

Oct. 26, 1965

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3,213,528

CASING BRICK

Filed Nov. 1, 1963

3 Sheets-Sheet 1

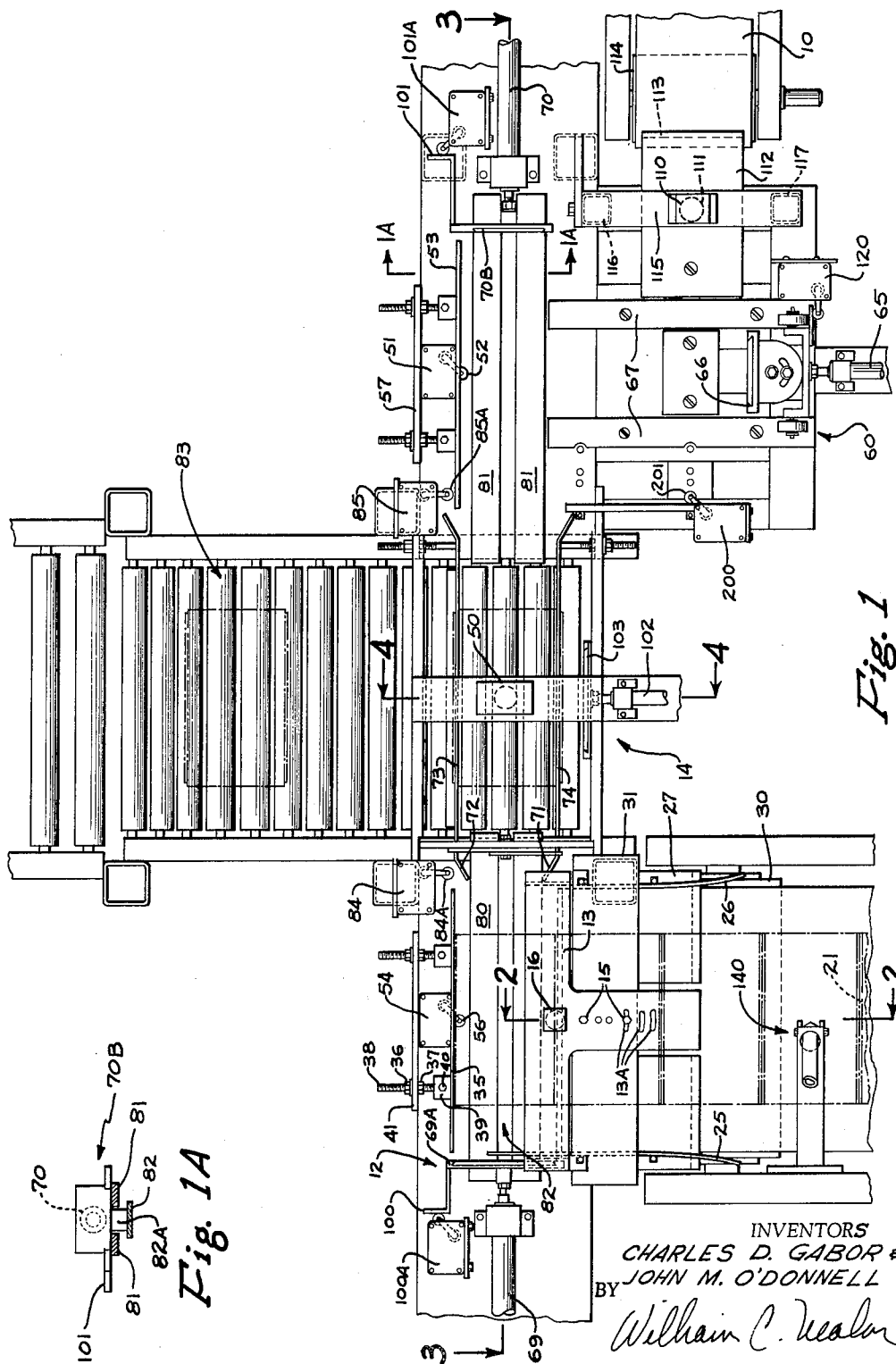


Fig. 1

Fig. 1A

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3 Sheets-Sheet 2

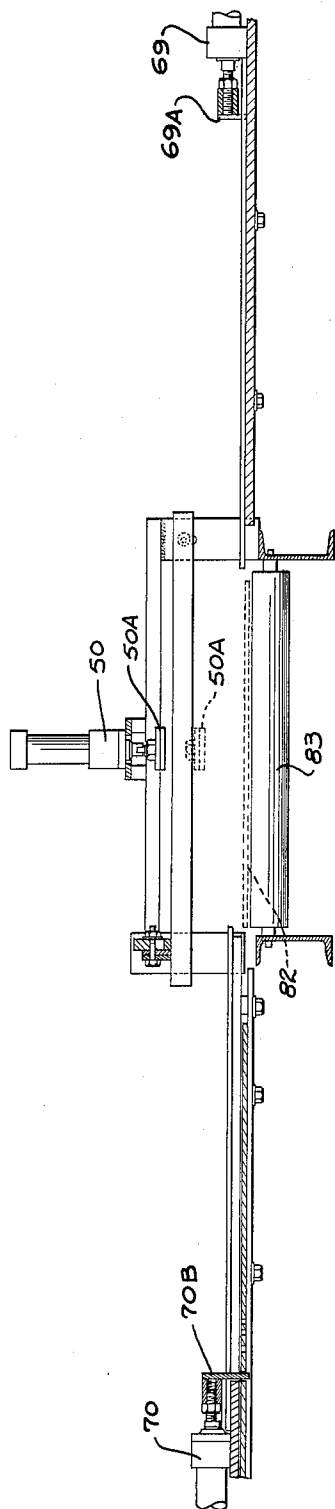


Fig. 3

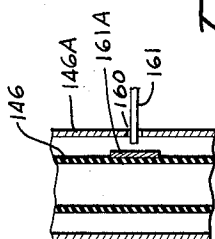


Fig. 2A

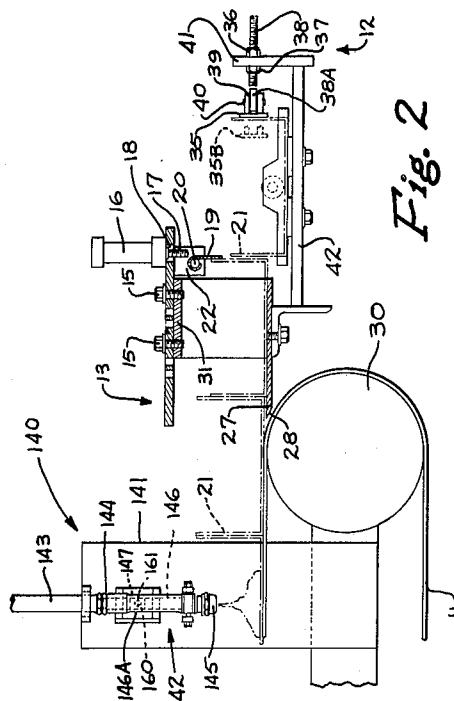


Fig. 2

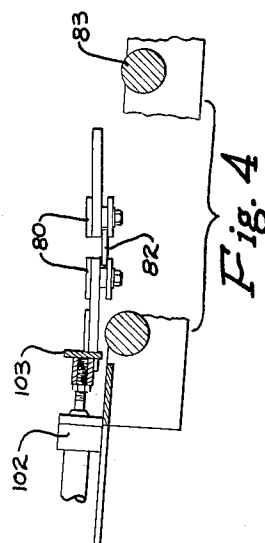


Fig. 4

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3 Sheets-Sheet 3

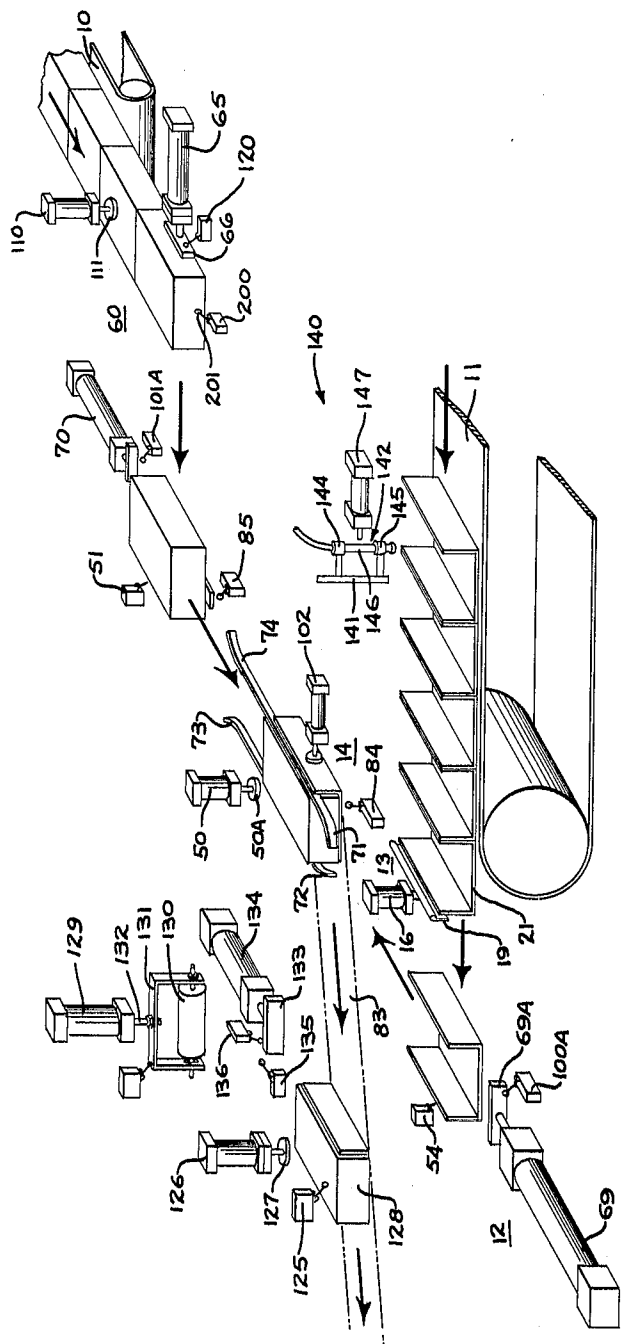


Fig. 5

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CASING BRICK

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5 Claims. (Cl. 29—211)

This invention relates to applying cases to brick and, more particularly, it relates to apparatus for applying channel-shaped metal cases to refractory brick.

For some industrial furnaces, it is desirable to use refractory brick which are metal encased. In the past, it has been common practice to use U-shaped cases, and to spread the case flanges apart by hand during applications about a brick. This is, of course, time consuming and difficult; and there is a danger of injury to workmen handling the sharp edged metal cases during application to the brick. Various machines have been suggested for automatically applying cases to brick. For example, the apparatus disclosed in United States Patent No. 2,682,703, which is owned by the same assignee as the present invention, has been extensively used for applying 3-sided, generally U-shaped, cases about refractory brick. This patent and other contemporaries thereof have proposed use of magnets and the like to spread the metal flanges of the cases during and for installation on brick.

However, even these patents have lacked the degree of automation which is desirable in today's highly mechanized industry. It is, therefore, an object of this invention to provide apparatus for automatically feeding brick and empty cases to a casing station, according to a predetermined schedule, to automatically case brick. The casing station includes means arranged to position and prepare a case for subsequently receiving brick, means to close the case about contained brick and to remove cased brick therefrom, all without manual interruption.

Briefly, in one embodiment, apparatus for the practice of this invention includes a brick supply station, which includes means arranged to remove single brick therefrom for delivery to a brick feed station. The latter station includes means arranged to feed brick to the casing station according to a predetermined schedule. The latter station cooperates with a case feed station to assure an empty case is properly and previously positioned at the casing station in time to receive brick moving thereto. The casing station further includes means arranged to release a cased brick while assuring good engagement between brick and case to provide a strong composite unit for delivery to a discharge conveyor. The apparatus includes an empty case supply station arranged to discharge cases, one at a time, to a case feed station, which case feed station, in turn, is arranged to move empty cases, one at a time, to the casing station, in time and in position, to receive a brick moving to the casing station from the brick feed station. The apparatus includes an integrated control system, arranged to sequentially and automatically actuate and stop the functions of the various working parts of the apparatus.

A better understanding and other features and advantages of method and apparatus, according to this invention, will be readily apparent to those skilled in the art from a study of the following detailed description, with reference to the drawings. In these drawings:

FIG. 1 is a fragmentary top plan view, with some parts omitted and some parts broken away, of casing apparatus according to the concepts of this invention;

FIG. 1-A is a front elevation of the pusher pad of a cylinder of FIG. 1;

FIG. 2 is a sectional view along the line 2—2 of FIG. 1;

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FIG. 2-A is a fragmentary side sectional view of some of the elements of FIG. 2;

FIG. 3 is a sectional view along the line 3—3 of FIG. 1;

FIG. 4 is a sectional view along the line 4—4 of FIG. 1; and

FIG. 5 is a simplified perspective schematic rendering of the apparatus of FIG. 1, illustrating the relative relation of parts thereof to better aid in an understanding of the integrated relationship of parts, by which completely automatic casing of brick is achieved with the apparatus of this invention.

The casing operation, which is performed by the apparatus of this invention, is, in its simplest form, a 3-step operation. The first step of the operation is to prepare a case, which can include inserting glue in it, so it will adhesively hold a later inserted brick. The second step is, of course, to insert the brick in the case; and the third step is to press the brick and case together. If desired, there can, also, be a subsequent stamping or marking step to place identifying information on the cased brick.

This machine should be located closely adjacent to a brick press, so the brick press operator can control the casing operation. Each time an operator removes a brick or bricks from a press, he places them on a brick feed conveyor, such as brick feed conveyor 10 of FIG. 1. The brick feed conveyor carries the brick into the machine, where they are automatically encased and, if desired, stamped with identifying information. The machine automatically discharges the encased and stamped brick over the roller conveyor 83 to a storage area, an area for palletization, etc.

Sequence of machine operation

Empty cases are placed on the case feed conveyor 11, in side by side relation, so the open side (best seen in FIG. 5) of the case is on the top and the open ends are parallel with the sides of the conveyor. Of course, if key brick are being cased, the wide end of the key brick case would be towards the casing station, as viewed in FIGS. 1 and 5, and there would not be the precise face to face alignment on the conveyor as is schematically shown in FIG. 5. Of course, in such an instance, guard rails (which are not shown in the drawings) would bear against opposed open ends of the key brick case, to assure their aligned forward movement along the conveyor belt 11.

In preferred practice, the casing conveyor 11 runs continuously, thereby constantly exerting a force upon the aligned series of cases, which tends to force them towards the feed station 12. This movement of cases is resisted by the case latch 13. As shown in the drawings, the case latch 13 is a T-shaped member (top view of it is best seen in FIG. 1) with its crossbars at right angles to the casing station 14 and its stem extending rearwardly substantially centrally along the vertical bisector of the conveyor 11. This stem portion has apertures 13A, which apertures are of generally forwardly-opening arcuate configuration, so as to allow adjustment of the case latch by suitable movement and positioning relative to the bolts 15. Mounted on top of the case latch is a hydraulic or pneumatic cylinder 16 (see FIG. 2), which is arranged to raise and lower its rod 17 which extends through the aperture 18 formed in the case latch 13. When the rod 17 is raised, it allows the member 19 to pivot about its pin 20 to thereby allow a case 21 to be discharged to the case feed station 12. The pin 20 is carried on an ear 22 secured, as by welding or the like, to the undersurface of the case latch 13. In a preferred construction, the pair of rearwardly diverging rails 25 and 26 assure aligned feeding of the cases from the conveyor onto the plate 27

and, thus, into position against the case latch. Note the forward edge 28 of the plate 27 is undercut, so it may be more closely seated adjacent the turn of belt 11 about its drive pulley 30. The case latch, itself, is bolted to the downwardly opening U-shaped bridge 31, which spans the belt 11 and its rails 25 and 26.

The foregoing described case latch installation allows only one case at a time to be discharged into the casing station 12. This action is, in part, aided by the adjustable stop 35 which can be moved towards and away from the case latch area of release, in order to accommodate varying widths of cases. For example, by suitable movement of the nuts 36 and 37 on the threaded rod 38, the stop 35 can be positioned as shown in the drawings. Since the drawings are approximately to scale, a 6¾" case could be encompassed. If about a 4" case is to be used, the stop 35 can be moved to the position 35B, for example, as shown in FIG. 2.

The stop 35 is, in essence, a metal strip having two pairs of rearwardly extending parallel lugs 39 through which pass pins 40 so the pad may be moved horizontally relative to the ends 38A of the rods 38. The wall 41 is welded to base member 42, to provide support for member 38 and its associated nuts and stop member 35.

Brick Ready limit switch 51 has a movable member 52 opening through the stop 53 (mounted in the same manner as stop 35) in position to be depressed when a brick is moved thereagainst from the brick feeding station 60, as is described below. Case Ready limit switch 54 is mounted to the rear of the stop 35 and has a member 56 which extends therethrough in position to contact cases moved against it by conveyor 11.

Brick transfer cylinder 65, having pivotal forward face 66, is arranged to move a brick over spaced tracks 67, until it contacts stop 53 with commensurate depression of member 52 and actuation of the Brick Ready limit switch 51. Brick Ready limit switch 51 causes retraction of cylinder 16 to release a case and also causes retraction of brick transfer cylinder 65.

An empty case contacting Case Ready limit switch 54 causes extension of both feed cylinders 69 and 70, the former being the empty case feed cylinder and the latter being the brick feed cylinder. Extension of cylinder 69 causes an upwardly opening empty case to move forwardly until the peripheral lips of its forward end encompass the inwardly bent finger portions 71 and 72 of the case spreaders 73 and 74. Continued movement of the case places it on either side of the spreaders 73 and 74, in time to receive the brick moving between these spreaders under the influence of brick feed cylinder 70.

Extension of cylinders 69 and 70 actuates switches 100A and 101A to cause extension of cylinder 16 to stop case travel off conveyor 11. These switches simultaneously retract cylinder 110 as explained below.

It should be noted, here, that during a casing operation, in which a case and brick arrive at the casing station 14 at approximately the same time, the brick moves into the case at a higher level than the bottom inside surface of the case. FIG. 3 shows the variation in elevation between case rails 80 and brick rails 81. Variation in elevation is necessary to prevent contact between the leading edges of the moving brick and case.

A movable bar 82 is provided, which moves into position with the empty case at the casing station, to thereby prevent the weight of the brick from dropping the brick and case onto the roller conveyor 83 before desired. As best seen in FIG. 3, pushing pad 70B of casing cylinder 70 includes an ear 82A (see FIG. 1A) which extends downwardly between tracks or runners 81 into rigid association with movable bar 82. Thus, the same cylinder action, which moves the brick causes a support therefore to be moved into position at the same time.

Limit switches 84 and 85 are the Case Cylinder Extend and Brick Cylinder Extend limit switches, respectively;

and are actuated when their respective elements 84A and 85A are contacted by respective cylinder pads 69A and 70B. Such contact causes cylinders 69 and 70 to retract to the positions indicated in FIG. 1. When cylinders 69 and 70 reach retracted position respective rearwardly extending arms 100 and 101 re-actuate respective Case Cylinder Ready and Brick Cylinder Ready limit switches 100A and 101A, to cause extension of pad 50A to push brick downwardly firmly into a case, and assure removal of brick and case from bars 73 and 74 onto the roller conveyor 83. Also, cylinder 102, to the rear of the casing station, after a short delay (a few seconds), is caused to extend its pad 103 to assure overcoming of inertia, to thereby start cased brick rolling down sloped roller conveyor 83 towards a marking stage or discharge, as desired.

A cylinder 110 is supported by plate 115 mounted across stanchions 116 and 117. When pad 111 is extended by cylinder 110 it frictionally engages brick to prevent movement. As noted above, with retraction of cased brick release cylinder 50, switches 100A to 101A cause retraction of cylinder 110 to thereby release brick. Thus, a new brick is moved into the brick transfer position in front of the pad 70B, as a casing operation is being completed.

A brick moving to position in front of pad 66 actuates Brick Feed Ready limit switch 200 by depressing its element 201 and causes cylinder 110 to extend so its pad 111 can again stop brick flow. It also causes brick transfer cylinder 65 to extend thereby repeating the cycle.

After a cased brick is pushed from the casing station by cylinder 50, it rolls down the roller conveyor 82, under the influence of gravity (after the sometimes necessary start by cylinder 102) where it contacts a limit switch 125 to initiate a stamping and marking operation, if desired. (The stamping and marking operation is shown only in FIG. 5, since, while it is a desirable portion of apparatus according to this invention, it should not be considered necessary according to the broader concept of the casing operation.)

Limit switch 125 causes extension of cased brick hold cylinder 126 to press its pad 127 firmly against a cased brick 128 for the marking operation. With extension of pad 127, limit switch 125 actuates cylinder 129 to lower its paint roller 130, which is rotatably suspended within yoke 131 of rod 132 of cylinder 129; and this roller 130 is caused to pass across the face of the stamp pad 133 carried by the stamping cylinder 135. One might say the roller 130 "inks" the stamp pad 133. Upon full extension of the rod 132, its suspended yoke 131 actuates the limit switch 135, which causes the paint cylinder 129 to retract and stamping cylinder 134 to extend it pad 133 into contact with an end of the cased brick 128. The length of the stroke (or the time the stamping cylinder is fully extended) is determined by time delay mechanism, if desired (such is not shown in the drawings, since such a mechanism is well known), to assure good deposit of ink or paint from the pad 133 on the contacted end face of the brick 128. After this delay, the cylinder 134 retracts its rod, and the cylinder 126 simultaneously releases the cased brick 128. The retraction of pad 127 may be controlled by the time mechanism, just mentioned, or by the limit switch 136 which senses retraction of pad 133.

The remaining section of the apparatus, worthy of note, is the glue or adhesive applying station at 140 (FIG. 2). The exemplary one shown in the drawings includes a supporting member 141, a rigid conduit section 142 supported thereby, and a flexible conduit 143 interconnected with a source of fluid adhesive or glue (not shown). The conduit section 142 is comprised of upper and lower rigid coupling members 144 and 145, between which extends the flexible tubular member 146 encompassed within the rigid sheath 146A. There is an aperture 160 through a wall of the sheath 146A, through which the rod 161 of

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cylinder 147 can be inserted to press against the plate 161a, to compress the flexible section 146 in the manner of a pinch valve to thereby close off flow of fluid glue or adhesive through the coupling 145, which coupling member, in fact, serves as the nozzle orifice for glue discharge. See FIG. 2A for enclosed detail. Other commercially available valve arrangements can, of course, be used.

In the sequence of machine operation, described above, Case Ready limit switch 54 causes withdrawal of the rod 161, to allow discharge of glue into a case on the conveyor therebeneath. It, thus, becomes readily apparent that the fitting 145 must be positioned so as to be substantially centrally of a case in an aligned series of cases. As a practical matter, though, which limit switch or sequential parts operation of the apparatus causes discharge of the glue is a matter of choice. Also, if desired, the glue discharge operation could be positioned above the case feed station 12, and still tied in with the operation of the Case Ready limit switch 54, to discharge glue into a case immediately upon contacting that limit switch in the feed station.

We consider the gluing section or portion of the apparatus, above described, as unnecessary to the broadest concept herein disclosed, since it is clear that the means which are used to hold the case and brick together could be any of many other well-known arrangements; such as, for example, after the cased brick is discharged from the casing station 14, ears could be punched through the side flaps of the case and into the brick body. This is one technique which has been practiced in the art for a long time. It has, also, been common to dimple the case at predetermined locations to coincide with preformed depressions in a brick, to thereby lock a case and brick together. Further, some workers have relied on mere frictional engagement between the case flaps and the brick to hold them together.

In summary, therefore, a series of cases are aligned on a conveyor 11 and a series of aligned brick are carried by the conveyor 10; each of these conveyors being in continuous operation such that, upon release of the forward member of the aligned series of empty cases and brick, they are caused to move forwardly to the casing machine. The apparatus allows release of but one case and brick at a time. Through an integrated control system, release of the case and the brick are scheduled to substantially coincide with an actual casing operation; so immediately upon completion thereof, a new case and a new brick will be in position to be moved to the casing station for the casing operation.

While the various cylinders can be either hydraulic or pneumatic, we suggest that the case cylinder 69 and brick cylinder 70, which must force brick and case into relation with each other should be driven by a hydraulic system. All of the other cylinders can be pneumatic.

In summary

- (1) Cylinder 65 extends:
 - (a) when limit switch 200 is actuated by a brick moving off conveyor 10.
- (2) When cylinder 65 extends it pushes a brick against limit switch 51, thereby:
 - (a) causing retraction of cylinder 16 to release a case off conveyor 11.
 - (b) causing retraction of cylinder 65.
- (3) A case moving off conveyor 11 actuates limit switch 54, thereby:
 - (a) causing extension of both cylinders 69 and 70.
 - (b) causing glue to be deposited in empty cases by extension of the glue cylinder 147.
- (4A) Initial extension of both cylinders 69 and 70 initially actuates limit switch 100A and 101A, thereby:
 - (a) extending cylinder 16 to stop case flow off conveyor 11.
 - (b) retracting cylinder 110 to allow one brick to move off conveyor 10.
 - (c) retracting of cylinder 50.

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(4B) Complete extension of cylinders 69 and 70 actuates limit switches 84 and 85, thereby:

- (a) causing retraction of cylinders 69 and 70.
- (5) Retraction of both cylinders 69 and 70 again actuates limit switches 100A and 101A, thereby:
 - (a) extending cylinder 50 to remove a cased brick.
- (6) Complete retraction of cylinder 65 (initiated by limit switch 51) actuates limit switch 120, thereby:
 - (a) causing extension and retraction of cylinder 102.
- (7) A brick moving off conveyor 10 actuates limit switch 200, thereby:
 - (a) extending cylinder 110 to stop brick flow of conveyor 10.
 - (b) starting a new cycle by again extending cylinder 65.

Limit switches and their operation are, of course, well known in the art, as are their interconnection with hydraulic or pneumatic cylinders to control operation thereof; and detailed explanation of the operation thereof, and their means of interconnection with hydraulic and/or pneumatic cylinders, has been omitted herein for the sake of simplicity. Further, variation in the above sequence of parts actuation can be had which are within the scope of this invention. However, an example of an integrated control system for hydraulic cylinders, which cylinders are caused to operate in a predetermined or desired sequence, is shown, for example, in copending application Serial No. 261,246, now Patent No. 3,131,463 granted May 5, 1964, owned by the assignee of the instant invention.

Having thus described the invention in detail and with sufficient particularity as to enable those skilled in the art to practice it, what is desired to have protected by Letters Patent is set forth in the following claims:

We claim:

1. Apparatus for applying channel shaped metal cases to refractory brick including a brick supply station which includes means arranged to remove single brick therefrom for delivery to an adjacent brick feed station, the latter station including means arranged to feed brick to an adjacent casing station according to a predetermined schedule, an empty case supply station arranged to discharge cases, one at a time, to an adjacent case feed station which in turn, is arranged to move empty cases one at a time to said casing station, in time and in position, to receive a brick moving to the casing station from the brick feed station, means cooperatively interconnecting said brick feed station with the case feed station to insure that an empty case is properly and previously positioned at said casing station in time to receive brick moving thereto, the casing station further including means arranged to release a cased brick while assuring good engagement between brick and case to provide a strong composite unit for delivery to a discharge conveyor, and control means interconnecting the brick supply station, the case supply station, the brick feed station, the case feed station, and the casing station arranged to sequentially and automatically actuate and stop the operation thereof to case brick.
2. Apparatus for automatically applying channel-shaped metal cases to refractory brick comprised of:
 - first conveyor means arranged to periodically supply brick, one at a time, to the apparatus;
 - first sensing means carried by said apparatus adjacent the path of travel of brick supplied by said first conveyor means arranged to be actuated thereby to thereby extend a first brick cylinder,
 - a first brick cylinder adjacent the discharge of the first conveyor means arranged to move a brick discharged therefrom to a brick feed station upon actuation of said first sensing means, a brick feed station adjacent the first brick cylinder;
 - second sensing means interconnected with second con-

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veyor means and positioned adjacent the path of travel of brick moving from the first brick cylinder arranged to be actuated by brick moving there-adjacent, said second conveyor means arranged to discharge an empty case to a case feed station when said second sensing means is actuated,

a second brick cylinder at said brick feed station arranged to move brick, one at a time, from said feed station to an adjacent casing station, a casing station adjacent and in the path of travel of brick moving from said brick feed station; a case cylinder adjacent said case feed station,

third sensing means in the path of travel of empty cases to the case feed station, said third sensing means interconnected with and arranged to actuate said case cylinder and said brick cylinder, to move cases to said casing station in time to receive brick moving thereto from said brick feed station under the influence of said second brick cylinder when they are actuated by said third sensing means.

3. Apparatus for applying single U-shaped metal cases to refractory brick and comprised of: a first conveyor arranged to periodically supply brick, one at a time, to the apparatus, and a second conveyor arranged to periodically supply U-shaped metal cases, one at a time, to said apparatus; first sensing means cooperatively interconnected with the discharge of the first conveyor and arranged to be actuated by a brick moving off said conveyor, said first sensing means when actuated arranged to actuate a first brick cylinder with which it is interconnected to move a single brick to an adjacent brick feed station, said first sensing means arranged to substantially simultaneously actuate means to stop subsequent brick moving from said first conveyor to said apparatus, means to stop brick positioned adjacent the discharge of said first conveyor; second sensing means oper-

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atively interconnected with latch means, latch means adjacent the discharge of said second conveyor constructed and arranged to periodically allow single discharge of cases from said second conveyor to a case feed station, a case cylinder at said case feed station arranged to move a case therefrom to said casing station; a second brick cylinder positioned at said brick feed station, second sensing means interconnected with said brick feed station arranged to be actuated when a brick moves thereto to allow said latch means to discharge a case; third sensing means arranged to be actuated by a case moving off the second conveyor, said third sensing means upon actuation arranged to extend said brick cylinder to move a brick to said casing station and to cause said case feed cylinder to extend and move a single case to said casing station in time to receive said brick moving thereto under the action of said second brick cylinder.

4. The apparatus of claim 3 further including an adhesive discharge mechanism adjacent the path of travel of empty cases arranged to deposit adhesive in said empty cases prior to application of said empty cases to brick.

5. The apparatus of claim 3 further including means in the path of travel of cased brick moving from said casing station arranged to apply distinctive indicia to said cased brick prior to discharge from said apparatus.

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