

April 30, 1968

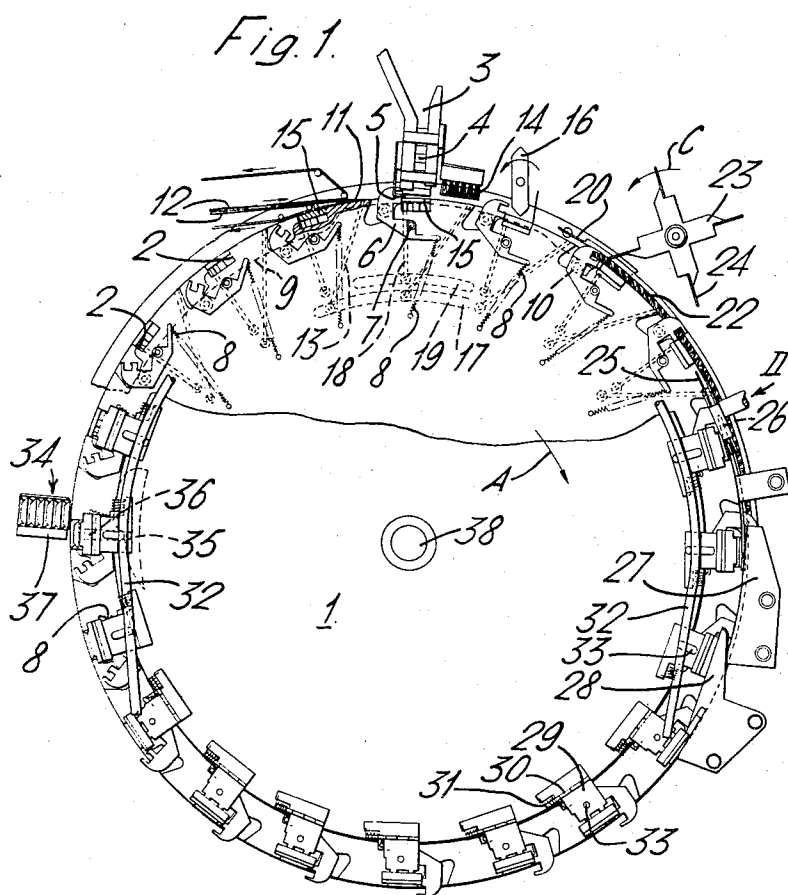
D. H. YOUNGMAN ETAL

3,380,227

PACKING OR WRAPPING MACHINE OF THE MOULD WHEEL TYPE

Filed Feb. 4, 1965

5 Sheets-Sheet 1



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5 Sheets-Sheet 2

Fig. 2.

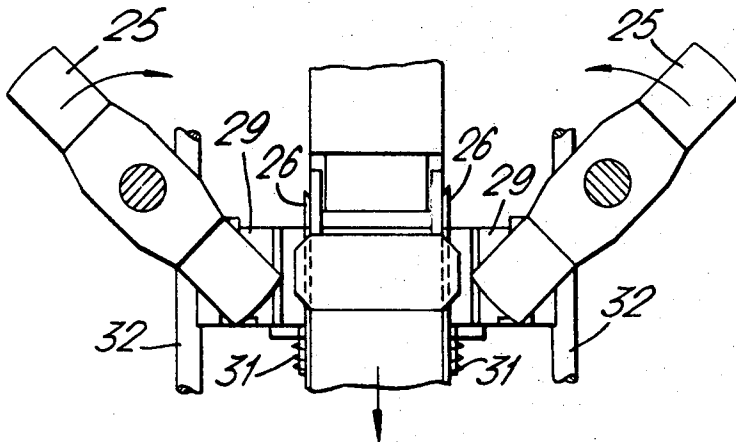
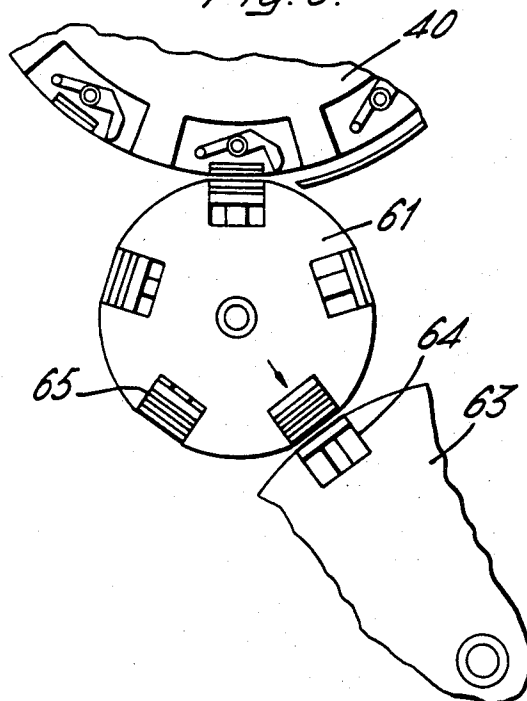


Fig. 6.



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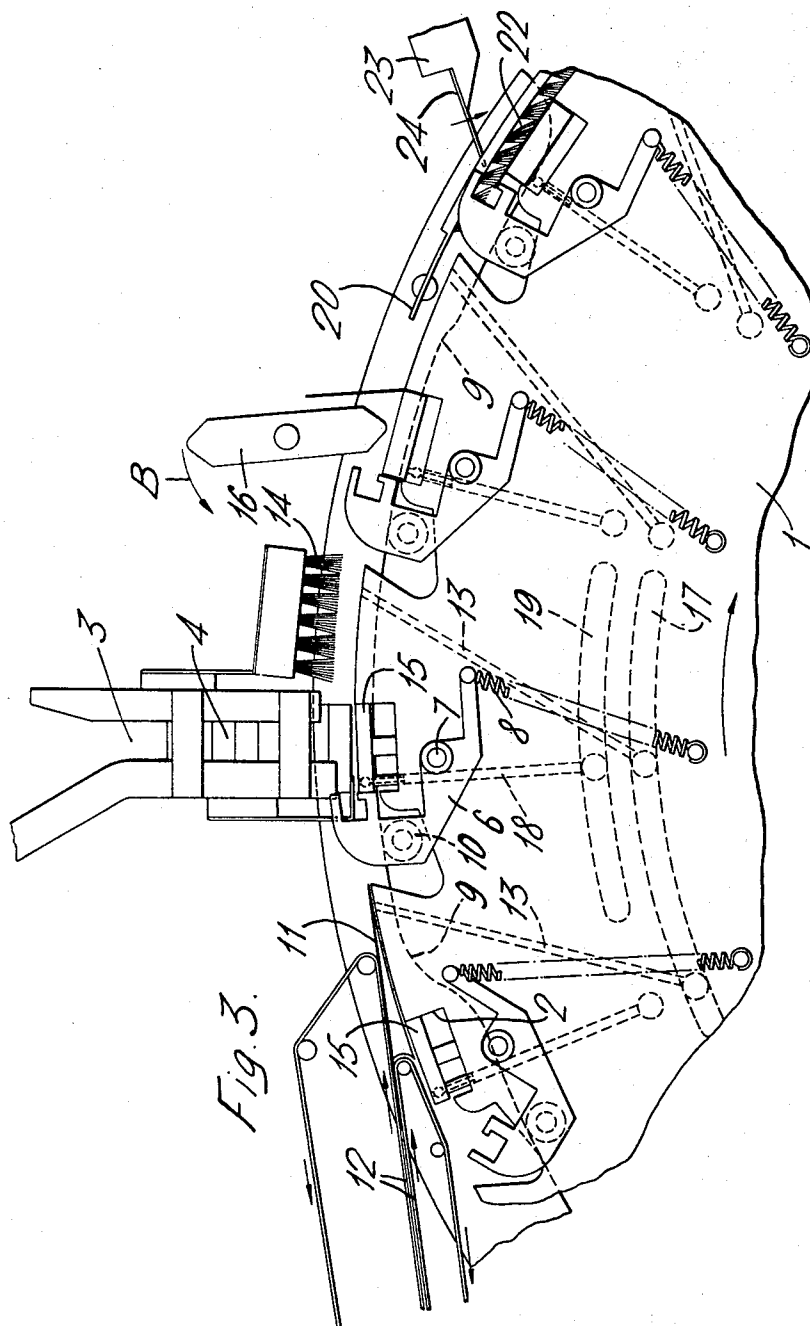
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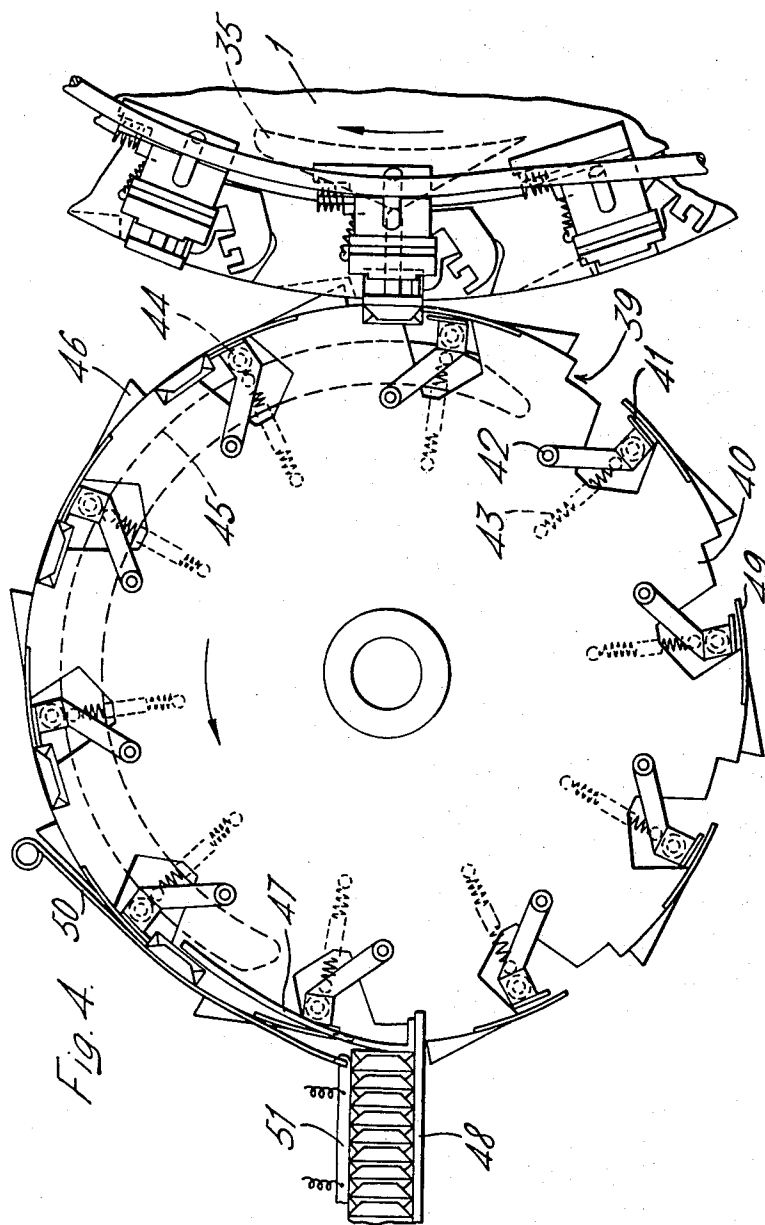
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5 Sheets-Sheet 4



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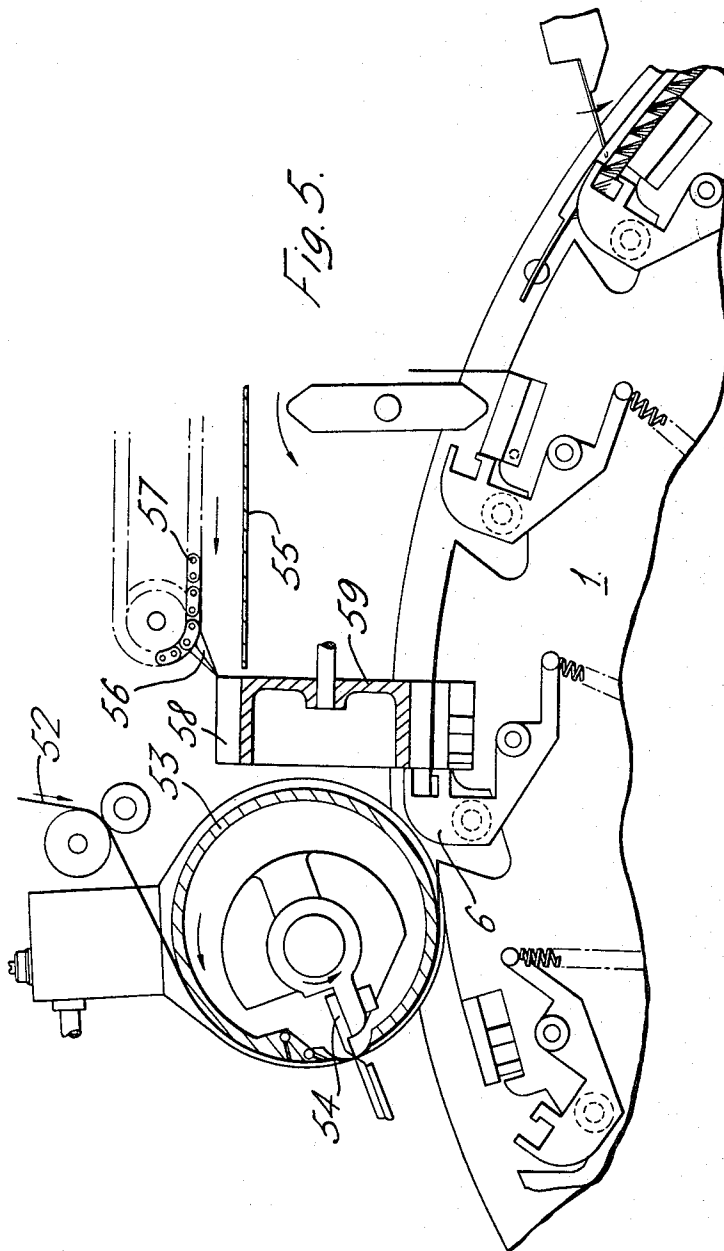
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PACKING OR WRAPPING MACHINE OF THE MOULD WHEEL TYPE

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5 Sheets-Sheet 5



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3,380,227

PACKING OR WRAPPING MACHINE OF THE MOULD WHEEL TYPE

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16 Claims. (Cl. 53—171)

ABSTRACT OF THE DISCLOSURE

A wrapping machine comprises a continuously rotating mould wheel with peripheral recesses over which wrapping sheets are fed and into which articles, removed from a magazine by pushers on the mould wheel, are inserted by a rotary presser with said sheets interposed, a rotary folder then folding a projecting portion of the sheet over the trailing face of the article and further folding devices including heat sealers completing the wrapping of the article. In one embodiment articles wrapped singly on a first mould wheel are transferred to a further wheel for wrapping in groups.

This invention concerns an improved packing or wrapping machine of the mould wheel type. A mould wheel machine has, as its principal feature, a large wheel or drum, with equally spaced recesses in its periphery in which packing and wrapping operations are conducted.

The machine herein described is for enclosing a rigid rectangular box in an outer transparent wrapper and thus would be normally termed a wrapping machine. Any rectangular block-shaped article can be handled in the same way and, if the article is a commodity, otherwise unprotected, the machine would more likely be termed a packing machine. For simplicity, however, the machine will be termed hereafter a wrapping machine, irrespective of the nature of the article or articles to be handled by it.

According to the invention there is provided a wrapping machine comprising a rotatable mould wheel including a plurality of recesses arranged around the periphery thereof, sheet feeding means to supply a sheet of wrapping material over a recess, sheet holding means for holding the said sheet over the said recess, article feeding means (e.g. a magazine or hopper), article removing means by which an article is transferred from the article feeding means to a position over the said sheet, presser means to insert the said article into the said recess with the said sheet interposed, and sheet folding means to fold the said sheet around the said article as the mould wheel continues to rotate.

The sheet holding means may comprise a suction port, a suction chamber and a suction source communicating with the suction chamber, the port and the chamber being in communication for so long as the sheet is held to the mould wheel.

The article removing means may comprise a pusher which may be carried by the mould wheel and may further comprise means for moving the pusher's face away from the said recess when the said sheet is to be wrapped about the said article.

The said recess may be provided with a movable bottom plate adapted to support the said article and the said interposed sheet, the movable bottom plate being cam operated so as to eject a wrapped article.

Pressing the article into the recess will thus fold the sheet into a U shape about the article while the rest of the folding operations are conducted on orthodox lines by fixed and moving folders.

Each end of a recess, that is, the part lying on a flat face of the wheel, may be closed by a plate to hold the article in position in the wheel and when the folding operations require it, this plate may be movable into and out of contact with an end of the article. If the wrapping has end folds, this plate may be heated to heat-seal the end folds.

The sheet may extend from the leading end of the aforesaid U as a long flap and the folding devices are then arranged to fold the long flap on to the top of the article, and then over the rear face, to overlap the rear end of the U so that the overlapping parts may be joined to provide a tubular wrapper. Joining may be effected by heat sealing in which case the pusher may have a heated lip to make the seal, the pusher moving into contact with the wrapper as soon as the tube is formed but a simpler arrangement is referred to below.

After all the desired folding operations have been effected the article may be discharged by ejecting it by movement of the movable bottom plate by a cam and if ejection takes place when the recess in question has its rear face horizontal the article can be ejected on to a horizontal heated plate, forming the base of a horizontal stacker, and this plate will heat-seal the aforesaid overlap.

A machine according to the invention will now be described with reference to the accompanying drawings in which:

FIGURE 1 is a front elevation of a wrapping machine mould wheel, with part of its casing broken away,

FIGURE 2 is a view of part of FIGURE 1, looking in the direction of the arrow II,

FIGURE 3 is a view of a further part of FIGURE 1, drawn to a larger scale,

FIGURE 4 is a view of a still further part of FIGURE 1 and an additional recessed wheel into which wrapped articles are delivered for collection.

FIGURE 5 shows a modification to FIGURE 3,

FIGURE 6 is a diagrammatic representation of a modification to FIGURE 4.

Referring to FIGURE 1, a mould wheel 1 has twenty-four recesses 2, equally spaced around its periphery, the wheel being driven to rotate continuously in the direction indicated by an arrow A. At a position near the top of the wheel 1 a magazine 3 contains stacked articles 4 which are to be wrapped. In the present case these are small stiff boxes of rectangular block shape. The lowest article in the magazine 3 is supported by a lip 5 which is forked, or otherwise shaped, so as to permit a pusher 6, carried by the wheel 1, to pass and carry away the lowest article. Each recess 2 of the wheel has its own pusher 6 which is pivoted at 7 and is held in the pushing position by a spring 8 and by a roller 10 in contact with a fixed cam ring 9. This can best be seen in FIGURE 3.

At a position, one recess pitch in front of (considered in the direction of rotation of the wheel 1) the magazine position, a sheet of wrapping material 11, FIGURE 3, is fed by conveyor bands 12 to the periphery of the wheel 1 where the leading edge of the sheet 11 is seized and held to the periphery by suction through a port 13. The sheets may be cut from a web, or fed from a sheet feed, according to their nature, and the sheet supply forms no part of the invention, except for the actual delivery to the wheel 1 by the bands 12.

As the wheel moves around to carry a sheet below the magazine 3 the sheet eventually becomes positioned beneath the lowest article which as it is carried out of the magazine by the pusher 6, moves at the same rate as the sheet. A brush 14 is fixed to the magazine 3 with its bristles engaging the moving article. Thus, acting as

a light brake, the bristles keep the article in contact with the pusher.

Each recess has a movable bottom plate 15 which is arranged to move rather stiffly in the recess so that it will stay in any given position until forced out of that position. At one pitch beyond the magazine 3 there is a rotatable presser 16, rotating in the direction of arrow B at one revolution for each two passing recesses and this presses the article into the recess, thus forming a part of the sheet into a square-cornered U. This operation is best shown in FIGURE 3 where it will be seen that the operation leaves a long flap clear of the recess and tending to stand up as shown. Just before the presser 16 operates, the leading edge of the sheet is freed of suction through the port 13, because the latter has moved out of communication with a suction groove 17. The bottom plate 15 is also provided with a suction port 18 which, near the magazine, communicates with another suction groove 19, so that at the article feeding position the whole sheet is drawn down on to the wheel periphery. From FIGURE 3 it will be seen that the pusher 6 still engages the article until it has passed nearly a pitch beyond the presser 16 when the cam ring 9 starts to turn the pusher away from the rear face of the article. Just prior to this turning movement the aforesaid upstanding flap comes into contact with a curved folding plate 20 which folds the flap down on to the top of the article. The flap is long enough to cover the top and extend beyond it by an amount sufficient to provide material to fold down on to the rear face of the article and overlap the limb of the U, lying on that face. A brush 22 smooths the flap down on the top face of the article and keeps it taut.

Near the position where the pusher starts to move clear of the flat face of the article, is a rotary folder 23 rotating in the direction shown by arrow C having folder blades 24 and rotating once for each four passing recesses. The blade 24, shown in FIGURE 3, is about to move down and fold the piece of material extending beyond the top face of the article down over the limb of the U on the rear face of the article and, when this has been done, the article is enclosed in a tubular wrapper, but the seam for the overlapping parts is not yet sealed. As the tubemaking is completed, the pusher 6 moves towards the article and eventually holds the overlaps together. As the partly-wrapped article moves a further pitch, rotary tuckers 25 make narrow tucks of the material extending beyond the ends of the rear face of the article while almost simultaneously, then arrow tucks at the front of the article are made by fixed tuckers 26. Both these kinds of tuckers are of conventional shape and construction and no further description is necessary.

At a further position, top and bottom folding plates 27 and 28, of the usual ploughshare construction, fold the remaining projecting parts of the tubular wrapper to make broad flaps, lying on the ends of the article and above the narrow tucks.

Each recess is provided with end plates 29, pivoted at 30, and urged by torsion springs 31 to move into contact with the ends of the recess, that is, in contact with the flat faces of the wheel 1, but while all the above-described operations have been taking place the end plates are held away from the ends of the recess by cam rails 32, shown broken. The rails engage pegs 33 fixed to the plates 29 and so the plates are held away from the ends of the recesses until the pegs 33 clear the rails 32.

The plates 29 comprise electric heaters and these heat-seal the folded ends of the tubular wrapper with the plates remaining in contact with the wrapper ends until a position about 235° from the magazine is reached.

The heat sealing of the overlap of the tube is effected after each wrapped article is discharged to a horizontal stacker 34. The articles are ejected from the recesses by movement of the bottom plates 15 of the recesses. For this purpose a fixed cam 35 is arranged to engage a guide rod 36 attached to each movable bottom plate and push

the plate back to its original position, the movement being sufficient to push the article into the stacker. A bottom plate 37 of the stacker 34 is heated and thus, as the articles are discharged from the stacker, by the continual insertion of other articles from the wheel 1, all the seams are heat-sealed and the whole wrapping operation is finished.

As it is necessary for the plates 29 to be moved away from the ends of a recess before a recess is fit to receive a further article, the cam rails 32 start to engage the pegs 33 about one pitch before the stacker position. Thus it will be seen that, although the rail 32 is shown broken away, the broken part is simply an arc concentric with the axis of a shaft 38, which is the driving shaft of the wheel 1.

In a modification shown in FIGURE 4 the finished wrapped articles are ejected from the recesses 2 in the wheel 1 by the aid of the cam 35, as before, but are pushed into recesses 39 in a further wheel 40. The wheel 40 is half the diameter of wheel 1 and thus rotates at twice the speed of 1. A recess 39 only partly embraces an article which is held in position by a gripper 41 pivoted at 42, and urged away from the gripping position by a spring 43. Each gripper has a roller 44 and, when this runs on to a fixed cam 45, the gripper is forced into the gripping position. The wheel 40 has a series of cams 46 fixed to it, one for each recess 39. When a gripped article reaches a position about 160° from the position where the articles are pushed into the recesses, the gripper 41 starts to move away from the article, as the cam 45 finishes in that region. A stripper plate 47, eccentric to the wheel periphery, lifts a loosened article out of the recess and delivers it to a stacking plate 48. As the article is moving out of its recess it is still constrained to move with the wheel by an overhanging lip 49 of each recess.

An article comes to rest on the plate 48 and immediately afterwards the cam 46, associated with the recess in question, comes into contact with the article on the plate and pushes it along so that a horizontal stack of wrapped articles is formed. A shield 50 controls the articles during ejection and movement to the stacking plate 48. The tube seam may be sealed by adding heating elements to the grippers 41 or by a heater plate 51 on the stacking plate 48.

The machine can be modified to effect multiple wrapping operations on an article and if desired to enclose a number of articles in an outer wrapper in the following manner.

It is assumed that articles, such as sticks of chewing gum, are to be wrapped. A common form of wrapping is a first wrap of metal foil and a second wrap of waxed paper while sometimes the whole is labelled. Alternatively the stick is first wrapped in paper-lined foil and then a label is fixed around it. A batch of the wrapped sticks is then enclosed in an outer wrapper which usually has a label already stuck to it or the wrapper itself might be a printed label. The procedure will vary according to the precise type of wrapping adopted but in a typical method a stick of gum would have a first wrapper of metal foil. Since the stick is thin, it is not possible to tuck the ends of the tube formed as previously described so they are merely bent over as a flap on to the top of the wrapping. This foil wrapping may be done with the machine shown in FIGURE 1 but the tuckers 25 and folders 26 are not required, nor is the heating for the movable end plates 29, though end plates of some kind are required to hold the articles in position. As the stick is so thin the U formed in the wheel recess as the first operation is formed with two limbs projecting above the recess. The rear limb is pushed down by a moving plate which follows the wheel movement, and the front one by the plate 20 as before. The foil wrapped stick is then ejected, as before, but into a second mould wheel, a recess of which has already had a piece of wax or other paper applied over it and held by suction. This is made into a tube about the foil wrapped stick and the pro-

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jecting ends of the tube are folded down flat, as one flap, on to the top face of the article. Alternatively the foil and paper may be fed as a single piece with the foil adhering to the paper, as is common in the art. If the paper wrapped stick is to have a label the operation is done in a third wheel in the same manner as before but using a tube not longer than the article itself. Finally the articles are ejected into a wheel, somewhat like the wheel 40, but having simple recesses with bottom plates which can be pushed outwards to eject articles. If it is assumed that the articles are fed into the recesses of this wheel in the manner shown in FIGURE 4, they will be ejected at the lowest position of a recess, to form a vertical stack from which batches of, say, five articles are removed and wrapped exactly in the manner first described with reference to FIGURE 1. If heat sealing is objectionable because of the nature of the article being wrapped it is easy to apply adhesive to those parts of the wrapper which are to be stuck together.

The nature of the final wrapper or label will vary according to requirements but in one example it consists of a triple thickness of material namely, metal foil, a very thin paper, and a printed wrapper. The three pieces are stuck together sufficiently to enable the wrapper to be fed as a single item.

Various other modifications are possible. One such is shown in FIGURE 5. For instance, the wrapper sheets may be fed from a web 52, by a suction drum 53 furnished with a cutter 54 this device being described fully in United States Patent No. 3,277,630, issued October 11, 1966 to Youngman, et al.

Instead of the magazine 3 of FIGURE 1, articles may come from another machine, such as a packing machine, being carried along a plate 55 by pushers 56 on an overhead conveyor 57. Each pusher delivers a packet into a recess 58 of an intermittently rotatable drum 59, rotating transversely to the wheel 1. As the drum stops, the packet in the lowest recess is pushed out by the pusher 6. Shrouds (not shown) surround the drum at each side, with the lower ends of the two shrouds projecting a little way into the recess to hold the packet ready for the pusher 6 to carry it away. Alternatively, packets may be brought to the position where the pusher 6 can take them, by conveyor bands of any suitable construction.

Instead of the vertical stack, mentioned above, from which batches of wrapped chewing gum are removed for final wrapping, the wrapper sticks of gum may be handled as shown diagrammatically in FIGURE 6. Each stick is ejected from the second mould wheel 40 mentioned in the description of FIGURE 4 into a transfer wheel 61. This has five equally spaced recesses in its periphery with bottom plates movable in stages so that a recess can hold from one to five sticks. A further wheel 63 is provided, twice the diameter of the transfer wheel 61, and this wheel has only two recesses 64, at the ends of a diameter. This second wheel may function as the final wrapping wheel, generally similar to the wheel 1.

The two wheels 61 and 63 rotate intermittently at different rates, the transfer wheel 61 making $1\frac{1}{2}$ revolution for each half revolution of the further wheel 63.

If the transfer wheel is filled, before starting, with one, two, three, four and five sticks in its recesses, as shown, a batch of five arriving opposite a recess 64 will be transferred to the recess, as indicated by the arrow, and the next $1\frac{1}{2}$ revolution will bring the recess marked 65 into line with the other recess of the second wheel. During said $1\frac{1}{2}$ revolutions this recess 65 has received a further stick of gum and so have the others, and the movements repeat, a stick being added to each recess as it passes the feeding position from wheel 40.

What we claim as our invention and desire to secure by Letters Patent is:

1. A wrapping machine comprising a rotatable mould wheel, a plurality of recesses arranged around the periphery thereof, means to continuously rotate the mould wheel, sheet feeding means to supply a sheet of wrapping

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material over a recess, sheet holding means for holding the said sheet over said recess, article feeding means, article transfer and insertion means by which an article is transferred from article feeding means to a position over the said sheet and including a rotatable member, and means to rotate the member unidirectionally in timed relationship with the rotation of the mould wheel so that the member engages and presses said article into said recess with said sheet interposed, and sheet folding means to fold the sheet around the article as the mould wheel continues to rotate.

2. A wrapping machine as claimed in claim 1, wherein the sheet holding means comprises a suction port, a suction chamber and a suction source communicating with the suction chamber, the port and the chamber being in communication for so long as the sheet is held to the mould wheel.

3. A wrapping machine as claimed in claim 1 wherein the article transfer and insertion means includes a pusher adapted to positively engage behind an article and push it in the general direction of travel of the periphery of the mould wheel.

4. A wrapping machine comprising a rotatable mould wheel, means for rotating said mould wheel, a plurality of recesses arranged around the periphery thereof, sheet feeding means to supply a sheet of wrapping material over a recess, sheet holding means for holding said sheet over said recess, article feeding means, article removing means comprising a pusher carried by the mould wheel by which an article is transferred from said article feeding means to a position over said sheet, presser means to insert said article into said recess with said sheet interposed, and sheet folding means to fold said sheet around said article as the mould wheel continues to rotate.

5. A wrapping machine as claimed in claim 4, wherein the article removing means further comprises means for moving the face of the pusher away from said recess prior to said sheet being wrapped about said article.

6. A wrapping machine as claimed in claim 1, wherein each of said recesses is provided with a movable bottom plate adapted to support said article and said interposed sheet.

7. A wrapping machine as claimed in claim 6, further comprising cam means for moving the movable bottom plate to eject a wrapped article.

8. A wrapping machine as claimed in claim 1, wherein the recesses are arranged in an axial direction around the periphery of the mould wheel.

9. A wrapping machine as claimed in claim 8, wherein each of said recesses is provided with two end plates which close to engage the wrapping sheet folded around said article on the mould wheel.

10. A wrapping machine as claimed in claim 9, wherein the end plates are pivotable so as to be capable of being removed from contact with said article while it is being wrapped.

11. A wrapping machine as claimed in claim 9, wherein the end plates are provided with heating elements.

12. A wrapping machine comprising a rotatable mould wheel having a plurality of recesses, each adapted to receive an article to be wrapped, spaced around its periphery, means to continuously rotate the mould wheel, sheet feeding means to feed a sheet of wrapper material over each recess, sheet holding means for holding the sheet over the recess, article delivery and insertion means to deliver articles to said mould wheel so that an article is received over each recess with a sheet interposed and to press the article into the recess so that the sheet is folded about the leading face of the article and a portion of the sheet projects from the recess, and folding means to fold said portion of the sheet about the article, said folding means including a folding member and means to rotate said folding member in timed relationship with the rotation of the mould wheel so that the member en-

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gages and folds said portion of the sheet over the trailing face of the article in the recess.

13. A wrapping machine as claimed in claim 12 wherein said article delivery and insertion means includes an insertion member and means to rotate said insertion member in timed relationship with the rotation of the mould wheel so that the member engages and presses the articles into the recesses.

14. A wrapping machine as claimed in claim 1, wherein the articles are block-shaped and the recesses conform to the general shape of the articles.

15. A wrapping machine as claimed in claim 12 wherein said article delivery and insertion means includes a rotatable drum having peripheral recesses from which articles are transferred to the recesses of said mould wheel.

16. A wrapping machine comprising a rotatable mould wheel having a plurality of recesses, each adapted to receive an article to be wrapped, arranged around the periphery thereof, means for rotating said mould wheel, sheet feeding means to feed a sheet of wrapper material over each recess, sheet holding means to hold the sheet over the recess, article delivery and insertion means to deliver an article over each recess with a sheet interposed and to press the article into the recess, sheet folding means to fold the sheet around the article, a rotatable transfer wheel having peripheral recesses arranged to

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pass through a receiving position at which an article wrapped on said mould wheel can be received, said peripheral recesses of the transfer wheel each being adapted to accommodate a plurality of said articles and being arranged to receive an article on each of a plurality of passes through said receiving position, and a rotatable wrapping wheel having at least one peripheral recess arranged to receive a plurality of articles from a recess of said transfer wheel and to wrap said plurality of articles as a group.

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