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(54) Title: MULTIPLE ROBOT SYSTEM

FIG. 30

(57) Abrégé/Abstract:
The present invention relates generally to film wrapping or packaging systems, and more particularly to a new and improved robotic film wrapping or packaging system which is not only substantially entirely automatic in its operation except for its initialization or START procedure, but in addition, a single programmable logic controller (PLC) can control the cyclic operations of one or more film wrapping or packaging robots.
FIG. 30

(54) Title: MULTIPLE ROBOT SYSTEM

(57) Abstract: The present invention relates generally to film wrapping or packaging systems, and more particularly to a new and improved robotic film wrapping or packaging system which is not only substantially entirely automatic in its operation except for its initialization or START procedure, but in addition, a single programmable logic controller (PLC) can control the cyclic operations of one or more film wrapping or packaging robots.

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MULTIPLE ROBOT SYSTEM

CROSS REFERENCE TO RELATED PATENT APPLICATION

This patent application is related to, based upon, and effectively a utility/non-provisional patent application conversion from United States Provisional Patent Application Serial Number 61/573,140, which was filed on September 12, 2011, the filing date benefits of which are hereby claimed, and United States Provisional Patent Application Serial Number 61/687,575 which was filed on April 27, 2012, the filing date benefits of which are also hereby claimed.

FIELD OF THE INVENTION

The present invention relates generally to film wrapping or packaging systems, and more particularly to a new and improved robotic film wrapping or packaging system which is not only substantially entirely automatic in its operation, except for its initialization or START procedure, but in addition, a single programmable logic controller (PLC) can control the cyclic operations of multiple film wrapping or packaging robots.
BACKGROUND OF THE INVENTION

Various different film wrapping or packaging systems are of course well known. For example, as disclosed within United States Patent 7,707,802 which issued to Forrest on May 4, 2010, several different types of conventional film wrapping or packaging systems are disclosed. More particularly, in FIGURE 1 of the patent, there is disclosed a well-known film wrapping or packaging system wherein a palletized load is placed upon a rotary turntable, and as the palletized load is rotated by means of the turntable, the load is wrapped within the film packaging material. In FIGURE 2 of the patent, a palletized load is disposed at a package wrapping station, and a rotary arm, carrying a carriage with a roll of packaging film mounted thereon, rotates around the palletized load thereby wrapping the same within the film packaging material. In FIGURE 3 of the patent, a palletized load is likewise disposed at a package wrapping station defined internally within an upstanding framework, and a carriage, carrying a roll of packaging film, is rotated around a ring member, thereby wrapping the packaging film around the palletized load. Still further, as can be appreciated from FIGURE 1 of the present patent application drawings, a conventional film wrapping or packaging robot 100 is disclosed. The robot 100 is seen to comprise a motorized unit or vehicle 102 having a suitable drive motor, not shown, operatively connected to a pair of wheels 104,104, the inside wheel 104 being the drive wheel such that the robot 100 can effectively circumnavigate around a palletized load disposed at a package wrapping station. The robot 100 is also seen to comprise an upstanding mast 106 upon which a support arm 108 is pivotally mounted. A
suitable actuator 110 is operatively connected to the a first proximal end of the support arm 108, while the second opposite or distal end of the support arm 108 has a film roll housing 112 mounted thereon. A roll of packaging film 114 is rotatably mounted upon a spindle, not visible, mounted upon the film roll housing 112. As can thus be readily appreciated, when the actuator 110 is effectively retracted, the first end of the support arm 108 is caused to move downwardly thus elevating the second opposite end of the support arm 108 so as to accordingly elevate or raise the film roll housing 112 and the roll of packaging film 114. Conversely, when the actuator 110 is extended, the first end of the support arm 108 will be elevated so as to cause the film roller housing 112 and the roll of packaging film 114 to be lowered. The different elevational levels of the film roll housing 112 and the packaging film 114 can be accordingly controlled so as to achieve desired wrapping or packaging of the palletized load in accordance with predetermined wrapping or packaging patterns.

While such a conventional film wrapping or packaging robot operates satisfactorily, such robots can be improved so as to enhance the efficiency of the overall wrapping or packaging operations. For example, with the conventional robot, an operator must initially secure the leading end of the wrapping or packaging film to the palletized load before initiating the operation of the robot to commence the film wrapping or packaging operation. In addition, since only one robot can wrap a palletized load at a particular location or wrapping station, and while it is possible to establish multiple wrapping stations at which multiple robots are respect-
ively disposed so as to individually perform their film wrapping or packaging operations, each robot requires an operator to
secure the leading end of each wrapping or packaging film to its respective palletized load, or alternatively, the
same operator needs to effectively service the multiple robots in a serial manner. In accordance with the first mode of
operation, additional manpower/operators are of course required to service the multiplicity of robots, whereas in ac-
cordance with the second mode of operation, an increased
amount of time is required for the same operator to serially service the multiple robots. Still yet further, it often hap-
pens that when a robot completes its entire film packaging or wrapping operation, comprising, for example, a predeter-
mined number of film layers wrapped around the lower part of the
palletized load and a predetermined number of film layers
wrapped around the upper part of the palletized load, the ro-
bot may conclude its entire film packaging or wrapping opera-
tion at a circumferential location, relative to the palletized
load, which is different from the circumferential location
at which the robot always starts the film packaging or wrap-
ing operation. Additional time, or operator control or in-
tervention, is therefore effectively required to relocate the
robot to its next load START or HOME position.

A need therefore exists in the art for a new and
improved robot system which comprises the use of multiple
film wrapping or packaging robots, wherein the system is sub-
stantially entirely automatic, except for initiating the ac-
tual START of the robots, all of the multiple robots can be
controlled by a single or central controller, and the robots
will automatically return to their START or HOME positions at
which they normally start the film packaging or wrapping operation.

**SUMMARY OF THE INVENTION**

The foregoing and other objectives are achieved in accordance with the teachings and principles of the present invention through the provision of a new and improved multiple robot system which comprises a multiplicity of film packaging or wrapping robots wherein the multiplicity of robots are adapted to circumnavigate their respective palletized loads in order to package or wrap the same within packaging or wrapping film, and wherein further, the multiplicity of robots are individually wirelessly connected to a single programmable logic controller (PLC). In this manner, when the operator initiates a **START** command, such as, for example, by pushing a **START** button on the control panel of the programmable logic controller (PLC), the multiplicity of robots will be simultaneously actuated so as to perform their film wrapping or packaging operations. Each robot is individually programmed so as to wrap or package its particular palletized load in accordance with a predetermined film packaging or wrapping pattern. Such a packaging or wrapping pattern may include, for example, a predetermined number of layers of film to be wrapped around the bottom of the palletized load, a predetermined number of layers of film to be wrapped around the top of the palletized load, the speed at which each robot operates to wrap or package the palletized load, the inclusion of any overlap or overwrap sections of the packaging or
wrapping film, and the like. In addition, as a result of the two-way communication effectively established between the multiple robots and the programmable logic controller (PLC), at the conclusion of a particular film packaging or wrapping operation, the individual robot will know its position relative to the palletized load and relative to its original HOME or START position whereby the robot will automatically navigate back to its START or HOME position so as to in fact be ready to commence a new film packaging or wrapping operation.

Still yet further, each one of the robots is provided with a new mechanism or system for automatically severing the packaging or wrapping film at the conclusion of a packaging or wrapping cycle, for retaining the leading end of the packaging or wrapping film upon the severing mechanism in preparation for a new packaging or wrapping cycle, and for attaching the leading end of the packaging or wrapping film to the palletized load without requiring an operator to perform this function.

**BRIEF DESCRIPTION OF THE DRAWINGS**

Various other features and attendant advantages of the present invention will be more fully appreciated from the following detailed description when considered in connection with the accompanying drawings in which like reference characters designate like or corresponding parts throughout the several views, and wherein:

**FIGURE 1** is a perspective view of a first conven-
tional PRIOR ART robot currently used in connection with the packaging or wrapping of palletized loads within packaging or wrapping film;

FIGURE 2 is a perspective view of a second conventional PRIOR ART robot which is similar to the conventional PRIOR ART robot illustrated within FIGURE 1 and which is to be modified in accordance with the principles and teachings of the present invention so as to provide the film packaging or wrapping robot industry with a new and improved robot which is capable of achieving the objectives of the present invention;

FIGURE 3 is a perspective view of the second conventional PRIOR ART robot as shown in FIGURE 2 but from a different perspective orientation such that different component parts of the robot are visible;

FIGURE 4 is a perspective view of a first embodiment of a new and improved robot, similar to the second conventional PRIOR ART robot which is illustrated within FIGURES 2 and 3, but which has been modified so as to include new structural features which will enable the new and improved robot to operate fully automatically once the operator has initiated a START control signal;

FIGURE 5 is a perspective view of the new and improved robot as illustrated within FIGURE 4 but from a different perspective orientation such that the new structural features thereof can be seen better and therefore be better appreciated;
FIGURE 6 is a schematic drawing illustrating the disposition of a multitude of robots, such as, for example, three robots, as more particularly disclosed within FIGURES 4 and 5, wherein the multitude of robots can be controlled by means of a single controller such as, for example, a programmable logic controller (PLC);

FIGURE 7 is a perspective view of a second embodiment of a new and improved robotic film packaging or wrapping system as constructed in accordance with the principles and teachings of the present invention;

FIGURE 8 is an enlarged view of the robotic film packaging or wrapping system as disclosed within FIGURE 7, illustrating in greater detail the dual guide wheel system and the adhesive strip or adhesive tape dispensing mechanism as mounted upon the support arm of the robot vehicle;

FIGURE 9 is an enlarged view of the adhesive strip or adhesive tape dispensing mechanism, in particular, the mounting of the adhesive strip or adhesive tape dispensing gun shown in its locked position upon the gun support plate;

FIGURE 10 is an enlarged view of the adhesive strip or adhesive tape dispensing mechanism, in particular, the mounting of the adhesive strip or adhesive tape dispensing gun shown, as shown in FIGURE 8, however, the gun is now shown in its unlocked position upon the gun support plate;

FIGURE 11 is a perspective view of a proximity sensor utilized in conjunction with the robot in order to en-
sure that the robot vehicle, of the robotic film packaging or wrapping system, is able to return to its original HOME or START position at the conclusion of a particular film packaging or wrapping operation in preparation for the commencement of a new film packaging or wrapping operation;

FIGURE 12 is a top perspective view of the proximity counter utilized in conjunction with one of the film feed rollers in order for personnel to know how much film has been used;

FIGURE 13 is a vertical perspective view of the film clamping and cutting mechanism for severing the wrapping or packaging film thereby forming a trailing end portion of the wrapped film which will self-adhere to the palletized load, and a leading end portion of the packaging or wrapping film which will be retained in preparation for a new film wrapping or packaging cycle, wherein the film clamping and cutting mechanism has been rotated from its horizontally oriented position to its vertical orientation;

FIGURE 14 is a vertical perspective view of the film clamping and cutting mechanism as shown in FIGURE 13, FIGURE 14 more clearly showing the spatial relationship between the film clamping and cutting mechanism with respect to the two blocks of foam material when the film clamping and cutting mechanism is disposed in its vertical orientation;

FIGURE 15 is front perspective view of the film clamping and cutting mechanism as shown in FIGURES 13 and 14,
FIGURE 15 clearly illustrating the movement of the film clamping and cutting mechanism to its retention position at which it retains the leading end portion of the packaging or wrapping film in preparation for a new film wrapping or packaging cycle after the trailing end portion of the previous film wrapping or packaging cycle has been severed;

FIGURE 16 is a perspective view of the actuator assembly, for the film clamping and cutting mechanism illustrated within FIGURES 13-15, wherein the actuator assembly is disposed at its de-actuated disposition;

FIGURE 17 is a perspective view of the actuator assembly, for the film clamping and cutting mechanism illustrated within FIGURES 13-15, wherein the actuator assembly is disposed at its actuated disposition;

FIGURE 18 is a perspective view illustrating the trailing end of the robot vehicle of the robotic film packaging or wrapping system, illustrating the mounting of the roll of packaging or wrapping film upon the robot vehicle, as well as the film clamping and cutting mechanism illustrated within FIGURES 13-17 and the actuator assembly for moving the film clamping and cutting mechanism toward and away from the palletized load;

FIGURE 19 is a front elevational view showing the use of an auxiliary or additional bumper pad secured to the large block of memory foam in order to ensure a sufficient amount of engagement of pressure is effectively impressed upon the leading end portion of the wrapping or packaging
film when being applied to a side wall portion of the palletized load;

**FIGURE 20** is a perspective view of a third embodiment of a new and improved robotic film packaging or wrapping system as constructed in accordance with the principles and teachings of the present invention;

**FIGURE 21** is a perspective view, similar to that of **FIGURE 20** but from a different angular perspective, of the third embodiment of a new and improved robotic film packaging or wrapping system as constructed in accordance with the principles and teachings of the present invention;

**FIGURE 22** is a top plan view of the actuator assembly for moving the adhesive applicator into engagement with the palletized load in order to transfer a dot of adhesive material onto the palletized load in preparation for attaching a leading end portion of the packaging or wrapping film to the palletized load, wherein the actuator assembly includes a pair of actuator slide plates;

**FIGURE 23** is a top plan view, similar to that of **FIGURE 22**, partially showing the actuator assembly so as to more clearly show the compression spring at the forward end of the actuator assembly;

**FIGURE 24** is a perspective view of a bottom support plate of the actuator assembly that is adapted to be fixedly connected to the pair of actuator slide plates disclosed within **FIGURE 22**;
FIGURE 25 is a top plan view of a slide track, and a slide mechanism slidably disposed within the slide track, wherein the slide track is adapted to be fixedly secured to the bottom support plate of FIGURE 24;

FIGURE 26 is a perspective view of the applicator support plate which is adapted to be fixedly connected to the slide mechanism disclosed within FIGURE 25;

FIGURE 27 is an enlarged view of the applicator support plate disclosed within FIGURE 26, disclosing the spring connection between the applicator support plate of FIGURE 26 and the bottom support plate of FIGURE 24;

FIGURE 28 is a top perspective view of the applicator support plate, as disclosed within FIGURE 27, having the adhesive dot tape supply roll, the applicator roller, the idler roller, and the take-up reel rotatably mounted thereon;

FIGURE 29 is a top plan view of the third embodiment of the new and improved robotic film packaging or wrapping system showing the entire applicator assembly of FIGURES 20–29 as mounted upon the main support arm of the robot vehicle; and

FIGURE 30 is a perspective view similar to that of FIGURE 29 but showing the entire applicator assembly as connected to the robot vehicle.
DETAILED DESCRIPTION OF THE ILLUSTRATED EMBODIMENTS

Referring now to the drawings, and more particularly to FIGURES 2 and 3 thereof, a second type of conventional PRIOR ART film wrapping or packaging robot is disclosed and is generally indicated by the reference character 200. As will be more fully disclosed and appreciated hereinafter, this second conventional PRIOR ART film wrapping or packaging robot 200 will be modified in several ways so as to effectively achieve the new and improved film wrapping or packaging robot of the present invention, and for continuity purposes throughout this disclosure, component parts of the various robots which correspond to component parts of the first conventional PRIOR ART film wrapping or packaging robot as illustrated within FIGURE 1 will be provided with corresponding reference characters except that they will be within the 200 series. More particularly, as can best be seen from FIGURES 2 and 3, and as was the case with the first conventional PRIOR ART film wrapping or packaging robot 100 illustrated with-in FIGURE 1, the second conventional PRIOR ART film wrapping or packaging robot 200 is seen to comprise a motorized unit or vehicle 202 having a suitable drive motor, not shown, operatively connected to the inside one of a pair of rear wheels 204,204 such that the robot 200 can effectively circumnavigate around a palletized load disposed at a package wrapping station. The robot 200 is also seen to comprise an upstanding mast 206 upon which a support arm 208 is pivotally mounted. A suitable actuator 210 is operatively connected to the a first proximal end of the support arm 208, while the second opposite or distal end of the support arm 208 has a film roll housing 212 mounted thereon. An upstanding spindle 213 is
fixedly mounted upon the film roll housing 212 for rotatably mounting, holding, and accommodating a roll of packaging film, not shown, thereon. As can therefore be readily appreciated, and in a manner similar to that characteristic of the first conventional PRIOR ART robot 100 illustrated within FIGURE 1, when the actuator 210 is effectively retracted, as can be seen in FIGURE 3, the first proximal end of the support arm 208 is caused to move downwardly thereby correspondingly lowering the second opposite distal end of the support arm 208 so as to accordingly lower the film roll housing 212 and the roll of packaging film disposed upon the spindle 213.

Conversely, when the actuator 210 is extended, the first proximal end of the support arm 208 will be elevated so as to cause the film roller housing 212 and the roll of packaging film disposed upon the spindle 213 to likewise be elevated. The different elevational levels of the film roll housing 212 and the packaging film disposed upon the spindle 213 can be accordingly controlled so as to achieve desired wrapping or packaging of the palletized load in accordance with predetermined wrapping or packaging patterns. It is additionally seen that the second conventional PRIOR ART robot 200 is also provided with a feeler mechanism, which may be, for example, a wheel 216 that is operatively mounted upon the distal end of a support arm 218, while the proximal end of the support arm 218 is operatively connected to a forward steering wheel assembly 219. This feeler mechanism or wheel 216 is adapted to be disposed in contact with the palletized load as the robot 200 circumnavigates around the palletized load during the film wrapping or packaging operation so as to maintain the robot 200 at a predetermined distance from the
palletized load in order to package or wrap the palletized load in the wrapping or packaging film in a uniform and consistent manner. The support arm 218 may be spring-biased or have a fluid shock absorber, not shown, operatively associated therewith such that when the robot 200, through means of the feeler or wheel 216, contacts the palletized load, the spring or shock absorber will effectively accommodate any contact load or force impressed upon the palletized load such that no damage is caused to the palletized load.

With reference now being made to FIGURES 4 and 5, pertinent portions of a first embodiment of a new and improved robot, which is generally indicated by the reference character 300 and which effectively is a robot similar to the robot 200 as illustrated within FIGURES 2 and 3 but modified in accordance with the principles and teachings of the present invention, is disclosed. For brevity purposes, a discussion of the structural components of the first embodiment of the new and improved robot 300, which are similar to corresponding structural components of the robot 200, will not be discussed but have been assigned corresponding reference characters within the 300 series, with the ensuing disclosure concentrating upon, or being directed toward, the new and improved features of the robot 300. More particularly, for example, as can best be seen from FIGURE 4, the film roll housing or framework 312 is fixedly mounted upon the distal end of the support arm 308 by means of a mounting bracket 320, and in addition, an actuator 322, which may be, for example, a suitable piston-cylinder assembly, is fixedly mounted upon the film roll housing or framework 312. The actuator or piston-cylinder assembly 322, is provided with an extens-
ible/contractible piston rod 324, and an applicator plate 326, the purpose of which will be explained more fully hereinafter, is pivotally mounted upon the free or external end of the piston rod 324 by means of a pivotal mounting assembly 328 such that the applicator plate 326 is permitted to pivot when the same comes into contact with a palletized load so as not to damage the palletized load as will be more fully explained hereinafter.

Continuing further, and as can probably best be appreciated from FIGURE 5, a motorized tape dispensing assembly 330 is also mounted upon the film roll housing or framework 312 by means of a support plate 332 which is, in turn, fixedly mounted to an upstanding member 334 of the film roll housing or framework 312. As can best be seen from FIGURE 4, a first drive member 336 is disposed upon the tape dispensing assembly 330 and is adapted to be driven by means of a small motor 338 as can best be seen in FIGURE 4. The first drive member 336 is drivingly engaged with a second driven member 340, such as, for example, by means of a pulley band or the like, not shown. In addition, the second driven member 340 is drivingly connected to a pair of capstans 342,344 by means of a pulley band 346 or other similar drive mechanism. The second driven member 340 is adapted to have a roll of tape, not shown, disposed thereon, wherein, for example, a plurality of adhesive dots, also not shown, are disposed upon the roll of tape. The adhesive dot tape will be conveyed around or between the pair of capstans 342,344 so as to come into contact with the wrapping or packaging film which is mounted upon the spindle 313 and which is conveyed toward the palletized load by means of one or more rollers, one of which is disclosed at
348, mounted upon the film roll housing or framework 312.

The one or more rollers 348 may be either a drive roller, a tension roller, a stretch roller, or the like, conventionally provided upon known film packaging or wrapping systems. Accordingly, when the wrapping or packaging film from the roll of film disposed upon the spindle 313 comes into contact with the adhesive dot tape being dispensed from the tape dispensing assembly 330, the adhesive dots will be transferred from the adhesive dot tape onto the leading end portion of the wrapping or packaging film because the adhesive affinity defined between the adhesive dots and the wrapping or packaging film is greater than the adhesive affinity defined between the adhesive dots and the roll of paper upon which the dots are initially disposed and which defines the roll of adhesive dot tape. When one of the adhesive dots is in fact secured upon the leading end portion of the wrapping or packaging film, the actuator 322 may then be actuated so as to effectively act as a plunger mechanism, extending the piston rod 324 and the applicator plate 326 toward the palletized load, such that the applicator plate 326 will cause the leading end of the wrapping or packaging tape, having the adhesive dot secured thereon, to be adhesively bonded to the palletized load whereby a film wrapping or packaging operation can commence. It is of course to be noted that as a result of this adhesive dot application system, the operation of adhering the leading end portion of the wrapping or packaging tape to the palletized load is completely automated with no need for any operator interaction. It is still further noted that the adhesive member is not to be limited to an adhesive dot but may comprise an adhesive patch, an adhes-
ive strip, an adhesive label, or the like.

With reference now being made to FIGURE 6, the schematic drawing illustrates another important feature of the robot system of the present invention wherein a multitude of robots 300, as illustrated within FIGURES 4 and 5, are now disposed adjacent to a plurality of wrapping or packaging stations or areas 350 at which a plurality of palletized loads 352 are disposed awaiting to be wrapped or packaged. A programmable logic controller (PLC) 354 is also provided within the vicinity of the multitude of robots 300, and it is schematically illustrated that the single programmable logic controller (PLC) 354 is effectively linked to each one of the robots 300 by any suitable type of wireless communication links 356,358,360, such as, for example, blue tooth technology or any other equivalent thereof. It is to be understood that while, for example, three robots 300 have been illustrated, the present invention system can of course be effectively utilized in conjunction with any number of robots 300, that is, a single robot 300, three robots 300, less than three robots 300, and more than three robots 300. In this manner, the single programmable logic controller (PLC) 354 can control a single or a multitude of automatically operable film wrapping or packaging robots. It is further seen that each one of the robots 300 will traverse a circular locus 362 around each palletized load 352, and that each robot 300 will initiate or commence each film wrapping or packaging cycle or operation from an initial HOME or START position which may, for illustrative purposes, be considered to be the six o’clock position of a clock face. In other words, at the conclusion of a particular film wrapping or packaging cycle or
operation, each robot 300 will be returned to its **START** or **HOME** position in preparation for the start or commencement of a new film wrapping or packaging cycle or operation. This is important for the overall efficiency of the film wrapping or packaging operation as will now be explained.

As can readily be appreciated, the programmable logic controller (PLC) 354 will effectively operatively interface with each robot 300 so as to initiate the start or commencement of a film wrapping or packaging cycle or operation, as a result of, for example, an operator pushing a **START** button on a console or control panel, not shown, of the programmable logic controller (PLC) 354. The programmable logic controller (PLC) 354 will also control all movements of the robot 300 and the various movable components thereof, such as, for example, the elevation of the support arm 308, the extensible/contractible movements of the piston rod 324 and the applicator plate 326, and the like, in order to achieve the desired film wrapping or packaging patterns. Such patterns can include, for example, a predetermined number of film layers wrapped around the lower part of the palletized load, a predetermined number of film layers wrapped around the upper end of the palletized load, a predetermined number of overlapping or overwrapping film layers, the degree of overlap or overwrap of such film layers, the speed of the robots when traversing the circular loci 362, the speed at which the support arm 308 is elevated or lowered so as to, in turn, determine, for example, the number of film layers that will be wrapped around the palletized while transitioning between the lower end of the palletized load and the upper end of the palletized load, or the like. Of course the individual robots
300 can also have their own operational programs incorporated within their units and these computers or controllers can likewise interface with the main or primary programmable logic controller (PLC) 354.

An interesting additional operational control that can also be implemented by means of the single programmable logic controller (PLC) 354, is, as has been alluded to hereinbefore, that the programmable logic controller (PLC) 354 can effectively ensure that at the conclusion of a film wrapping or packaging cycle or operation, each robot 300 is returned to its START or HOME position. One might wonder that if the robots 300 were programmed to wrap the palletized load 352 with a predetermined number of complete film wraps or layers at both the top and bottom of the palletized load 352, then at the conclusion of the upper and lower film wrap layers, and therefore at the conclusion of the entire film wrapping or packaging cycle or operation, the robots 300 would inherently or by definition be disposed back at their START or HOME positions. However, this is not necessarily true. Assuming, for example, that a particular robot 300 has been programmed to wrap its palletized load 352 with five complete film wraps or layers at the lower end of the palletized load 352 and five complete film wraps or layers at the upper end of the palletized load 352. In addition, depending upon, for example, the vertical height of the palletized load, the elevation of the support arm 308 will require more time to reach the upper end of the palletized load when a particular palletized load is taller than another palletized load. During the transition between the completion of, for example, all of the film wraps or layers around the lower end of the palletized
load 352 and the commencement of the film wraps or layers around the upper end of the palletized load 352, the robot 300 continues to traverse its circular locus 362. For example, for loads that are four feet high and six feet high, respectively, it will require more time for the support arm 308 to reach the top of the six foot high load than for it to reach the top of the four foot high load, and during these transition times, the robot 300 continues to traverse its circular locus 362. Accordingly, the robot 300 will be disposed at a different circumferential position along the circular locus 362 depending upon the height of the palletized load.

Thus, while each film wrap or layer around the lower end of the palletized load 352 started and ended at, for example, the **START** or **HOME** or six o'clock position, when the support arm 308 has elevated the film roll housing or framework 312 to its properly elevated position in preparation for commencement of the film wrapping or packaging at the upper end of the palletized load which is four feet high, the robot 300 may not in fact be disposed at its **START** or **HOME** or six o'clock position, but may in fact be disposed at, for example, a position diametrically opposite the **START** or **HOME** or six o'clock position, that is, at the twelve o'clock position. For a palletized load that is six feet high, the robot 300 may be disposed at, for example, the three o'clock position. A photoeye or other sensor, not shown but conventionally provided upon such mobile robots, will send a signal to the control logic of the conventional robot that the support arm and the film roll housing or framework of the conventional robot have now attained their uppermost positions at
which time the film packaging or wrapping of the upper end portion of the palletized load can now be commenced. Accordingly, the film packaging or wrapping cycle or operation will in fact then be commenced and such film packaging or wrapping cycle or operation will also end or terminate at the twelve o'clock position. Thus, the robot will not be positioned back at the START or HOME position in preparation for the commencement of a new film packaging or wrapping cycle or operation. In accordance with the present invention, however, the programmable logic controller (PLC) 354 can control the robots 300 such that regardless of where a particular film packaging or wrapping cycle or operation terminates, the robots 300 will be moved immediately back to their START or HOME positions. This can easily be done, for example, by means of the programmable logic controller (PLC) 354 keeping track of the lineal or angular displacement of each robot 300 from its START or HOME position.

Still yet further, it is also to be appreciated that the single programmable logic controller (PLC) 354 can of course simultaneously control the multiple robots 300 or it can individually control any one of the multiple robots 300. For example, if one of the palletized loads 352 has not in fact been delivered to its designated film wrapping or packaging station 350, or if the particular load 352 has, for some reason, not been properly placed at the proper position within the film wrapping or packaging station 350, such as, for example, at the center of the film wrapping or packaging station 352, the programmable logic controller (PLC) 354 will not send the appropriate START signal to that particular robot 300 operatively associated with that palletized load.
352 and that particular film wrapping or packaging station 350, however, suitable control signals will in fact be sent to the other robots 300 in connection with which the palletized loads have been sensed as being present and properly located within the particular or respective film wrapping or packaging station 350. It is lastly noted that the actual drive mechanism for each one of the robots 300 may comprise a forward steering wheel assembly, not shown, which may also be under the control of the programmable logic controller (PLC) 354 and is similar to the forward steering wheel assembly 219 of the robot 200 illustrated within FIGURE 2, or alternatively, the circular loci 362, which the robots 300 traverse, can comprise a magnetic strip, or particularized paint, which sensors within the robot 300 can effectively see or track.

With reference now being made to FIGURES 7-18, a second embodiment of a new and improved robotic film packaging or wrapping system, and the various operative components thereof, as constructed in accordance with the principles and teachings of the present invention, is disclosed and is generally indicated by the reference character 400. It is to be noted that operative components of the second embodiment of the new and improved robotic film packaging or wrapping system 400, which correspond to operative components of the first embodiment of the new and improved robotic film packaging or wrapping system 300 as illustrated within FIGURES 4-6, will be designated by corresponding reference characters except that they will be within the 400 and 500 series. Still yet further, for brevity purposes, a discussion of the structural components of the second embodiment of the robotic film packaging or wrapping system 400, which are similar to cor-
responding structural components of the first embodiment of the robotic film packaging or wrapping system 300, or which are similar to the PRIOR ART robotic film packaging or wrapping system 200, will not be discussed, the ensuing disclosure concentrating upon, or being directed toward, the new and improved features of the second embodiment robotic film packaging or wrapping system 400.

More particularly, as can best be seen from FIGURES 7 and 8, one of the new and improved structural features or operative components characteristic of the second embodiment robotic film packaging or wrapping system 400, as compared to the first embodiment robotic film packaging or wrapping system 300, or as compared to the PRIOR ART robotic film packaging or wrapping system 200, is that in lieu of the use of a single feeler mechanism or guide wheel 216, the motorized unit or robot vehicle 402 of the second embodiment robotic film packaging or wrapping system 400 is provided with a pair of feeler mechanisms or guide wheels 416,417. The provision of the dual guide wheel system 416,417 has been found to provide better stability for the packaging or wrapping system 400 with respect to the palletized load to be wrapped or packaged, particularly when the robot 402 is navigating around corners of the palletized load. As can best be appreciated from FIGURE 8, the dual guide wheels 416,417 are effectively connected together by means of a tie bar 419 at the center of which is a rotary axle 421. A pair of vertically dependent axles 422,424 are fixedly mounted within opposite ends of the tie bar 419, and each one of the dual guide wheels 416,417 is rotatably mounted upon a respective lower end portion one of the axles 422,424 by means of rotary bearing assemblies 423,
425. In addition, an upstanding spindle 427 projects upwardly through the distal or free end portion of the main support arm 418 of the robot 402, and a connecting bar 429 has one end thereof pivotally connected to the lower end portion of the spindle 427 beneath the support arm 418 while the opposite end of the connecting bar 429 is pivotally connected to the lower end portion of the rotary axle 421.

In this manner, the dual guide wheels 416,417 are effectively free to move in angular modes in order to remain engaged with sides of the palletized load as the robot 402 moves about the palletized load. Accordingly, as the robot 402 navigates a corner of the palletized load, the leading wheel 416, as viewed in the direction of the movement of the robot 402 around the palletized load, will first disengage from the side of the palletized load which has just been wrapped, but due to the pivotal mounting of the dual guide wheels 416,417 upon the robot 402 through means of the rotary axle 421, the spindle 427, and the connecting bar 429, as has been described, as well as the constant or continuous engagement of the dual guide wheels 416,417 with the palletized load through means of the support arm 418, the tie bar 419 will effectively be caused to pivot around the rotary axle 421 thereby causing or permitting the leading wheel 416 to engage the next side of the palletized load while the trailing wheel 417 is still engaged with the previously wrapped side of the palletized load. This dual guide wheel mounting system therefore permits the film wrapping or packaging to proceed in a smooth and tight manner with respect to the palletized load as opposed to, for example, the use of a single guide wheel system which may cause the robot to effectively
"bounce" or momentarily disengage from the palletized load as the robot navigates around the corner regions of the palletized load.

With continued reference being made to FIGURE 8, and with additional reference being made to FIGURES 9 and 10, it is to be appreciated that in accordance with the principles and teachings of the second embodiment robotic film packaging or wrapping system 400, the adhesive dot application system of the first embodiment robotic film packaging or wrapping system 300 has effectively been eliminated, and in lieu thereof, there has been incorporated an adhesive tape or adhesive strip application system or assembly whereby an adhesive tape or adhesive strip is to be applied to a side wall portion of the palletized load in order to, in turn, adhere a leading end portion of the wrapping or packaging film 414 to the adhesive tape and the palletized load in order to commence a wrapping or packaging film operation with respect to the palletized load. More particularly, as can initially best be seen from FIGURE 8, a first support plate 431, having a mounting block 433 and a spacer collar 435 integrally formed therewith, are effectively mounted upon the support arm 418 so as to be movable therewith, the collar 435 being angularly or pivotally movably mounted upon the upstanding spindle 427. It is further noted that an additional pair of collars 437 is also provided in conjunction with the spacer collar 435 and the mounting block 433 by means of which the first support plate 431 is not only disposed at a predetermined angle with respect to the robot support arm 418, but in addition, the first support plate 431 is disposed at a predetermined height with respect to the robot support arm 418. An actuator 439 is
mounted upon a side portion of the first support plate 431 and is operatively connected to a second, linearly slidable actuation plate 441 that is operatively connected to the first support plate 431 by means of a pair of springs 443. Actuation of the actuator 439 will cause the second actuation plate 441 to move linearly against the spring bias of the pair of springs 443, whereas when the actuator 439 is deactuated, the pair of springs 443 will return the second actuation plate 441 to its original position. A third gun support plate 445 is pivotally mounted upon the second actuation plate 441 by means of a pivot mechanism, not shown, and a corner portion of the third gun support plate 445 is operatively connected to the second actuation plate 441 by means of a biasing spring 447.

With reference now also being made to FIGURES 9 and 10, it is additionally seen that the adhesive tape or adhesive strip application system or assembly further comprises a an adhesive tape or adhesive strip application gun 449. The application gun 449 can comprise a standard application gun, such as, for example, a SCOTCH® ATG 700, and is seen to comprise a gun handle 451, a trigger mechanism 453, and an adhesive tape or adhesive strip housing 455. The gun 449 is adapted to be mounted upon the gun support plate 445, and in order to confine the gun 449 at a particular position and angular disposition upon the gun support plate 445, a first upstanding semi-circular ring or barrier is provided upon the gun support plate 445 as at 457, as can best be seen in FIGURE 9, so as to engage the right end portion of the housing 455, while a second upstanding semi-circular ring or barrier is likewise provided upon the gun support plate 445 as at
459, as can best be seen in FIGURE 8, so as to engage the left end portion of the housing 455. While the barriers 457 and 459 effectively serve to secure the position and angular disposition of the gun 449 at a particular position and orientation upon the gun support plate 445, the gun 449 is actually locked in place or locked down onto the gun support plate 445 by means of a conventional over-center locking mechanism 461 which is clearly shown in FIGURES 9 and 10.

As can be seen from FIGURES 9 and 10, the over-center locking mechanism 461 comprises a base member 463 fixedly secured to the gun support plate, a locking bar 465, and an operating handle 467. The base member 463 actually comprises a clevis structure with pivot pins 469 and 471 extending therethrough. In addition, the free distal end portion of the operating handle 467 is pivotally connected to the proximal end portion of the locking bar 465 as at 473, while the operating handle 467 is operatively connected to the pivot pin 471 by means of a connector member, not shown or capable of being seen, which connects the pivot pin 471 to another pivot pin 475. As can be readily appreciated from FIGURES 9 and 10, and in accordance with well-known operative techniques characteristic of an over-center locking mechanism, when the operating handle 467 is pivotally moved to its upward or raised position as shown in FIGURE 10, the upward movement of the right, free, or distal end portion of the operating handle 467 will force the locking bar 465 to move upwardly, due to the pivotal interconnection between the operating handle 467 and the locking bar 465 as at 473, such that the locking bar 465 no longer engages the handle portion 451 of the application gun 449 whereby the application gun
449 is free to be removed from its locked position upon the gun support plate 445. Conversely, downward movement of the right, free, or distal end portion of the operating handle 467 will force the locking bar 465 to move downwardly, due to the pivotal interconnection between the operating handle 467 and the locking bar 465 as at 473, such that the locking bar 465 is forced into engagement with the handle portion 451 of the application gun 469 thereby locking the application gun 449 at its locked position upon the gun support plate 445.

Continuing further, and with reference still being made to FIGURES 8 and 9, a trigger actuator 475, in the form of an upstanding tubular member, is disposed adjacent to the application gun trigger mechanism 453 and is fixedly mounted upon a plate 477. The trigger actuator 475 is operatively connected to the piston rod 479 of a solenoid actuator 481, and accordingly, when the solenoid actuator 481 is fired and maintained in the ON position, the piston rod 479 is retracted and moved toward the right as viewed within FIGURES 9 and 10 thereby causing the trigger mechanism 453 to be maintained at its firing position. With reference reverting back to FIGURE 8, it is further seen that a supply roll of an adhesive tape or an adhesive strip is disposed internally within the adhesive tape or adhesive strip housing 455 and is disclosed at 483. The adhesive tape or adhesive strip actually comprises a paper tape or strip upon which there is disposed a double-sided adhesive tape or strip wherein one side of the double-sided adhesive tape or strip has a substantially larger adhesive affinity for or with respect to the palletized load than for or with respect to the paper backing tape or strip. Accordingly, when the side of the double-sided adhesive tape
or strip, which has the larger adhesive affinity, is effectively forced into contact with the palletized load, it will effectively release from the paper backing strip and stick to the palletized load. In order to achieve the dispensing of the adhesive strip or tape from its supply roll 483, a braking roller 485 and an idler application roller 487 are mounted upon suitable support brackets, not shown, at a position adjacent to an outlet or output port of the adhesive tape or adhesive strip housing 455 whereby the two rollers are disposed in peripheral contact with each other such that the idler application roller 487 is caused to rotate as a result of its contact engagement with the palletized load 452 with the braking roller 485 permitting the idler application roller 487 to rotate. The adhesive tape or adhesive strip will exit the housing 455 and be routed around an external peripheral portion of the braking roller 485 and effectively be inserted or threaded into the nip defined between the braking roller 485 and the idler application roller 487. The highly sticky side of the double-sided adhesive tape will be disposed in contact with the braking roller 485 while the paper-backing portion of the double-sided adhesive tape will be disposed in contact with the idler application roller 487.

The braking roller 485 is treated with a suitable substance so as to prevent the highly sticky side of the double-sided tape from sticking thereto, and therefore, as the adhesive tape or strip moves around the outer peripheral surface of the idler application roller 487, the highly sticky side of the double-sided adhesive tape or strip will effectively face outwardly from the idler application roller 487 and will be disposed toward the palletized load 452. As
can also be seen from FIGURE 8, the gun housing 455 also includes a take-up reel 489 for the paper backing of the double-sided adhesive tape or strip, wherein the take-up reel 489 may be driven when the trigger mechanism 453 is activated.

Alternatively, the take-up reel 489 can be operatively connected to the idler application roller 487 such that as the idler application roller 487 rotates and deposits the adhesive tape or strip onto the palletized load 452, the take-up reel 489 is being rotated so as to take-up the paper backing strip or tape. The braking roller 485 is also operatively connected to the trigger mechanism 453. Accordingly, when the solenoid 481 is deactivated, the trigger mechanism 453 is released and the braking roller 485 is braked or prevented from rotating, thereby, in turn, effectively braking the idler application roller 487 such that the idler application roller 487 no longer rotates and no longer dispenses the adhesive tape or adhesive strip onto the palletized load 452. The robot vehicle 402 continues to move however, thereby causing the adhesive tape to sever while the paper backing of the double-sided adhesive tape or strip remains intact. This operation will be explained in greater detail later in the specification.

With reference now being made to FIGURE 11, another new and unique feature characteristic of the robot vehicle 402 of the second embodiment of the robotic film packaging or wrapping system of the present invention will now be described. It has previously been noted with respect to the PRIOR ART robotic systems as disclosed within FIGURES 1-3, as well as with respect to the first embodiment of the robotic film packaging or wrapping system of the present invention as dis-
closed within FIGURES 4-6, that it is important to not only know where the robot vehicle 402 will be located relative to its original HOME or START position, but more importantly, that the robot vehicle 402 can be returned to its original HOME or START position in preparation for the commencement of a new film wrapping or packaging operation. Accordingly, the robot vehicle 402 has been provided with a proximity sensor 491, and the floor region of the wrapping station 450 has been provided with a metal plate 493 suitably secured to the particular floor region of the wrapping station 450 designating the HOME or START position of the robot vehicle 402. Accordingly, after completion of a particular film wrapping or packaging operation, the programmable logic controller (PLC) 454, operatively connected to the robot vehicle 402 through means of the suitable communication links 456, will cause the robot vehicle 402 to circumnavigate the palletized load, regardless of where the robot vehicle 402 is with respect to the palletized load and with respect to the HOME or START position, until the proximity sensor 491 detects the metal plate 493, indicating the HOME or START position, at which time the programmable logic controller (PLC) 454 will terminate the motor drive of the robot vehicle 402. For best results using the proximity sensor 491 in connection with the metal plate 493 in order to detect the START or HOME position, it has been determined that the proximity sensor 491 should be approximately one inch (1.00") in diameter and that it should be secured to a side portion of the robot vehicle 402 such that the proximity sensor 491 is located approximately eight centimeters (8cm) above the metal plate 493.

With reference now being made to FIGURE 12, still
another new and unique feature characteristic of the robot vehicle 402 of the second embodiment of the robotic film packaging or wrapping system of the present invention will now be described. In connection with all film wrapping or packaging systems, it is always important to know how much wrapping or packaging film is being utilized in connection with the wrapping or packaging of a particular load. For example, such data may be desired for efficiency-improvement purposes. In other words, wrapping or packaging installations may desire to vary their wrapping or packaging techniques so as to reduce the amount of film required to wrap or package a particular load. Alternatively, such data may be used as a means for accurately tracking how much film is being used for particular wrapping or packaging operations in connection with which the wrapping or packaging installation is only required to pay for the film actually used.

Accordingly, in accordance with the principles and teachings of the present invention, the upper end portion of one of the wrapping or packaging film dispensing roller axles 495 is provided with a plurality of studs or bosses 497. In particular, four of such studs or bosses 407 are fixedly mounted upon the upper end portion of the particular film roller axle 495 at equiangularly spaced locations, that is, 90° apart. A proximity counter 499 is disposed adjacent to the upper end portion 495 of the particular roller axle, and accordingly, as the roller axle rotates, the plurality of studs or bosses 497 rotate past the proximity counter 499. The proximity counter 499 can therefore count the number of studs or bosses 497 passing thereby, such data can be transmitted to the programmable logic controller (PLC) 454, and
knowing the diameter of the particular roller, which could be an idler roller, a stretch roller, or the like, a determination can be derived as to how much wrapping or packaging film has been unwound from its supply roll and wrapped upon the palletized load.

A last new, novel, and unique structural feature characteristic of the new and improved second embodiment of the robotic film packaging or wrapping system 400 of the present invention will now be described with reference being made to FIGURES 13-18. More particularly, FIGURES 13-18 are concerned with a new and improved film cutting and clamping mechanism, and an operative assembly for appropriately moving the same, whereby at the conclusion of a particular film wrapping or packaging operation, the wrapping or packaging film is severed so as to effectively create a trailing end portion of the wrapping or packaging film which effectively self-adheres to the palletized load, while simultaneously creating a leading end portion of the wrapping or packaging film which is retained so as to be utilized to commence the next film wrapping or packaging operation in connection with a new palletized load. In accordance with the principles and teachings of the present invention, it is seen from FIGURES 13-18 that a substantially C-shaped mounting plate or bracket 501 has a pair of memory foam members 503, 505 mounted upon the front face thereof, that is, the face that is disposed toward the palletized load. In addition, a clamping plate 507 is provided, and a cutting implement 509 is fixedly mounted upon the clamping plate 507. The clamping plate 507 is fixedly mounted upon the distal end portion of a horizontally oriented rod member 511 wherein the horizontally oriented rod
member 511 passes through the mounting plate 501 so as to be operatively connected to suitable actuating mechanisms mounted upon the back or rear side of the mounting plate 501 as will become more apparent hereinafter. The rod member 511 is both linearly movable in the horizontal direction along its axis, and rotatable through an angular extent of 90° about its longitudinal axis, whereby two different or separate operative positions with respect to its longitudinal axis are defined.

It is initially to be appreciated that the clamping plate 507 and the cutting implement 509 are normally spaced away from the wrapping or packaging film and are disposed upon one side of the packaging or wrapping film while the palletized load 452 is disposed upon the opposite side of the packaging or wrapping film, that is, during a film packaging or wrapping operation. The exception to this relative state of the various structural components with respect to each other is when a film packaging or wrapping operation is being completed at which time the packaging or wrapping film is about to be severed by the cutting implement 509 in order to effectively create the trailing end portion of the packaging or wrapping film which will effectively self-adhere to the packaged or wrapped palletized load, and the leading end portion of the packaging or wrapping film which will be retained by the clamping plate 507 in preparation for the commencement of a new film packaging or wrapping operation. It is to be noted that, as can best be seen from FIGURE 13, the cutting implement 509 includes a knife edge or similar cutting or severing structure 513 for performing the severance of the packaging or wrapping film. FIGURE 14 clearly illustrates how
the rod member 511 passes through the mounting plate or bracket 501, and FIGURES 15 and 16 illustrate the various structural components for moving the horizontally oriented rod member 511 linearly along its horizontally oriented axis as well as for rotating the rod member 511 around its horizontally oriented axis. As may be readily appreciated, since the clamping plate 507 and the cutting implement 509 are fixedly mounted upon the free distal end portion of the horizontally oriented rod member 511, then the linear and angular movements of the rod member 511 will cause cutting implement 509 to undergo similar movements.

As can be seen from FIGURES 15 and 16, a horizontal platform 515 is fixedly attached to a rear face 517 of the mounting plate or bracket 501, and a substantially vertically oriented actuator 519 is mounted upon the platform 515. The actuator 519 comprises a cylinder 521 and a piston 523, and it is also seen that the rod member 511 is fixedly disposed within a collar 525 which is rotatably mounted upon the mounting plate or bracket 501 through means of a suitable bearing assembly 527. The piston rod 523 is fixedly connected to an ear or circular disk 529, and the ear or circular disk 529 is, in turn, fixedly connected to a connector block 531 which is fixedly connected to an outer peripheral or tangential portion of the collar 525 which is radially offset from the longitudinal axis of the rod member 511. Accordingly, when the piston 523 of the actuator 519 is moved from its retracted position illustrated within FIGURE 16 to its extended position illustrated within FIGURE 17, the collar 525 has effectively been rotated approximately 90° in the clockwise direction, and consequently, the rod member 511, along with the
clamping plate 507 and the cutting implement 509, have also been rotated through such an angular extent. Therefore, the clamping plate 507 and the cutting implement 509 have been rotated, for example, from an initially horizontally oriented position to a vertically downward position, the significance of which will become clearer hereinafter.

Continuing still further, and with reference still being made to FIGURES 16 and 17, it is further seen that a horizontally oriented actuator 533 is also fixedly mounted upon the rear face 517 of the mounting plate or bracket 501, and that the horizontally oriented actuator 533 comprises a cylinder 535 and a piston 537 which cannot be seen very well within FIGURE 16 but can in fact be seen quite clearly within FIGURE 17. The actuator cylinder 535 has an upstanding square-shaped bracket or collar 539 fixedly mounted thereon, and the bracket or collar 539 is, in turn, fixedly mounted upon the horizontally oriented rod member 511. It is noted that contrary to the normal actuation of a typical conventional actuator wherein the piston is the relatively movable component of the piston-cylinder assembly, in this case, the actuator cylinder 535 is the movable component in view of the fact that the piston 537 is fixedly attached to the rear face 517 of the mounting plate or bracket 501. As a result of the longitudinal movement of the actuator cylinder 535 in the rearward direction away from the rear face 517 of the mounting plate or bracket 501, and the fixation of the actuator cylinder 535 to the rod member 511 through means of the collar or bracket 539, the rod member 511, along with the clamping plate 507 and the cutting implement 509, are also moved in the rearward direction. Considered conversely, how-
ever, the clamping plate 507 and the cutting implement 509 are effectively moved toward the front face 541 of the mounting plate or bracket 501. More particularly, as can also be best appreciated from FIGURES 14 and 15, as the clamping plate 507 and the cutting implement 509 are moved toward the front face 541 of the mounting plate or bracket 501, the cutting implement 509 encounters the packaging or wrapping film 543 extending from the palletized load 452 and will sever the packaging or wrapping film 543 thereby forming a trailing end portion of the packaging or wrapping film 543 which will self-adhere to the palletized load, while the clamping plate 507 forcefully engages the small block of memory foam 503 so as to fixedly retain a leading end portion of the packaging or wrapping film 543 which is now actually stretched taut across the large block of memory foam 505 as seen in FIGURE 15.

With reference lastly being made to FIGURE 18 in connection with the various structural components comprising the second embodiment robotic film packaging or wrapping system 400, it is seen that the upstanding packaging or wrapping film roll spindle 413 is fixedly secured upon a film dispensing roller housing 412, and that the film dispensing roller housing 412 is provided with a framework which is pivotally attached thereto. More particularly, it is seen that the framework comprises a vertically oriented bar or rod 545 that is pivotally mounted upon the film dispensing roller housing 412 so as to be pivotal about the longitudinal axis of the vertically oriented bar or rod 545, and three horizontally oriented, vertically spaced bars or rods 547, 549, 551 which are fixedly mounted to lower, middle, and upper portions of
the vertically oriented bar or rod 545. A mounting bracket 553 extends outwardly from the floor or lower platform 555 of the film dispensing roller housing 412, and an actuator 557 is fixedly attached to the floor or platform 555 and the lower horizontal bar 547 of the framework.

In addition, it is seen that the mounting plate or bracket 501 is pivotally mounted upon free distal end portions of the horizontally oriented middle and upper bar or rod members 549,551 of the framework as at upper and lower pinions 559, only the upper one being visible. In this manner, when the actuator 557 is actuated so as to extend or retract the piston thereof (not visible), the framework is able to be moved toward or away from the palletized load 452 which will, in turn, move C-shaped mounting bracket or plate 501, and the clamping plate 507 and the cutting implement mounted 509 mounted thereon, toward or away from the palletized load 452. When the mounting bracket or plate 501 is moved into engagement with the palletized load 452, it is desired that the mounting bracket or plate 501, having the large block of memory foam 505 mounted thereon, be flush with the palletized load 452 such that the leading end portion of the packaging or wrapping film 543 can be properly applied to the palletized load 452. In order to ensure this flush disposition of the mounting bracket or plate 501, and to further ensure that the mounting bracket or plate 501 does not move or pivot too far backwardly beyond the flush position, a strong coil spring 561 is mounted around the lower pinion 559 with opposite ends 563,565 of the coil spring 561 being connected to the mounting bracket or plate 501 and to the middle framework bar or rod 549, respectively. If desirable, for spatial considera-
tions, or for locating the mounting bracket or plate 501, with its various operative components thereon, at a particular trailing-end location with respect to the robot vehicle 402, the various horizontally oriented framework members 547, 549, 551 may comprise telescopic structures.

Having described substantially all of the structural components of the second embodiment robotic film packaging or wrapping system 400, a brief description of some of the important operations of the same will now be described. The first operation that will be described is the attachment of the leading end portion of the packaging or wrapping film 543 onto the palletized load 452 as the leading end portion of the packaging or wrapping film 543 is disclosed within FIGURE 15 as being effectively clamped onto the smaller block of memory foam 503 by means of the clamping plate 507 and with an adjacent portion of the packaging or wrapping film 543 extending across the larger block of memory foam 505 in a taut manner. The film packaging or wrapping operation is begun with the robot vehicle 402 disposed near a corner portion of the palletized load 452 and the support arm 418 is moved in a clockwise direction, with respect to the robot vehicle 402, so as to effectively bring the dual guide wheels 416, 417 into engagement with the corner portion of the palletized load 452 such that one of the guide wheels 416 is disposed in engagement with one side of the palletized load 452 while the other guide wheel 417 is disposed in engagement with another side of the palletized load 452. The robot vehicle 402 itself then begins to move in a clockwise direction around the palletized load 452 such that the robot vehicle 402 and the support arm 418 now move in a clockwise direction relative to
the dual guide wheels 416,417.

Accordingly, as can best be appreciated from FIGURE 8, since the support arm 418 is moving in the clockwise direction relative to the guide wheels 416,417, the entire adhesive tape or adhesive strip assembly, comprising the gun 449 and the idler application roller 487 are also rotated in the clockwise direction whereby the idler application roller 487, having the highly sticky adhesive side of the adhesive tape or strip disposed upon its outer peripheral surface, will now approach the palletized load 452 and will be at approximately the same radially outward extent as the outer peripheral surfaces of the dual guide wheels 416,417. At this point in time, the actuator 439 is actuated so as to linearly move and extend the actuation plate 441 so as to in fact move the idler application roller 487 further into engagement with the palletized load 452, the solenoid 481 is activated so as to activate the trigger mechanism 453 which drives the take-up reel 489 and releases the braking roller 485, and the adhesive tape or adhesive strip is engaged with and applied to a side wall portion of the palletized load 452. Due to the greater adhesive affinity defined between the adhesive tape or adhesive strip and the palletized load 452 than the adhesive affinity defined between the adhesive tape or adhesive strip and its paper backing, the adhesive tape or adhesive strip is transferred from the paper backing to the palletized load 452. It can therefore be appreciated that as the robot vehicle 402 continues to move forward relative to the palletized load 452, the top, spring-biased gun support plate 445 will pivot further causing a predetermined portion of the adhesive tape or adhesive strip to unroll from the idler appli-
cation roller 487 and be forcefully applied onto the palletized load 452. After a predetermined amount of the adhesive tape or adhesive strip is applied to the palletized load 452, the solenoid 481 is deactivated, the trigger mechanism 453 is deactivated, and further dispensing of the adhesive tape or adhesive strip is terminated as a result of the braking roller 485 braking or stopping rotation of the idler application roller 487. The idler application roller 487 then simply moves away from the palletized load 452 due to the continued movement of the robot vehicle 402 with respect to the palletized load 452 whereby the actual adhesive tape or adhesive strip effectively snaps or breaks, while the paper backing remains intact, due to the significant difference in tensile strength between the adhesive strip or adhesive tape material as compared to that of the paper backing material, and the spring 447 returns the spring-biased gun support plate 445 to its original position.

Having now applied an adhesive tape or adhesive strip to the palletized load 452, the robot vehicle 402 continues to circumnavigate the palletized load 452 and when the rear end of the robot vehicle 402, upon which the leading end portion of the packaging or wrapping film 543 is located as a result of being clamped onto the small block of memory foam by means of the clamping plate 507, and extending across the large block of memory foam 505 which will serve as an application pad for applying the leading end portion of the packaging or wrapping film 543 onto the palletized load 452, as can be appreciated from FIGURES 15 and 18, the actuator 557 is actuated so as to move the framework 545 and the C-shaped mounting plate or bracket 501 toward the palletized load 452
whereby the leading end portion of the packaging or wrapping film 543 can now be brought into contact with the adhesive strip or adhesive tape that has been previously affixed to the palletized load. Continued movement of the robot vehicle 402 effectively "wipes" the leading end portion of the packaging or wrapping film 543 onto the adhesive tape previously applied to the palletized load whereupon the robot vehicle 402 can continue to circumnavigate the palletized load 452 thereby wrapping the palletized load 452 with the packaging or wrapping film in a predetermined manner or in accordance with a predetermined mode or pattern. In order to further ensure that the leading end portion of the packaging or wrapping film 543 is in fact sufficiently engaged and pressed onto the palletized load 452, particularly where, for example, a particular carton or box of the palletized load has an uneven or concave surface portion, an additional or auxiliary bumper pad 566, as illustrated within FIGURE 19, may be fixedly secured to the large block of memory foam 505.

It is of course to be appreciated that once the leading end portion of the packaging or wrapping film 543 has been secured to the adhesive strip or adhesive tape disposed upon the palletized load 452, the actuator 519 is actuated so as to pivot the clamping plate 507 and the cutting implement 509 from their vertically downward position, at which the clamping plate 507 has clampingly retained the leading end portion of the packaging or wrapping film 543 upon the small block of memory foam 503, to their horizontal positions at which the clamping plate 507 and the cutting implement 509 are located above the upper edge portion of the packaging or wrapping film 543 so as to effectively be completely clear of
and disengaged from the packaging or wrapping film 543. The actuator 533 is also actuated so as to retract the clamping plate 507 and the cutting implement 509 away from the packaging or wrapping film 543, as is the actuator 557 so as to also retract the framework assembly 545 away from the palletized load 452. It is lastly noted, as can best be seen in FIGURE 15, that the lower end portion of the clamping plate 507 is provided with a freely rotating wheel or roller 567 such that when the clamping plate 507 and the cutting implement 509 are pivotally rotated from their vertically downward positions to their horizontal positions, the wheel or roller 567 effectively enables the clamping plate 507 to freely move or roll over the packaging or wrapping film 543 without snagging the same.

Lastly, when the film packaging or wrapping operation is completed, reverse operations are implemented in connection with the clamping plate 507 and the cutting implement 509 in order to sever the packaging or wrapping film 543 and thereby effectively form a trailing end portion of the packaging or wrapping film, which will self-adhere to the palletized load, and a leading end portion of the packaging or wrapping film 543 which will be retained upon the small block of memory foam 503 by means of the clamping plate 507. More particularly, when the film packaging or wrapping operation is completed, the actuator 557 is actuated so as to move the framework 545 and the C-shaped mounting plate or bracket 501 toward the film wherein such components are, at this time, upon the outside or to the rear of the packaging or wrapping film. Actuator 519 is then actuated so as to rotate the rod member 511 and thereby move the clamping plate 507 and the
cutting implement 509 to their horizontal positions above the upper edge portion of the packaging or wrapping film 543, and the actuator 533 is actuated so as to move the rod member 511 linearly forwardly so as to effectively move the clamping plate 507 and the cutting implement 509 in the forward direction whereby the clamping plate 507 and the cutting implement 509 are now moved over the upper edge portion, or across the boundary, of the packaging or wrapping film 543 and will effectively be disposed upon the inside of the packaging or wrapping film 543. The robot vehicle 402 is at this time stopped, and the actuator 519 is actuated so as to effectively rotate the clamping plate 507 and the cutting implement 509 downwardly from their horizontal positions to their vertically downward positions. Substantially simultaneously, the actuator 533 is also actuated so as to effectively retract the clamping plate 507 and the cutting implement 509 rearwardly such that as the cutting implement 509 encounters a body portion of the taut packaging or wrapping film 543, it will sever the same leaving the trailing edge portion of the packaging or wrapping film to self-adhere to the palletized load 452 while the clamping plate 507 will capture and retain the leading end portion of the packaging or wrapping film 543 onto the small block of memory foam 503 as is shown in FIGURE 15. The apparatus is then ready for a new packaging or wrapping operation.

With reference now being made to FIGURES 20-30, pertinent portions of a third embodiment of a new and improved robot, which is generally indicated by the reference character 600 and which is effectively a robot similar to the second embodiment robot 400 as illustrated within FIGURES 7-
but modified in accordance with the principles and teachings of the present invention, is disclosed. For brevity purposes, a discussion of the structural components of the third embodiment of the new and improved robot 600, which are similar to corresponding structural components of the second embodiment robot 400, will not be discussed in detail but have been assigned corresponding reference characters within the 600 and 700 series. To the contrary, the ensuing disclosure will concentrate upon, or be directed toward, the new and improved features of the third embodiment of the robot 600 that, as will become more apparent hereinafter, deal with the application of adhesive dots, or the like, to the palletized load such that a leading end portion of a packaging or wrapping film is able to be automatically applied to the palletized load, and the actuator structure for achieving the application of the adhesive dots to the palletized load.

More particularly, with reference first being made to FIGURES 20 and 21, the primary difference that can readily be appreciated between, for example, the third embodiment robot system 600 as disclosed within FIGURES 20 and 21, and the second embodiment robot system 400 as disclosed within FIGURES 7 and 8, resides in the adhesive applicator subsystem or subassembly as will become more apparent hereinafter. More specifically, it is initially noted, for example, that the main support arm 618 of the robot 602 has a substantially elongated Z-shaped configuration, that the vertically disposed axles 622, 624 supporting the dual guide wheels 616, 617 are taller or longer than their counterparts 422, 424, that the vertically oriented spindle 627 rotatably mounted within the free or distal end portion of the main support arm 618 of the
robot 602 is likewise taller or longer than its counterpart 427, and that the adhesive application subassembly or subsystem is fixedly mounted upon the lower end portion of the vertically oriented spindle 627 but at an elevational level that is just above the dual guide wheels 616,617. This structural arrangement of the variously noted system components permits the components to be spatially accommodated in an optimal manner while also permitting the variously noted system components to be optimally located with respect to the palletized load 652.

With reference now being additionally made to FIGURES 22-30, the individual components, comprising the adhesive application system, as well as their overall operative intercooperation with respect to each other, will now be described. As can best be appreciated from FIGURES 20-23, an actuator assembly for moving the adhesive applicator roller into engagement with the palletized load, as will be more fully described hereinafter, is seen to comprise a bottom plate 654 upon which a suitable actuator 656 is fixedly mounted. A slide housing 658 is also mounted upon the bottom plate 654 adjacent to the actuator 656, and a pair of slide plates 660,662, which are slidably disposed atop the slide housing 658, are operatively connected to a screw actuator or rotary drive rod 664 which can best be seen in FIGURES 22 and 23. As the actuator 656 is actuated to rotate the screw actuator or rotary drive rod 664 in a first direction, the slide plates 660,662 will move translationally forwardly along the slide housing 658 toward the palletized load. The slide plates 660,662 effectively serve as actuators for limit switches, not shown, so as to effectively define the travel
limits, that is, the extension and contraction, or disposition, of the application roller with respect to the palletized load. When the slide plates 660,662 are moved forwardly toward the palletized load, the forward slide plate 660 will eventually actuate its associated limit switch such that the actuator 656 is deactuated whereby the application roller will be disposed at and maintained at its forwardmost position so as to be engaged with the palletized load. At a predetermined time controlled by a programmable logic controller (PLC), the actuator 656 will again be actuated so as to rotate the screw actuator or rotary drive rod 664 in the opposite direction which will cause the slide plates 660,662 to be moved in the opposite or rearward direction away from the palletized load such that the rear slide plate 662 will actuate its associated limit switch whereby the actuator 656 will be deactuated.

As can additionally best be seen from FIGURES 20 and 23, a pair of vertically spaced collars 668,670 are mounted upon the vertically upstanding spindle 627 and are fixedly secured to the spindle 647 by means of, for example, a pair of set screws, not shown, which tightly grip external peripheral portions of the spindle 647. In addition, as best seen in FIGURE 23, a semi-circular housing 672 is fixedly secured to the pair of collars 668,670 by any suitable means, such as, for example, welds as shown at 674, and a substantially L-shaped angle iron 676 has its vertically oriented leg 678 fixedly secured to the housing 672 by means of fasteners 680, while the horizontally oriented leg 682 is fixedly secured to the bottom plate 654 of the actuator assembly by means of fasteners 684. In this manner, the actuator as-
sembly is rotatably or pivotally mounted upon the upstanding spindle 647.

Continuing further, and with reference now being made to FIGURE 24, there is shown a bottom support plate 686 which is provided with a plurality of holes or apertures 688. As can be seen from FIGURES 22 and 23, each one of the slide plates 660, 662 is also respectively provided with a plurality of holes or apertures 690, 692, and in this manner, the bottom support plate 686 is adapted to be fixedly secured to the upper surface portions of the pair of slide plates 660, 662 by means of suitable fasteners, not shown. In FIGURE 25, there is disclosed a slide track 694 which is also provided with several apertures or holes 696 whereby the slide track 694 can be fixedly secured atop the bottom support plate 686 by means of suitable fasteners, also not shown. A slide mechanism, comprising a slide member 698 and a slide plate 700, is adapted to be slidably disposed within the slide track 694 as a result of the slide member 698 being slidably disposed upon the upper surface portion of the slide track 694 and between slide track guide surfaces or edge portions 702 extending along oppositely disposed, longitudinally oriented sides of the slide track 694. The slide plate 700 is adapted to be fixedly secured to the underlying slide member 698 by any suitable means, such as, for example, fasteners, not shown, which may be inserted through holes or apertures 704 formed within the slide plate 700. As can best been seen in FIGURE 26, there is disclosed an applicator support plate 706 upon which the various components of the adhesive dot applicator assembly are adapted to be supported. More particularly, it is seen that the applicator support plate 706 has a substan-
tially L-shaped configuration with the central portion of the long leg 705 of the applicator support plate 706 accommodating fasteners which pass therethrough so as to engage holes or apertures 708 defined within the corner regions of the slide plate 700, such fasteners being shown at 710 in FIGURE 26.

The short leg 712 of the applicator support plate 706 is provided with an aperture 714 which is adapted to accommodate a spindle, not shown, of an adhesive dot supply roll 716 as can best be seen in FIGURE 28, such that the adhesive dot supply roll 716 is rotatably mounted upon the applicator support plate 706. In a similar manner, the central portion of the applicator support plate 706 is also provided with another aperture 718, within the vicinity of the fasteners 710, for accommodating a spindle, not shown, of an adhesive dot backing paper or strip take-up reel 720 which is also best seen in FIGURE 28 and which is also rotatably mounted upon the applicator support plate 706. FIGURE 28 also discloses the fact that the adhesive dots 722 are releasably mounted in a serially spaced array upon a backing paper, strip, or the like 724 wherein, after a series of the adhesive dots 722 are applied to the palletized load, in a manner similar to the application of the adhesive dots of the first embodiment of the robotic film packaging or wrapping system 300, the backing paper, strip, or the like 724 is taken up by the take-up reel 720. As can also best be appreciated from FIGURE 28, the substantially L-shaped applicator support plate 706 is also provided with a pair of ears or extensions, the first forwardly extending ear or extension 726 having the adhesive dot applicator roller 728 rotatably mounted thereon, whereas a transversely extending second ear or ex-
tension 730 has an idler roller 732 roatably mounted thereon.

Having described substantially all of the operative components of the third embodiment robotic film packaging or wrapping system 600, a brief description of the operation of the same will now be set forth. When a film packaging or wrapping operation or cycle is to be commenced, the programmable logic controller (PLC) 754 will transmit a **START** signal to the robot vehicle 602, and the robot vehicle 602 will begin to commence its path around the palletized load 652. The programmable logic controller (PLC) 754 will receive signals from the drive wheel assembly of the robot vehicle 602, and will therefore transmit a signal to the application actuator 656 at a predetermined time such that the application actuator 656 can be fired so as to linearly move the slide assembly comprising the slide plates 660, 662, the bottom support plate 686, the slide track 694, the slide mechanism 698, 700, and the applicator support plate 706, in the forward direction such that the adhesive dot applicator roller 728 will move into engagement with the palletized load. As can best be seen in **FIGURE 20**, the predetermined time at which the application actuator 656 is fired would optimally be at approximately time at which the robot vehicle 602 would approach the second palletized load indicia as noted at 734. In this manner, sufficient surface area of the palletized load 652 is available upon which a sufficient number of applicator dots 722 can be applied to the palletized load 652 in preparation for the leading end of the packaging or wrapping film 543 to be impressed upon and adhered to the adhesive dots 722 secured to the palletized load 652. It is to be noted that when the applicator actuator 656 is fired, it will move all of the
aforenoted structural components, that is, the slide assembly comprising the slide plates 660,662, the bottom support plate 686, the slide track 694, the slide mechanism 698,700, the applicator support plate 706, and the adhesive dot applicator roller 728 to the forwardmost position at which the adhesive dot applicator roller 728 will engage the palletized load.

However, due to the aforenoted rotary screw drive 664 within the slide housing 658, the applicator roller 728 does not contact the palletized load 652 with sufficient force to damage the palletized load 652. In addition, it will also be recalled that the slide assembly comprising the slide member and the slide plate 698,700 are slidably disposed within the slide track 694, and that the applicator roller 728 is fixedly connected or mounted upon the slide member and slide plate 698,700 through means of the applicator support plate 706. Accordingly, when the applicator roller 728 encounters the palletized load 652, slide mechanism comprising the slide member and the slide plate 698,700, along with the applicator roller 728 as mounted upon the applicator support plate 706, will tend to move backwardly or away from the palletized load 652. In order to effectively prevent this, and to maintain the applicator roller 728 in engagement with the palletized load 652, it is noted, as can best be seen in FIGURES 24,26, and 27, that a plurality of holes or apertures 736 are provided within a side edge portion of the bottom support plate 686. As can best be seen in FIGURES 26 and 27, a screw or bolt 738 is disposed within one of the holes or apertures 736, and one end of a coil spring 740 is connected to the bolt or screw 738. The applicator support plate 706 is provided with a dependent lug 742, and a second opposite end
of the coil spring 740 is connected to the lug 742. In this manner, the retrograde movement of the aforesaid components, including the applicator support plate 706 and the applicator roller 728, is effectively prevented or at least controlled such that engagement of the applicator roller 728 with the palletized load 652 is maintained. The provision of the plurality of holes or apertures 736 within the side edge portion of the bottom support plate 606 permits one to adjust the effective spring biasing force of the coil spring 740.

Continuing further, and with reference being made to FIGURE 28, it will be appreciated that as the applicator roller 728 makes contact with the palletized load 652, the movement of the applicator roller 728 along the side wall of the palletized load will cause the applicator roller to rotate. This rotation of the applicator roller 728 will cause the adhesive dots 722 to be applied to the palletized load 652, and at the same time will cause the adhesive dot supply roll 716 to rotate. The adhesive dot supply roll 716 is operatively connected to the take-up roll or reel 720 by means of a suitable connector band 744 such that the take-up roll or reel 720 is rotated in unison with the adhesive dot supply roll 716. With continued reference being made to FIGURE 28, the purpose of the idler roller 732 is that when the applicator roller 728 is rolling along the side wall of the palletized load 652, a space between individual cartons or boxes on the palletized load 652 may be encountered. For example, with reference being made to FIGURE 20, two cartons or boxes 746,748 are noted, and there is a small space 750 defined between the cartons or boxes 746,748. In order to effectively prevent the applicator roller 728 from entering the space
750, or to become trapped in such space, the idler roller 732 is engaged with a side wall portion of, for example, the box or carton 748 so as to prevent the applicator roller 728 from entering the space 750 to any large extent.

Obviously, many variations and modifications of the present invention are possible in light of the above teachings. It is therefore to be understood that within the scope of the appended claims, the present invention may be practiced otherwise than as specifically described herein.
WHAT IS CLAIMED AS NEW AND DESIRED TO BE PROTECTED BY A
UNITED STATES PATENT IS:

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1. A robot system for wrapping or packaging at least one palletized load, disposed at at least one film wrapping or packaging station, within wrapping or packaging film, comprising:

10 at least one robot, having a reel of wrapping or packaging film mounted thereon, wherein said at least one robot is respectively disposed adjacent to the at least one palletized load, disposed at the at least one film wrapping or packaging station, so as to respectively wrap or package the at least one palletized load within wrapping or packaging film; and

15 an adhesive member applicator assembly, mounted upon said at least one robot, for applying at least one adhesive member to the at least one palletized load such that a leading end portion of said wrapping or packaging film can be adhered to the at least one palletized load whereby the at least one palletized load can be automatically wrapped or packaged, within the wrapping or packaging film, during a wrapping or packaging operation without requiring the services of an operator.

2. The system as set forth in Claim 1, further comprising:

30 a programmable logic controller (PLC) operatively connected to said at least one robot, and in communication
with said at least one robot, so as to control said at least one robot in order to cause said at least one robot to perform a film wrapping or packaging operation upon the at least one palletized load.

3. The system as set forth in Claim 2, wherein:

    said programmable logic controller (PLC) automatically controls said at least one robot such that said at least one robot commences a film wrapping or packaging operation at a predetermined HOME position, and upon conclusion of said film wrapping or packaging operation, said programmable logic controller (PLC) causes said at least one robot to automatically return to said HOME position.

4. The system as set forth in Claim 1, wherein:

    said at least one robot comprises a multiple number of robots respectively disposed adjacent to a multiple number of palletized loads disposed at a multiple number of packaging or wrapping stations;

    wherein each one of said multiple number of robots has an adhesive member applicator assembly disposed thereon for respectively applying a leading end portion of a wrapping or packaging film onto a respective one of the multiple number of palletized loads.
5. The system as set forth in Claim 4, further comprising:
a single programmable logic controller (PLC) opera-
tively connected to all of said multiple number of robots,
and in communication with all of said multiple number of ro-
bots, so as to control all of said multiple number of robots
in order to cause said multiple number of robots to perform
film wrapping or packaging operations upon their respective
palletized loads.

6. The system as set forth in Claim 5, wherein:
said single programmable logic controller (PLC)
controls each one of said multiple number of robots automatic-
ically such that each one of said multiple number of robots
commences a film wrapping or packaging operation at a prede-
termined HOME position, and upon conclusion of said film
wrapping or packaging operation, said programmable logic con-
troller (PLC) causes each one of said multiple number of ro-
bots to automatically return to said HOME position.

7. The system as set forth in Claim 1, wherein:
said at least one robot has a forward steering
wheel assembly disposed thereon so as to permit said at least
one robot to maintain a substantially circular locus path
around the at least one palletized load during a film wrap-
ning or packaging operation.
8. The system as set forth in Claim 4, wherein:
   each one of said multiple number of robots has a forward steering wheel assembly disposed thereon so as to permit each one of said multiple number of robots to maintain its substantially circular locus path around each one of the multiple number of palletized loads during a film wrapping or packaging operation.

9. The system as set forth in Claim 7, wherein:
   said substantially circular locus is defined around ther at least one film wrapping or packaging station and comprises a member, selected from the group comprising a magnetic strip and a particularized paint, which can be sensed by said at least one robots as said at least one robot traverses said substantially circular locus.

10. The system as set forth in Claim 8, wherein:
    said substantially circular locus is defined around each one of the multiple number of film wrapping or packaging stations and comprises a member, selected from the group comprising a magnetic strip and a particularized paint, which can be sensed by each one of said multiple number of robots as each one of said multiple number of robots traverses said substantially circular locus.
11. The system as set forth in Claim 1, wherein:
said adhesive member may be selected from the group
comprising an adhesive dot, an adhesive patch, an adhesive
strip, an adhesive tape, and an adhesive label.

12. The system as set forth in Claim 1, wherein:
said adhesive member applicator assembly comprises
a supply roll of tape having a plurality of adhesive members
disposed upon said tape, an applicator roller around which
said tape is disposed such that said tape, having said plu-
rality of adhesive members disposed thereon, can be disposed
in contact with the palletized load, and a take-up reel for
taking up portions of said tape from which said plurality of
adhesive members have been removed and applied to the palle-
tized load.

13. The system as set forth in Claim 12, further comprising:
an actuator for moving said applicator roller into
contact with the palletized load such that at least one of
said plurality of adhesive members, from said supply roll of
tape, can be applied to the palletized load in order to per-
mit said leading end of said wrapping or packaging film to be
adhered to the palletized load when a film wrapping or pack-
aging operation is to be commenced.
14. The system as set forth in Claim 13, further comprising:
   a cutting implement for severing the packaging or wrapping film upon the completion of a palletized load packaging or wrapping operation whereby a trailing end portion of the packaging or wrapping film will be formed so as to self-adhere to the packaged or wrapped palletized load while a leading end portion of the packaging or wrapping film is also formed in preparation for the commencement of a new packaging or wrapping operation; and
   a clamping member fixedly connected to said cutting implement for clamping the leading end portion of the packaging or wrapping film in preparation for the commencement of a new packaging or wrapping operation.

15. The system as set forth in Claim 14, further comprising:
   a first actuator operatively connected to said clamping member and said cutting implement for angularly moving said clamping member and said cutting implement to a first position at which said clamping member and said cutting implement can move across the boundary of the packaging or wrapping film leading from the palletized load to said robot, and a second position at which said clamping member and said cutting implement can engage the packaging or wrapping film leading from the palletized load to said robot such that said cutting implement can sever the packaging or wrapping film and thereby form the trailing and leading end portions of the packaging or wrapping film while said clamping member can clamp the leading end portion of the packaging or wrapping film
film in preparation for the commencement of a new packaging or wrapping operation.

16. The system as set forth in Claim 15, further comprising:
   a second actuator operatively connected to said clamping member and said cutting implement for moving said cutting implement and said clamping member toward and away from the packaging or wrapping film such that when said cutting implement and said clamping member are moved toward the packaging or wrapping film, said cutting implement severs the packaging or wrapping film thereby forming the trailing and leading end portions of the packaging or wrapping film and said clamping member clamps the leading end portion of the packaging or wrapping film, while when said cutting implement and said clamping member are moved away from the packaging or wrapping film, the leading end portion of the packaging or wrapping film is able to be released.

17. The system as set forth in Claim 16, further comprising:
   an application pad, across which the leading end portion of the packaging or wrapping film is disposed; and
   a third actuator for moving said application pad into engagement with the palletized load such that the leading end portion of the packaging or wrapping film can be applied to the adhesive tape affixed to the palletized load.
18. The system as set forth in Claim 15, further comprising:

   a roller wheel rotatably mounted upon said clamping
   member for permitting said clamping member to be rotatably
   moved between said second and first positions so as not to
   snag the leading end portion of the packaging or wrapping
   film when the leading end portion of the packaging or wrap-
   ping film is to be released from its clamped state after the
   leading end portion of the packaging or wrapping film has
   been applied to the palletized load.

19. The system as set forth in Claim 4, further comprising:

   a metal plate disposed upon a floor region adjacent
   to each one of the multiple number of film wrapping or pack-
   aging stations; and

   a proximity sensor disposed upon each one of said
   multiple number of robots so as to detect said metal plate
   and thereby ensure that each one of said multiple number of
   robots returns to its **HOME** position at the completion of a
   packaging or wrapping operation.

20. The system as set forth in Claim 1, further comprising:

   a proximity counter disposed upon said at least one
   robot for determining the amount of wrapping or packaging
   film applied to the at least one palletized load.
FIG. 20
FIG. 29