** over the eccentric pivot **104** controlled by the flywheel **105** which receives its motion from the splined shaft **32** (compare with FIG. **1**).

At the moment of the cutting, the tubular sheet **2** is blocked by the pressure member **107** (FIG. **21**) actuated by the tappet means **108** over the cam **109** actuated by the shaft **110** which also receives the motion from the splined shaft **32**.

The grooved roller **111** (see also FIG. **1**) acts as transmission roller for the belts **83** forming the supporting and conveying surface for the tubular sheet **2**.

After having been cut, the bag is conveyed by the belts **83** up to a stop **112** (FIG. **1**) which sets a limit for the travel of the tubular sheet. From here the bag is automatically taken up by the filling machine which is not represented and the operations of which are synchronized with respect to the main drive shaft **24**.

I claim:

1. A machine for the manufacturing and the delivery of plastic bags of various lengths obtained from a flattened tubular sheet, said machine comprising:

a. feeding means for leading said flattened tubular sheet into said machine,

b. at least one pair of jaws for thermowelding said tubular sheet,

c. at least one pair of cooling jaws for the thermowelded portions,

d. a pair of endless conveying belts provided with transmission rollers and disposed for accompanying said tubular sheet during the travel thereof from said thermowelding jaws to said cooling jaws for preventing said thermowelded deformable portions of said sheet from being deformed,

e. transmission means,

f. mechanisms for introducing straws into said tubular sheet at each bag section,

g. means for cutting said bags, thereby separating said bags from each other,

said machine being characterized by the mechanisms controlling said means introducing said tubular sheet, said thermowelding jaws, said cooling jaws, said conveying means, said transmission means, said mechanisms for introducing said straw into said bag and said cutting means being located in separate boxes spaceable at different distances with respect to each other even during the operation of said machine in order to obtain bags of various lengths, and furthermore by said cutting means being disposed at the end of the travel of said tubular sheet so that each bag may be cut away from said tubular sheet after it had been finished with said straw introduced therein.

2. The machine as claimed in claim **1**, including gear means in certain of said boxes and a stationary rack, said gear means engaging said rack, said boxes being disposed to be displaced during the operation of said machine by rotation of said gear means and a plurality of eccentric members mounted on shafts, said eccentric members being actuated by said shafts and being disposed for locking said boxes in place.

3. The machine as claimed in claim **1**, and further comprising three splined shafts and a main drive shaft, two first ones of said splined shafts having gears, said main shaft driving said first two splined shafts, a slider crank mechanism on said main shaft disposed to drive said third splined shaft, said slider crank mechanism having a rack and gear teeth cut on said third shaft for intermittently driving said feeding means and said conveying means by an amount corresponding to the length of a bag; the amplitude of said intermittent motion being controlled by varying the eccentricity of said slider crank.

4. The machine as claimed in claim **3**, said slider crank mechanism comprising a flywheel and said rack comprising a connecting rod and a crank knob, said groove disposed for displaceably receiving said crank knob.

5. The machine as claimed in claim **1** comprising further a cam fixed rotatably on one of the two first splined shafts but axially sliding with respect thereto by virtue of said splines, said cam located in the box containing said thermowelding jaws, disposed for allowing for the displacement of said box, rollers operated by said cam and acting as tappet means, said rollers carried by arms pivoted at one of their ends, said cam controlling said thermowelding jaws, strips of heat-resisting carbon tetrafluoride being interposed between said thermowelding jaws and said tubular sheet to be welded and protection arms pivoted at one of their ends disposed for protecting said carbon tetrafluoride strips from the thermal radiation of said thermowelding jaws in the open position of the latter.

6. The machine as claimed in claim **5**, further comprising electromagnetic pistons, said pistons disposed for actuating said protection arms, said pistons also disposed for maintaining said arms open while said jaws being open, and a mechanical lever system disposed for being actuated by said cam controlling the opening of said thermowelding jaws and the closing said arms in the case of said electromagnetic pistons failing to operate.