Oct. 26, 1937. G. W. FRENCH 2,097,183

BAG MAKING MACHINERY

Filed May 15, 1936 2 Sheets-Sheet 1

Fig. 3.

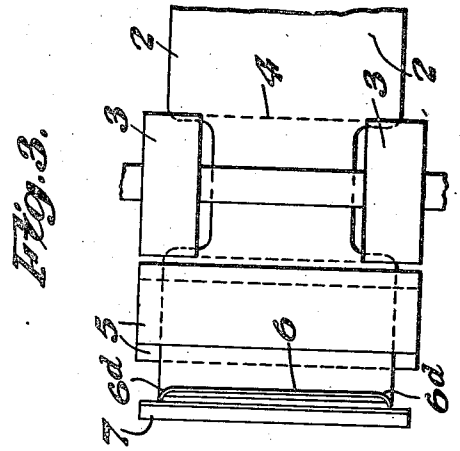
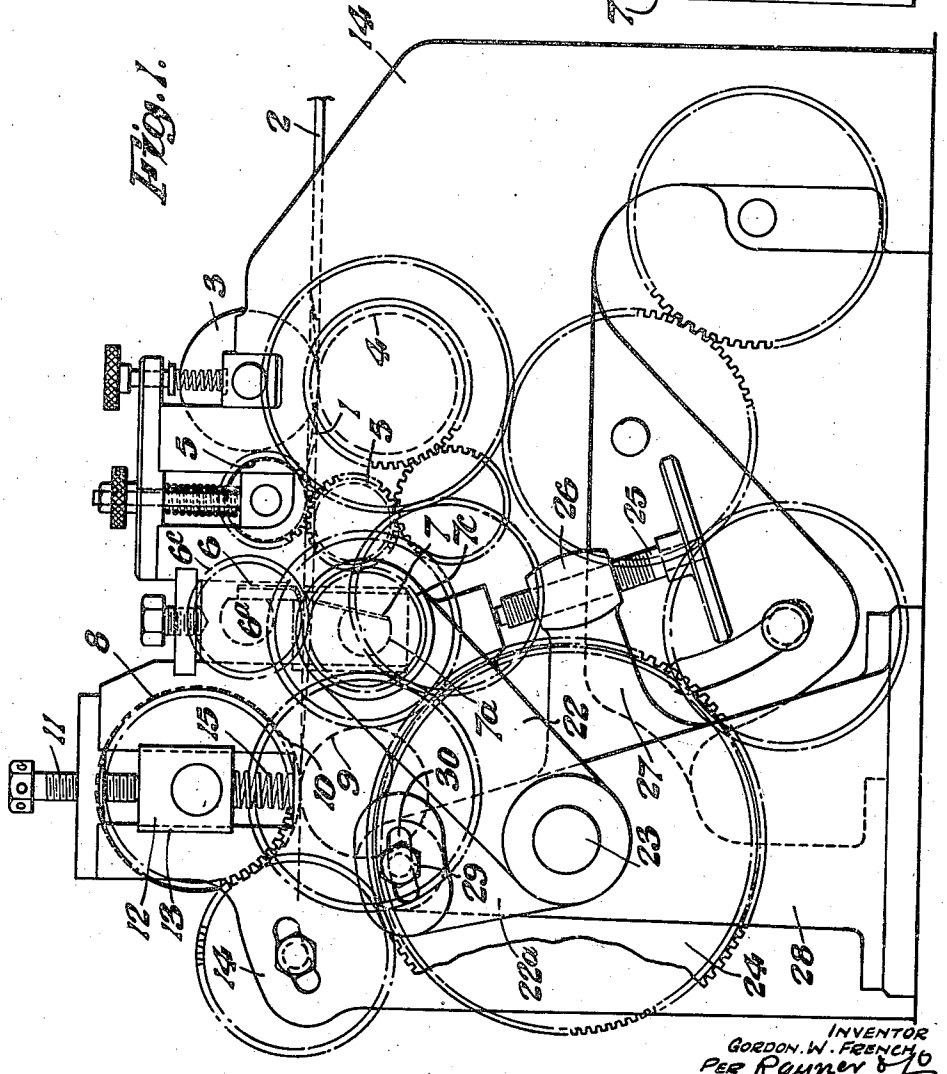


Fig. 1.



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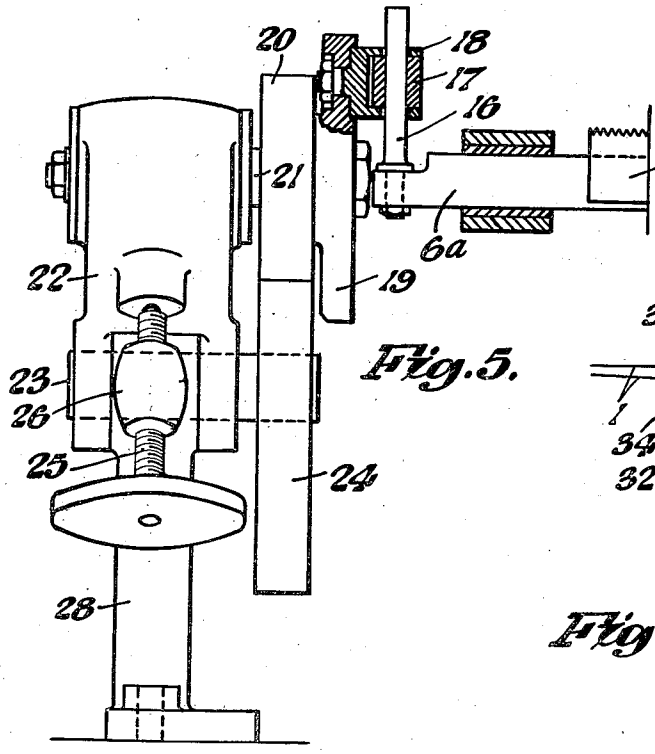


Fig. 5.

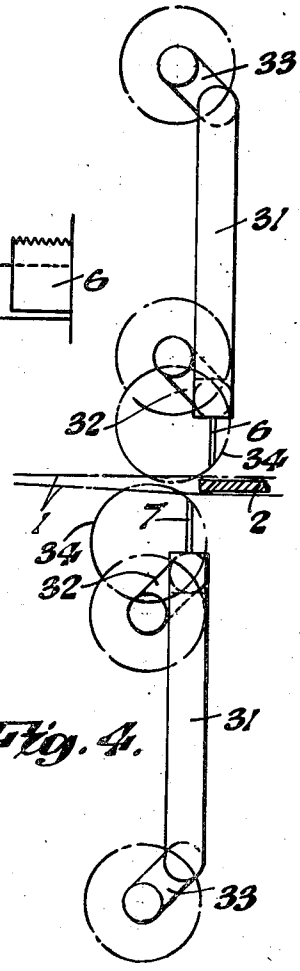


Fig. 4.

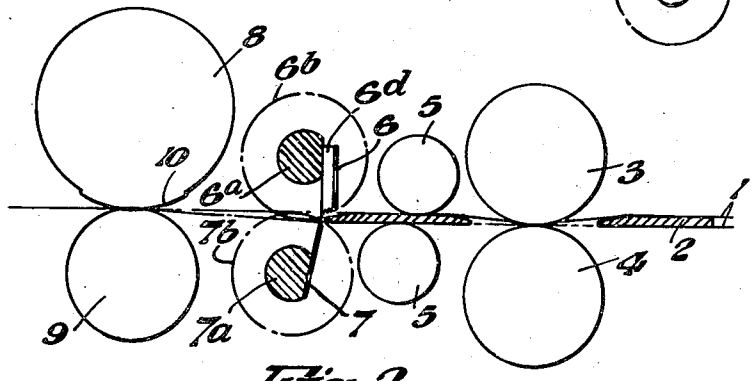


Fig. 2.

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UNITED STATES PATENT OFFICE

2,097,183

BAG MAKING MACHINERY

Gordon William French, Bristol, England

Application May 15, 1936, Serial No. 79,851
In Great Britain May 21, 1935

8 Claims. (Cl. 93—33)

This invention comprises improvements in and relating to machinery for making bags from paper, transparent or translucent viscose materials or the like.

In the present method of cutting tubular sheet material into predetermined lengths for the purpose of making bags and the like it is customary to form the sheet material into flattened tubular form by feeding it round a former plate, located between the two axes of feeding rollers, the bottom roller being continuous, and the top roller consisting of two separate portions or treads mounted on a shaft, the plate having a restricted or neck portion to clear these treads. Sheet material fed over said plate is gripped between the top treads and bottom roller and has two edges imparted to it. The end of the former or guide plate from which the sheet material passes is shaped to act as a cutter plate, for example by being bevelled and serrated, and slightly in rear of and narrowly spaced upon this cutting edge is what is known as a breaker plate, also having a serrated shearing edge, the arrangement being that what is known as a beater arm is moved across the plane of travel of the sheet material near to the shearing edge of the former or guide plate so as to break or tear the tubular sheet material along the two shearing edges of the said plates, which, being set one in advance of the other, imparts a stepped severance to the flattened tube of material.

This method of severance, although satisfactory for paper, is quite unsuitable for transparent viscose materials of the type known by the registered trade name "Cellophane" or the like, as the act of striking off the material against the serrated plates produces splits and cracks in the material. The object of the present invention is to provide means for effecting a stepped severance of the flattened tube of material without producing the serrated and torn edges associated with the use of a beater arm.

According to this invention the opposite sides of the flattened tube of paper, transparent or translucent viscose or other suitable material are each severed separately by individual knives or cutting blades adapted each to cut through the material at the required position to provide a severance of the flattened tube of material.

A practical embodiment of this invention can be summarized as consisting in the provision of a pair of cutting knives, one located above and one below the track of the tubular sheet material, means for moving said knives towards and away from the opposite sides of the tubular sheet material to individually shear opposite sides of the sheet material and means moving the cutting edges of said knives substantially synchronously with and in the direction of movement of the sheet material immediately succeeding the shearing operations.

One knife or cutting blade may be suitably shaped to provide an arcuate V shape or other form of cut in one side of the flattened tube. The knives or cutting blades preferably have a motion imparted to them in the same direction as the movement of the flattened tube of material during the actual cutting operation in addition to a motion substantially transverse to the direction of movement of the flattened tube of material which effects the actual severance.

Each of the knives or cutting blades is so mounted and operated that it will rotate about an axis so that during its rotation the path of the outer end of each knife or cutting blade will intersect the path of travel of one of the two sides of the tube of sheet material. The direction of rotation of the two knives or cutting blades is such that during the period of intersection with the two sides of the tube of sheet material and whilst the severance of this sheet material is being effected the knives or cutting blades will travel in the same direction as the sheet material and the rate of rotation of the cutters will be so arranged that the cutting edges of the knives or cutting blades will move at approximately the same rate as the sheet material upon which they are operating.

In a preferred form of this invention two knives or cutting blades may be each mounted to rotate about an axis and these knives or cutting blades are mounted on opposite sides of the tubular sheet of material and are arranged to rotate in opposite directions to each other and are so positioned that each knife or blade will intersect with and cause a severance of one side of the sheet of tubular material and will at the point of intersection be travelling in the same direction and approximately at the same speed as the sheet of tubular material upon which they operate. The axis of revolution of one knife or cutting blade is preferably off-set from the axis of revolution of the other knife or cutting blade by an amount approximately equal to the step to be produced in the severance of the tube of sheet material. The knives or cutting blades are preferably located so that the point at which the knives or blades commence the severance of the sheet material is close to the end of the former plate.

In order that my invention may be clearly

understood and readily carried into effect I have appended hereto 2 sheets of drawings somewhat diagrammatically illustrating embodiments thereof, and wherein:—

Fig. 1 is a side elevation showing a suitable arrangement of gearing at the shearing end of a bag making machine.

Fig. 2 is a diagrammatic side elevation showing the relative positions of cutters, former plate and feeding rollers.

Fig. 3 is a plan view of Fig. 2.

Fig. 4 is a detail side elevation view showing an alternative form of mechanism for operating the cutters, and

Fig. 5 is a detail end elevation view of a suitable form of mechanism for adjusting the rate of travel of the cutting edges of the knives to correspond with the rate of travel of the sheet material to enable bags of varying depth to be produced on one machine.

Referring to the drawings the tubular sheet material to be cut into lengths is indicated by the reference numeral 1 and is fed flattened sleeve fashion over a former plate 2 of H configuration in plan so as to produce a central neck to enable the sheet material to be gripped between a pair of upper rollers 3 and a lower cylinder or roll 4 disposed beneath the former plate 2. A pair of steadying rolls 5 bear against the sheet material between the front or cutting end of the former plate 2 and the feed rolls 3 and 4 to maintain the sheet material in close contact with the former plate immediately before reaching the cutting stage.

The cutters comprise an upper knife 6 and a lower knife 7, the ends of the upper knife 6 conveniently being bowed as at 6*d* (see Fig. 3) to form the corners of a narrow flap adapted to be folded over the edge produced by the knife 7 to effect a closure of each bag.

A pair of draw-off rolls 8 and 9, upper and lower respectively, are arranged in front of the cutting stage adapted to receive between them the leading edges of the successively severed lengths of sheet material and to draw them and deliver them to a suitable stacking zone. These rolls 8 and 9 serve to exert the requisite tension on the material as it is about to be cut, this tension being released considerably during the predominating portion of the feeding stage of each severed strip. For this purpose the upper roll is for a short portion of its circumference slightly increased in diameter to provide a projection 10 which bears against the sheet material immediately preceding and during the cutting stage, consequently the sheet material is momentarily placed under increased tension as it leaves the former plate 2 during the cutting stage.

The pressure of the roller 8 upon the sheet material can be regulated by a pair of screws 11 engaging bearing blocks 12 supporting the ends of the shaft of the roller and arranged in guides 13 formed on a machine frame 14, coiled compression springs 15 yieldingly opposing the adjustment of the blocks 12 in well known manner.

The cutting edges of the knives or blades 6 and 7 may be either continuous or serrated or undulating in form. In order to provide the maximum support for the material during severance the former plate 2 may be extended into or beyond the path swept out by the cutting blades. Grooves or slots would then be provided in the former plate to clear the projecting teeth in the blades.

Each knife or cutting blade is preferably mounted upon a suitable rotary holder supported in bearings and adapted to rotate therein in the required direction and at the desired speed. The knives or cutting blades are so mounted in these holders that their outer or cutting edges rotate about circular paths (indicated by the dotted line 6*b* and 7*b*) so that they will intersect with one side of the tube of sheet material but not with the other side. The knives or cutting blades are arranged so that at the first point of contact with the tube of sheet material the cutting edges will be presented to this material approximately at right angles to the surface of the material upon which they will act to effect a severance thereof as shown in Fig. 2. For this purpose the blades may conveniently be mounted on flats formed on shafts 6*a* and 7*a* so that they lie tangentially to a circle concentric with the axis of rotation and this circle may in some cases be of a radius approximately equal to one half of the radius about which the cutting edge rotates. This arrangement of the knives or cutting blades is intended to present the cutting edges thereof to the material to be severed so that during the act of severance the knives or cutting blades penetrate the material with a motion approximately at right angles to the plane of the material and at the same time follow the forward motion of the material.

Suitable means are provided whereby bags of different depth may be cut on the same machine by varying the rate of feed of the sheet material. At the same time the speed of the knives at the moment of impact with the sheet material must approximate to the speed of the material, consequently means is provided whereby the peripheral speed of the cutting edges of the knives can be uniform or can be adjustable to various degrees of non-uniformity. One method of effecting this desideratum is shown in Figs. 1 and 2 in which the shafts 6 and 7 rotating on fixed axes are geared together by gear wheels 6*c* and 7*c* so that they travel at the same speed. The shaft 6*a* which is supported at both ends in bearings (one of which is indicated in Fig. 5) has radiating relatively fixedly from one end a pin 16 which acts as a crank and slidable thereon is a collar 17 located in a forked bracket 18 extending unilaterally from a disc 19 which is fixed on the shaft 21 of a gear wheel 20. This shaft 21 is carried in a bearing at the upper and free end of an arm 22 radiating from and adjustable about the axis of a shaft 23 carrying a gear wheel 24 with which meshes the beforementioned gear wheel 20.

The adjustment of the arm 22 is effected by a set screw 25 threaded through a boss 26 at the free end of a bracket 27 extending from a fixed pedestal 28 carrying the bearing for the shaft 23. The upper end of this pedestal has passed through it a bolt 29 which also passes through an arcuate slot 30 in a lug 22*a* formed on the adjustable arm 22 whereby the latter may be secured in selected position.

When the knife shaft 6*a* is co-axial with the shaft 21 its rate of revolution is uniform but if the arm 22 is adjusted so as to displace the axis of the shaft 21 relatively to the axis of the knife shaft 6*a* the collar 17 will slide along the pin 16 during rotation of the disc 19 resulting in the rate of revolution of the shaft 6*a* being variable for each complete revolution, its maximum speed being when the collar 17 is furthest from the axis of the shaft 6*a*.

By means of the foregoing the mean speed

of the shafts 6a and 7a can be infinitely varied to enable the machine to be set to cut variable lengths of bags, whilst at the same time a constant relationship of rate of feed of the sheet material and speed of knives during the cutting stages can be maintained. In conjunction with this arrangement the roller 8 is mounted so that it can be removed and replaced with a roller having a diameter and dimension of projection 10 appropriate to the requirements of the setting of the machine for the desired size of bag.

An alternative mechanism for operating the knives 6 and 7 is shown in Fig. 4 in which each knife or blade is mounted in a suitable holder 31 which is supported parallel link fashion by a pair of cranks 32 and 33 in such a manner that when the cranks are turned about their axes the appropriate cutting knife or blade will be caused to rotate about a circular path indicated by the dotted line 34 whilst maintaining the cutting edges of the blades presented toward the opposite walls of the flattened tube of material. The two knives or blades are arranged upon opposite sides of the former plate and the path of travel of the cutting edges of the knives or blades is such that during their movement they will intersect the path of travel of the respective walls of the flattened tube of material 1 whilst the knives or blades are travelling in the same direction and at approximately the same speed. The curved path of movement of the knives or blades will cause their edges to effect the cutting or severing operation whilst they are moving in the same direction as the flattened tube of material, and when the cutting operation has been effected the cutting edge of the knife or blade will be withdrawn and the continuation of its rotary movement will bring it back to its original position to effect the next cutting operation after the desired length of tubular material has been fed over the end of the former plate. Any other suitable form of mechanical motion may be employed to impart to the knives or blades the combined reciprocating motion in a direction substantially at right angles to the direction of travel of the tube of flattened material and also in a direction and at a speed corresponding substantially with the direction and rate of movement of the tube of flattened material during the actual cutting operation. If desired the position of the two knives or blades may be adjustable relatively to each other so as to vary the distance between the cut or severed edges of the two walls of the flattened tube of material. Interchangeable knives or blades may be provided to enable the effective shape of the cut edge to be varied or to adapt them for use upon different types of material.

The arrangements described above comprise a simple construction and application of my invention and forms an efficient, practical, and cheap method and means for effecting the separate severance of the two sides of a tube of sheet material and also enables a stepped severance of the material to be effected. If desired the position of the axis of rotation of one or both cutters relatively to the other or to the former plate may be adjustable.

I claim:—

1. In a paper bag making machine in which tubular sheet material is fed in a substantially flat condition over a former to a cutting zone for cutting it into lengths, the provision of a pair of cutting members one of which is adapted to shear one side of the tubular sheet material and one the other side, means for rotating the cutting edges of said knives in circular paths one above and one below the track of the sheet material, said track being substantially tangential with both of said circular paths and in a direction complementary to the direction of rotation of said cutting edges, said means comprising parallel link motion devices supporting said cutting members and adapted to impart movement to the cutting edges simultaneously towards opposite sides of the sheet material in circular paths in opposite directions and complementary to the direction of travel of the sheet material.

2. In a paper or like bag making machine, a former plate, means for feeding tubular sheet material along said former plate, a pair of cutters located one above and one below and in juxtaposition to one end of said former plate, means for drawing off the sheet material from said former, and means moving said cutters substantially simultaneously against opposite sides of said tubular sheet material whereby the cutters individually sever opposite sides of the tubular sheet material, and means effecting variations in the shearing intervals in relation to a predetermined rate of feed of the sheet material, said latter means comprising a shaft rotatable on a fixed axis and adapted to impart rotation to both cutting members, a rotary driving member, a collar carried by said rotary member unilaterally in relation to its axis, a radial pin fixed to one end of said shaft engaged slidably in said collar, said rotary member being carried by an angularly adjustable arm.

3. In a paper or like bag making machine, a former plate, means for feeding tubular sheet material along said former plate, a pair of cutters located one above and one below and in juxtaposition to one end of said former plate, means for drawing off the sheet material from said former, means moving said cutters substantially simultaneously against opposite sides of said tubular sheet material whereby the cutters individually sever opposite sides of the tubular sheet material, and means effecting variations in the shearing intervals in relation to a predetermined rate of feed of the sheet material, and means momentarily increasing the tension of the tubular sheet material during the engagement of the knives or cutting members with opposed sides of the sheet material, said latter means comprising a draw-off roll and another roll between which is gripped the sheet material after passing over the former plate or through the cutting zone, said draw-off roll being formed with a portion of its periphery slightly greater in diameter than the remainder of its periphery adapted to engage with the sheet material immediately in advance of and during the cutting stage.

4. In a paper or like bag making machine, a former plate, means for feeding tubular sheet material along said former plate, a pair of cutters located one above and one below and in juxtaposition to one end of said former plate, means for drawing off the sheet material from said former, means moving said cutters substantially simultaneously against opposite sides of said tubular sheet material whereby the cutters individually sever opposite sides of the tubular sheet material, means effecting variations in the shearing intervals in relation to a predetermined rate of feed of the sheet material, means effecting a rate of movement of the cutting edges during the cutting stage which is constant in relation to the predetermined rate of feed of the sheet material,

and means momentarily increasing the tension of the tubular sheet material during the engagement of the knives or cutting members with opposed sides of the sheet material, said latter means comprising a draw-off roll and another roll between which is gripped the sheet material after passing over the former plate or through the cutting zone, said draw-off roll being formed with a portion of its periphery slightly greater in diameter than the remainder of its periphery adapted to engage with the sheet material immediately in advance of and during the cutting stage.

5. In a paper bag making machine in which tubular sheet material is fed in a substantially flat condition over a former to a cutting zone for cutting it into lengths, the provision of a pair of cutting members one of which is adapted to shear one side of the tubular sheet material and one the other side, means for rotating the cutting edges of said knives in circular paths one above and one below the track of the sheet material, said track being substantially tangential with both of said circular paths and in a direction complementary to the direction of rotation of said cutting edges, means for supporting the material with its two sides spaced apart at the cutting zone for an appreciable distance on at least one side of the path of the cutting edge of each cutting member, the movement of the cutting edges of the cutting members in the direction of movement of the material being substantially equivalent to the speed of travel of the material during the actual cutting operation and means for applying additional tension on the material to hold it taut whilst the cutting members are severing the material.

6. In a paper bag making machine in which tubular sheet material is fed in a substantially flat condition over a former to a cutting zone for cutting it into lengths, the provision of a pair of cutting members one of which is adapted to shear one side of the tubular sheet material and one the other side, means for rotating the cutting edges of said knives in circular paths one above and one below the track of the sheet material, said track being substantially tangential with both of said circular paths and in a direction complementary to the direction of rotation of said cutting edges, means for supporting the material with its two sides spaced apart at the cutting zone for an appreciable distance on at least one side of the path of the cutting edge of each cutting member, the movement of the cutting edges of the cutting members in the direction of movement of the material being substantially equivalent to the speed of travel of the material during the actual cutting operation, and means momentarily increasing the tension of the tubular sheet material during the engagement of the knives or cutting members with opposed sides of the sheet material, said latter means comprising a draw-off roll and another roll between which is gripped the sheet material after passing over the former plate or through the cutting zone, said draw-off roll being formed with a portion of its periphery slightly greater in diameter than the remainder of its periphery adapted to engage with the sheet material immediately in advance of and during the cutting stage.

7. In a paper bag making machine in which tubular sheet material is fed in a substantially flat condition over a former to a cutting zone for cutting it into lengths, the provision of a pair of cutting members one of which is adapted to shear one side of the tubular sheet material and one the other side, means for rotating the cutting edges of said knives in circular paths one above and one below the track of the sheet material, said track being substantially tangential with both of said circular paths and in a direction complementary to the direction of rotation of said cutting edges, said last mentioned means including a driven gear wheel, a pinion in mesh with said gear wheel, means to adjust the axis of the pinion around the axis of the gear wheel, a spindle connected to the cutting members for driving said members, and a sliding and pivoting connection between the spindle and said pinion.

8. In a paper bag making machine in which tubular sheet material is fed in a substantially flat condition over a former to a cutting zone for cutting it into lengths, the provision of a pair of cutting members one of which is adapted to shear one side of the tubular sheet material and one the other side at the cutting zone, a fixed former the front edge of which is spaced a short distance rearwardly of the cutting zone so that the sides of the material are held apart at the cutting zone by the former in the absence of any element between the sides at the cutting zone, means for rotating the cutting edges of said knives in circular paths one above and one below the track of the sheet material, said track being substantially tangential with both of said circular paths and in a direction complementary to the direction of rotation of said cutting edges.

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