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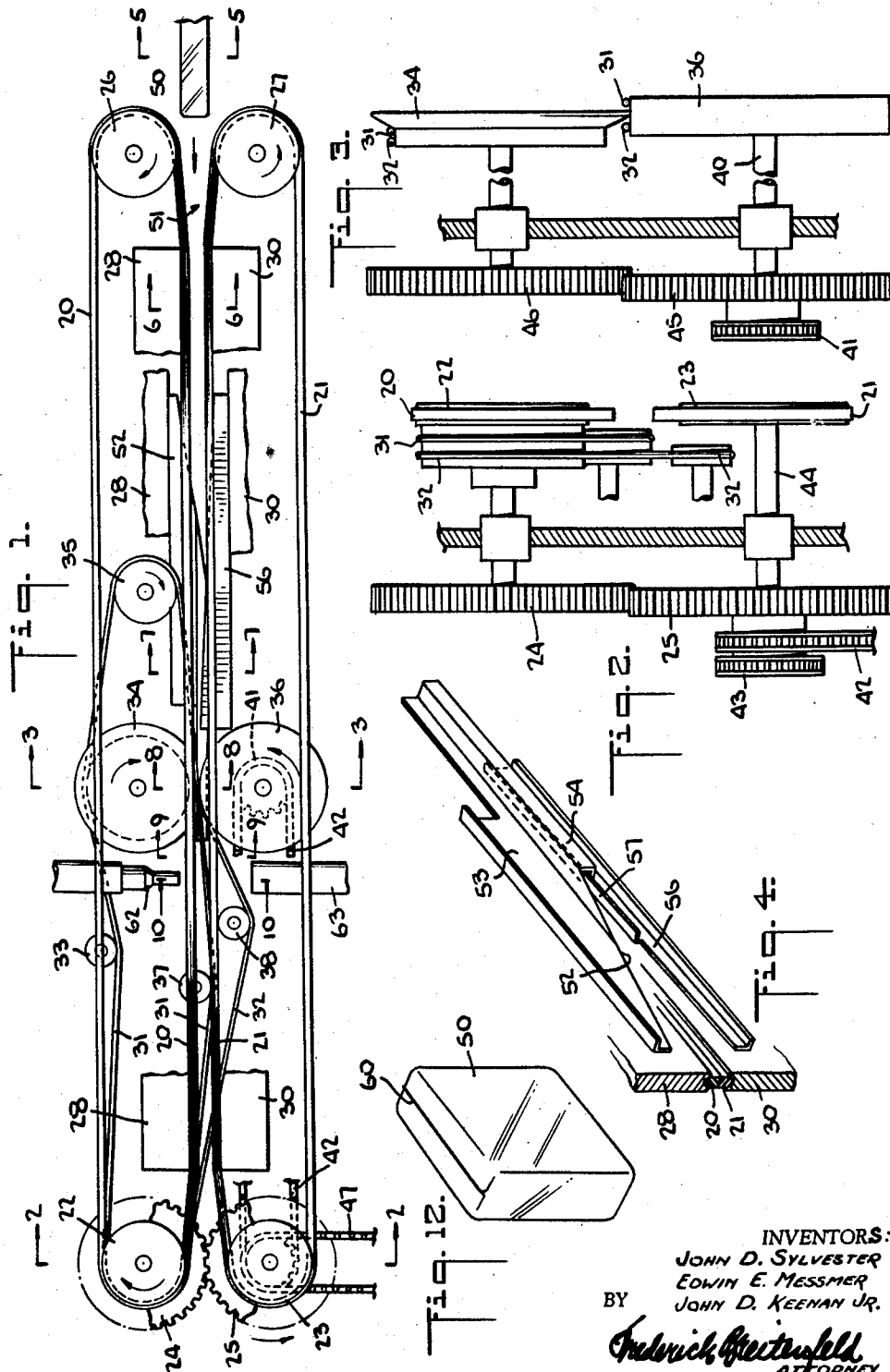
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MACHINE FOR FORMING EDGE SEAL CLOSURES ON BAGS

Filed March 19, 1958

2 Sheets-Sheet 1



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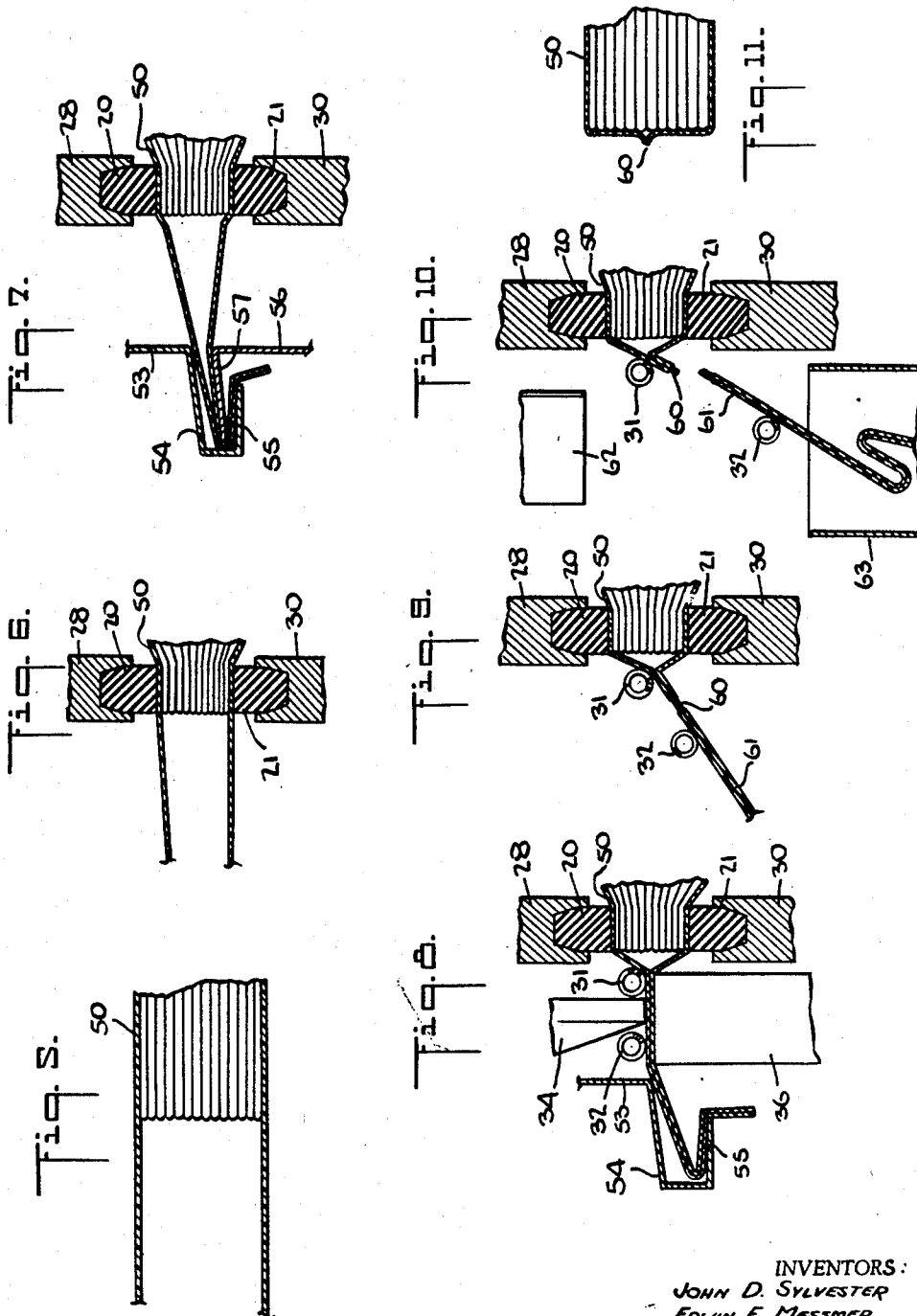
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MACHINE FOR FORMING EDGE SEAL CLOSURES ON BAGS

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7 Claims. (Cl. 53—373)

This invention relates generally to heat-sealing procedures and apparatus, and has particular reference to the formation of an edge seal closure on a heat-sealable bag containing merchandise.

The term "bag" as used herein is intended to include within its significance any container defined by opposed walls of heat sealable material softenable under heat, whether or not the container be originally in the form of a tube open at one or both ends, or a sheet wrapped around the merchandise and sealed to form a tube-like enclosure at the time of wrapping.

It is a general object of the invention to provide an improved rotary sealing machine of the kind in which the opposed walls of the bag are advanced to and through the nip of a pair of complementary rollers at least one of which has a heated attenuated edge.

An edge seal closure is one in which the two walls of the bag are bonded together along a line which defines the edge of the sealed container. It is a more particular object of the invention to provide a mode of procedure, and an apparatus, whereby such an edge seal closure can be formed more closely adjacent to the filled region of the bag than has been possible heretofore. The invention is of particular utility in the packaging of merchandise of resiliently compressible character such as pajamas, shirts, napkins, and other articles having similar characteristics of yieldability.

Since it is not feasible to bring together and seal the extreme edges of the two walls of a bag opening, it is desirable in practice to engage the bag along a region somewhat spaced from the edges of the opening. It is a feature of this invention to provide for the engagement of the bag along a margin of the filled region itself and for moving the bag toward and past the sealing station so that the mouth region of the bag will be pinched between the sealing rollers along a sealing line as closely and snugly alongside the filled region as possible. Other special means are provided for coping with and ultimately disposing of the excess margin or skirt lying beyond the sealing line, and for shielding the filled region of the bag from undesired contact with the heated edge of the sealing roller.

The improved mechanism involves the provision and arrangement of parts whereby the desired results can be achieved in a commercially practical and reliable manner. A particular feature resides in the provision of a special shielding element adjacent and tangent to the heated roller edge, interposed between the latter and the filled region of the bag. Preferably the shielding element is in the form of a heat-resistant belt guided around pulleys positioned in advance of and beyond the sealing point, respectively.

These general objectives and advantages may be achieved, and the benefits of the improved method attained, in the manner illustratively exemplified in the accompanying drawings, in which:

Figure 1 is a side view of an apparatus embodying the features of the invention;

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Figure 2 is a cross-sectional view along line 2—2 of Figure 1, showing the various belt pulleys and the gears which drive them;

Figure 3 is a cross-sectional view along line 3—3 of Figure 1, showing the rollers which perform the sealing operation;

Figure 4 is perspective view of a part of the machine which collects and folds the open ends of the bags prior to sealing;

Figures 5 to 10, inclusive, are enlarged fragmentary cross-sectional views along correspondingly-numbered lines of Figure 1, showing the successive actions of the machine upon the package;

Figure 11 is a partial cross-sectional view of a finished package; and

Figure 12 is a perspective view of the finished package.

The machine chosen for illustration is mounted on supporting framework (not shown in Figure 1), which includes bearings for several of the shafts and a source of driving power which may be an electric motor. Two endless conveyor belts 20 and 21 are mounted on a system of pulleys, including the pulleys 22 and 23 geared together by gears 24 and 25 to run in synchronism. The pulleys 26 and 27 at the other end of the machine hold the belts in tension and direct their course. At the central portion of the machine the belts pass through grooved channels formed in plates 28 and 30. The belts 20 and 21 are preferably made of non-slip material such as leather, plastic, or a rubber-cloth composition.

The belts may be adjusted by any appropriate means (not shown) to bring the adjacent laps at the center of the machine, which are advancing in unison, closer together or farther apart. Depending upon the nature and size of the containers to be sealed, and the merchandise filling them, the belts 20, 21 may be brought together to engage each filled bag between them, the engagement being along a marginal area of the filled region of the bag. Where the contents is resiliently compressible, as in the illustrated example, the belts may be brought together to any desired degree to squeeze the opposed bag walls and the enclosed merchandise to a temporarily reduced thickness. Under certain circumstances (e.g. where the filled bag is relatively thin) it may be satisfactory to employ only one of the conveyor belts (the one lying beneath the bag) to engage the bag and advance it.

The function of the conveyor belts is primarily to move the bags successively to and past a sealing station, but if compression of the bag during this advance is desirable the belts perform this additional function as well.

The sealing operation is performed by a pair of wheels or rollers 34 and 36 at least one of which has a heated attenuated edge. In the illustrated device, the roller 34 has this heated edge. The wheel as a whole or the narrowed edge is heated by any known appropriate means, such as electric heating coils (not shown). The relatively flat-rimmed wheel or roller 36 is not heated. The rollers are arranged in tangential contact and rotate to define a nip between which the bag walls to be sealed are moved. The travel of the bags is along a direction lying in the plane of rotation of the rollers 34, 36, i.e., along the line of the seal which is created as the superposed bag walls move through the point at which the sealing rollers come together.

The roller 36 is driven by shaft 40, coupled to a sprocket wheel 41 which is turned by a chain 42 meshing with another sprocket wheel 43 secured to shaft 44 on which is mounted wheel 23 and gear 25. Sealing wheels 36 and 34 are coupled together by a pair of gears 45 and 46 which insure that the peripheries of wheels 34 and 36 move together without a slipping motion. All the chains, wheels, and belts are moved by a power chain 47 which is coupled to an electric motor (not shown).

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The plastic containers or bags 50 shown in the accompanying figures are first filled and then entered into the machine successively by placing them in contact with belts 20, 21, at a position 51 where the belts converge and compress the material in each bag as it is engaged (see Figures 5 and 6). The engagement is along a margin of the filled region. The bags are usually of a generally rectangular shape, as indicated in Figures 1 and 12, and composed of heat sealable material such as polyethylene or similar plastic. As the belts move the containers toward the sealing position, the extending walls of the mouth region of each bag are brought into contact with the sloping edge 52 of a deflector plate 53 secured to plate 28. Deflector plate 53 includes angular bent-over portions 54 and 55 which cooperate with a second deflector plate 56 having a bent-over portion 57 which extends into the space formed by portions 54 and 55. The deflector plates 53 and 56 with their bent-over portions engage the excess container material and form it into a fold (Figure 7), thereby making it easier to handle during the sealing operation and during the subsequent removal of the excess material.

As illustrated in Figures 6 to 10, belts 20 and 21 are each formed with a flat outward surface which is best designed to grasp and retain the bags. The inner surfaces of belts 20 and 21 are formed with angular surfaces which are adapted to be grasped by power pulleys 22 and 23 but which will slide easily in the grooves in plates 28 and 30.

It is important that inadvertent contact between the projecting mouth region of the bag, i.e., the excess skirt lying beyond the sealing line, and the heated roller 34 be prevented, because of the great tendency of heat-softened material to adhere to a heated surface. To achieve this, a shielding element is provided which is tangential to the heated roller at the sealing point and in a position at one side of the heated edge whereby it bears against the projecting skirt and maintains it in its straight-line travel.

The shield is preferably in the form of a belt 32, and this belt may advantageously be made of steel wire wound in a helix similar to a spring. It extends around pulleys hereinafter to be described, located in advance of and beyond the sealing point, respectively.

The engagement of the bag along the margin of the filled region makes it possible to perform the sealing operation along a line closely alongside of the filled region. A special shield is required, however, between the filled region of the bag and the heated roller 34. This shielding element is similar to the belt 32 and lies on the opposite face of the heated roller edge. It is adjacent to and tangential to the roller 34, and performs several functions. Not only does it shield the filled part of the bag from contact with the heated roller edge, but it presses down upon the bag wall and thus helps to form the seal in the closest possible relation to the contents of the bag. Moreover, and of primary importance, is the fact that as the bag walls emerge from between the rollers, in heat-sealed but momentarily softened condition, it prevents the wall which was in direct contact with the heated roller edge from deviating from a straight-line direction of travel. Such deviation is induced by adhesion of the wall to the heated roller edge, and tends to re-open the seal that has just been formed. The shielding element prevents this from happening.

The shield is preferably in the form of a coiled steel wire belt 31, similar to the belt 32.

The shielding belts 31 and 32 are engaged by pulley 22 and powered by it. Both belts run under an idler 33, then over a flat part of sealing wheel 34, a second idler wheel 35, and to the flat-rimmed surface of sealing wheel 36 (see Figure 3). After leaving the sealing wheel 36, the belt 31 passes under a third idler 37 and back to pulley 22 while the belt 32 passes under idler 38 and then back to power pulley 22.

As illustrated in Figure 9, the sealed line 60 is about

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midway between the two belts 31, 32. Beyond this line is the skirt or strip of excess material 61 which lies generally under belt 32. When the container is free and clear of the sealing wheels, but with the seal still in a softened condition, it passes under a nozzle 62 which directs a stream of compressed air downwardly into a chute 63. The stream of compressed air is strong enough to tear the excess material from the bag 50 and carry it through the chute 63 to a container (not shown) below the machine. The separation of the excess material 61 from the sealed edge 60 is aided by belt 32 which continues to force the excess material downwardly toward the open end of the chute.

The container 50 is still held in compression by belts 20, 21, as illustrated in Figure 10, and this condition is maintained until the bag approaches the ends of plates 28, 30, thereby permitting the sealed edge 60 to cool to room temperature and regain its original strength. As the containers emerge adjacent to pulleys 22, 23, the belts 20 and 21 diverge and permit the material within the bag 50 to expand and partially regain its former shape. When the material within the bag expands, the folded portion near the sealed edge is unfolded and presents a substantially plane surface. The finished bag is illustrated in Figure 12 and has the end seal closure 60 lying at one side of the container in snug adjacency to it. This makes a highly attractive and commercially practical package.

The invention has been described and illustrated in connection with a bag filled with a resilient compressible commodity. Some of the features of the invention are not restricted to a deliberate compression of the package as a whole between the conveyor belts. For example, products consisting of discrete particles, such as nuts, coffee beans, and the like may be packed in plastic containers, introduced into the machine, and the containers sealed. In such cases there is no subsequent expansion of the packed material to bring the seal closed to the end edge, but with discrete particles in the container this feature is not so important. The advantages of the invention in these applications are that the product is prevented from coming in contact with the heated sealing wheel, and there is no excess material remaining on the container.

The machine has also been described and illustrated in a position which places sealing wheels 34, 36 in a vertical plane, and while this is the preferred position for sealing compressible materials, the entire machine may be operated on its side or in an oblique disposition, so that the sealing wheels 34, 36 lie in an oblique or horizontal plane. The latter position may be used when sealing containers holding discrete particles.

The treatment of the filled containers as described above, although preferably carried out with the aid of apparatus of the character illustrated, may nevertheless be performed by other apparatus or by separate pieces of mechanism. For example, some of the operations which have been described above as performed by machine components may be performed by hand, such as the compression of the material within the container or the removal of the excess material after sealing.

The apparatus herein described and illustrated has proven satisfactory on a continuous production basis, operating reliably over long periods of time at sealing speeds up to and exceeding 1,000 inches per minute.

It is to be understood, of course, that many of the details herein described and illustrated may be modified by those skilled in the art without necessarily departing from the spirit and scope of the invention as expressed in the appended claims. It is therefore intended that these details be interpreted as being merely illustrative.

What is claimed is:

1. In a heat-sealing machine adapted to form an edge-seal closure on a heat-sealable bag containing merchandise, a heat-applying means comprising a pair of tangentially

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arranged rollers one of which has a heated attenuated edge, means for engaging the bag along the margin of its filled region and moving it toward and past said rollers so that the mouth region of the bag will be pinched between said rollers along a sealing line closely alongside said filled region, and a shielding element adjacent and tangent to said heated roller edge between the latter and the filled region of the bag, to shield the latter from the heat of said roller.

2. In a heat-sealing machine, the elements defined in claim 1, said shielding element being a heat-resistant belt, means for guiding said belt around pulleys positioned in advance of and beyond the sealing point, respectively, and means for advancing said belt at substantially the same speed as the bag.

3. In a heat-sealing machine, the elements defined in claim 1, said bag-engaging means comprising a conveyor belt mounted for movement in the direction along which the seal is to be made.

4. In a heat-sealing machine, the elements defined in claim 1, said bag-engaging means comprising a pair of opposed conveyor belts mounted for movement in unison in the direction along which the seal is to be made, said belts being positioned to engage the bag between them.

5. In a heat-sealing machine, the elements defined in claim 1, said bag-engaging means comprising a pair of opposed conveyor belts mounted for movement in unison in the direction along which the seal is to be made, said belts being positioned to engage the bag between them and to compress the engaged margin of the filled region of the bag.

6. In a heat-sealing machine adapted to form an edge-

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seal closure on a heat-sealable bag containing merchandise, a heat applying means comprising a pair of tangentially arranged rollers one of which has a heated attenuated edge, means for engaging the bag along the margin of its filled region and moving it toward and past said rollers so that the mouth region of the bag will be pinched between said rollers along a sealing line closely alongside said filled region, a first shielding element adjacent and tangent to said heated roller edge on one side of the latter to shield said mouth region of the bag from said heated roller, and a second shielding element adjacent and tangent to said heated roller edge on the opposite side of the latter to shield the filled region of the bag from the heat of said roller.

7. In a heat-sealing machine, the elements defined in claim 6, said shielding elements comprising heat-resistant belts arranged adjacent to the sealing line along the path of travel immediately preceding and following the point of tangency of said rollers, and means for advancing said belts at substantially the same speed as the bag.

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