

DESCRIPTION

TITLE OF THE INVENTION

WALL MATERIAL RETAINING AUXILIARY TOOL, METHOD
5 OF MANUFACTURING THE SAME, AND METHOD OF CONSTRUCTING
CONCRETE STRUCTURE USING THE WALL MATERIAL RETAINING
AUXILIARY TOOL

TECHNICAL FIELD

10 The present invention relates to a wall material
retaining auxiliary tool, a method of manufacturing
the auxiliary tool, and a method of constructing a
concrete structure by using the wall material
retaining auxiliary tool.

15

BACKGROUND OF THE INVENTION

Generally, a concrete structure is constructed
by holding two front and back molding frames at a
constant spacing through a plurality of spacer bolts,
20 by placing concrete into the space between the molding
frames held at the constant spacing, and by removing
the molding frames after the concrete hardened. The
surface of the body concrete after the molding frame
were thus parted has a poor appearance as it is.
25 Therefore, the general method finishes the surface by

applying cement mortar or a resin mortar (as will be generally called merely "mortar") to a constant thickness. However, the mortar applied later may peel off the surface of the body concrete because of its aging change. Therefore, there have been desired counter-measures for performing the peeling prevention efficiently.

When the outer wall of the existing concrete structure is to be repaired with the mortar, on the other hand, there is the general method of applying the mortar directly to the outer wall face without removing the old outer wall. It is, however, impossible to attain a sufficient adhesion strength merely by applying the mortar over the old outer wall. Therefore, the peeling preventing treatment is made in advance before the mortar is applied.

In the peeling preventing treatment of the related art, a primer is applied to the outer wall, followed by the application of an intermediate resin, and this intermediate resin is covered with a net made of a synthetic resin. This synthetic resin net is fixed by driving anchor pins at every constant intervals, and the mortar is applied to the synthetic resin net. In this peeling preventing method, however, it is necessary to fix the synthetic resin

net without looseness all over the face of the outer wall. If the net is loose between the adjoining anchor pins, the mortar is so weakened in its adhesion that it easily peels off. However, considerably high skills are required for fixing the synthetic resin net tightly all over the outer wall thereby to raise the cost.

DISCLOSURE OF THE INVENTION

10 An object of the present invention is to solve the aforementioned problems of the related art and to provide a wall material retaining auxiliary tool for preventing a wet type wall material such as mortar from peeling off, by improving the retaining strength (or adhesion) of the wet type wall material merely by a simple attachment, and a method of manufacturing the auxiliary tool.

20 Another object of the present invention is to provide a method of constructing a concrete structure in which the wet type wall material is prevented from peeling off by utilizing the aforementioned wall material retaining auxiliary tool.

25 A wall material retaining auxiliary tool of the present invention for achieving the aforementioned object is characterized in that it is molded of a

resin to include: a base portion to be buried in a
cone recess formed in the surface of a body concrete;
and retaining portions to engage with a wet type wall
material to be applied to said body concrete surface,
5 so that a cavity may be formed in said base portion.

Another wall material retaining auxiliary tool
according to the present invention is characterized in
that it is molded to include: a base portion to be
fixed by a spacer bolt arranged in a molding frame and
10 to be connected to a molding frame fastening bolt;
retaining portions to engage with a wet type wall
material; and a frame bank extending along the outer
circumferential edge of said base portion for
enclosing said retaining portions on the inner side
15 and made higher than said retaining portions.

20

The aforementioned individual wall material
retaining auxiliary tools can be easily manufactured
25 by the injection-molding method using the resin.

By using the aforementioned individual wall material retaining auxiliary tools, on the other hand, the concrete structure can be constructed in the following manners.

5 Where the concrete structure is manufactured by employing the wall material retaining auxiliary tool molded to include the base portion and the retaining portions, the method is characterized: by burying the base portion of said wall material retaining auxiliary
10 tool in a corn recess formed in the surface of a body concrete; and then by applying a wet type wall material to cover the surface of said body concrete and said wall material retaining auxiliary tool.

 Where the concrete structure is manufactured by
15 employing the wall material retaining auxiliary tool having a frame bank, on the other hand, the method is characterized: by fixing a wall material retaining auxiliary tool, as including retaining portions formed on a molding frame side end of a base portion and a
20 frame bank higher than said retaining portions, to a spacer bolt arranged in a molding frame; by placing a freshly mixed concrete in said molding frame to harden the concrete into a body concrete; next by parting said molding frame; and then by applying a wet type
25 wall material to cover the surface of the body

concrete and the wall material retaining auxiliary tool.

Where the concrete structure is manufactured by employing the wall material retaining auxiliary tool having removable retaining portions, on the other hand, the method is characterized: by fixing a wall material retaining auxiliary tool, as including a frame bank formed on the molding frame side end of a base portion, to a spacer bolt arranged in a molding frame; by placing a freshly mixed concrete in said molding frame to harden the concrete into a body concrete; next by parting said molding frame; by fixing retaining portions formed separately of the base portion, to a level higher than the frame bank, to the base portion; and next by applying a wet type wall material to cover the surface of the body concrete and the wall material retaining auxiliary tool.

Where the concrete structure is manufactured by employing the wall material retaining auxiliary tool including a flat base portion and retaining portions, the method is characterized: by fixing a wall material retaining auxiliary tool including retaining portions and a flat base portion to a body concrete by anchor means so that the base portion may be directed to the

side of the body concrete; and next by applying a wet type wall material to cover the surface of the body concrete and the wall material retaining auxiliary tool.

5 Where the concrete structure is manufactured by employing not only the wall material retaining auxiliary tool but also an retaining auxiliary member, on the other hand, the method is characterized: by fixing a wall material retaining auxiliary tool, as
10 including retaining portions formed on a molding frame side end of a base portion and a frame bank higher than said retaining portions, to a spacer bolt arranged in a molding frame; by placing a freshly mixed concrete in said molding frame to harden the
15 concrete into a body concrete; next by parting said molding frame; after by fixing a retaining auxiliary member to the wall material retaining auxiliary tool; and by applying a wet type wall material to cover the surface of the body concrete and the wall material
20 retaining auxiliary tool.

BRIEF DESCRIPTION OF THE DRAWINGS

In Fig. 1 showing a wall material retaining auxiliary tool according to an embodiment of the
25 present invention, (A) is a top plan view, and (B) is

an A-A sectional view in (A).

In Fig. 2 showing a wall material retaining auxiliary tool according to another embodiment of the present invention, (A) is a B-B sectional view in (B),
5 and (B) is a top plane view.

Fig. 3 is a side elevation showing a wall material retaining auxiliary tool according to still another embodiment of the present invention.

Fig. 4 is a side elevation showing a wall
10 material retaining auxiliary tool according to still another embodiment of the present invention.

Fig. 5 (A) to (C) are explanatory views showing a method of fabricating a concrete structure sequentially of its steps when the wall material
15 retaining auxiliary tool of Fig 1 is employed.

In Fig. 6 showing a wall material retaining auxiliary tool according to still another embodiment of the present invention: (A) is a C-C sectional view in (C); (B) is a view of arrow 6B in (A); and (C) is a
20 view of arrow 6C in (A).

In Fig. 7 showing a wall material retaining auxiliary tool according to still another embodiment of the present invention; (A) is a D-D sectional view in (C); (B) is a view of arrow 7B in (A); and (C) is a
25 view of arrow 7C in (A).

In Fig. 8 showing a wall material retaining auxiliary tool according to still another embodiment of the present invention; (A) is an E-E sectional view in (C); (B) is a view of arrow 8B in (A); and (C) is a
 5 view of arrow 8C in (A).

Fig. 9 presents explanatory views showing a method of manufacturing a concrete structure sequentially of its steps when the wall material retaining auxiliary tool of Fig. 6 is employed.

10 In Fig. 10 showing a wall material retaining auxiliary tool according to still another embodiment of the present invention: (A) is a top plan view; (B) is a 10B-10B sectional view in (A); and (C) is a half bottom view.

15 Fig. 11 is a side elevation of the wall material retaining auxiliary tool of Fig. 10.

In Fig. 12 showing a wall material retaining auxiliary tool according to still another embodiment of the present invention, (A) is a top plan view, and
 20 (B) is a 12B-12B sectional view in (A).

Fig. 13 is a longitudinal section showing an essential portion of a wall material retaining auxiliary tool according to still another embodiment of the present invention.

25 Fig. 14 is an explanatory view showing a portion

of a method of manufacturing a concrete structure when the wall material retaining auxiliary tool of Fig. 12 is employed.

Fig. 15 is a longitudinal section showing a wall material retaining auxiliary tool according to still another embodiment of the present invention separately.

Fig. 16 is an explanatory view showing a portion of a method of manufacturing a concrete structure when the wall material retaining auxiliary tool of Fig. 15 is employed.

Fig. 17 is an explanatory view showing a portion of a method of manufacturing a concrete structure using a wall material retaining auxiliary tool according to still another embodiment of the present invention.

In Fig. 18 showing a wall material retaining auxiliary tool according to still another embodiment of the present invention, (A) is an F-F section in (B), and (B) is a top plan view.

Fig. 19 is a longitudinal section of a wall material retaining auxiliary tool according to still another embodiment of the present invention.

Figs. 20 (A) and (B) are explanatory views of a method of manufacturing a concrete structure when the

wall material retaining auxiliary tool of Fig. 18 is employed.

Fig. 21 is an explanatory view showing another method corresponding to Fig. 20 (B).

5 Figs. 22 (A) to (E) are sectional views of an essential portion of the modes of the individual retained portions.

Fig. 23 is a top plan view of a wall material retaining auxiliary tool according to still another
10 embodiment of the present invention.

In Fig. 24 showing a wall material retaining auxiliary tool according to still another embodiment of the present invention, (A) is a top plan view, and (B) is a G-G sectional view in (A).

15 In Fig. 25 showing a method of assembling a molding frame, (A) is a sectional view at the time of assembling the molding frame, and (B) is a sectional view after the molding frame was parted.

20 BEST MODE FOR CARRYING OUT THE INVENTION

The "wet type wall material" in the present invention is a wall material which is so plastic at an execution time that it can be applied but which comes into a hard state after lapse of a predetermined time
25 after applied. This wet type wall material can be

exemplified by mortar, plaster, organic adhesive or a caulking material.

The embodiment of the present invention will be described herein on the case in which the mortar is
5 applied as the wet type wall material to the wall face of a concrete structure.

Figs. 1 (A) and (B) show one example of the wall material retaining auxiliary tool of the present invention, which is employed for preventing the mortar
10 from peeling off when the mortar is applied to a new concrete structure after the molding frame was parted.

The wall material retaining auxiliary tool P is constructed by molding a frusto-conical base portion 1 and looped retaining portions 2 integrally of a
15 thermoplastic resin. The looped shaped retaining portions 2 are made so thick as to have a sufficient rigidity and are protruded in multiplicity and arrayed in columns over a wider area one of the two end faces of the base portion 1. In the end face of the
20 narrower area side of the base portion 1, on the other hand, there is formed at an axial portion one insertion hole 3 which is surrounded by a cavity 4. This cavity 4 may be exemplified by one donut-shaped one or may be divided into a plurality of portions
25 from the donut shape by partitions.

The wall material retaining auxiliary tool P thus constructed is employed as means for preventing the mortar from peeling off, as shown in Figs. 5 (A) to (C), when the mortar is applied to the concrete structure, from which the molding frame has been parted.

Before entering into the description of steps of Figs. 5 (A) to (C), the method of constructing a concrete structure with reference to Figs. 25 (A) and (B).

Fig. 25 (A) shows the state in which the concrete is placed into a molding frame 24. Numeral 20 designates a body concrete; numeral 21 a spacer bolt; numeral 25 a connector; and numeral 26 a frame fastening bolt.

There are arranged two front and back molding frames 24 (although only one side is shown) for forming a space in which freshly mixed concrete is to be placed. Into the space between the two front and back molding frames 24 and 24, there is inserted the spacer bolt 21, to the two end portions of which there are fastened the connectors 25. From one of these connectors 25, there is extended to the outside the frame fastening bolt 26, and the molding frame 24 is inserted into the frame fastening bolt 26 such that it

is fitted to abut against the outer side end face of the connector 25. On the outer side of the molding frame 24, there are fitted a pair of horizontal members 27 and 27 and a form tie 28. Moreover, a nut
5 29 is fitted and fastened on frame fastening bolt 26.

As the freshly mixed concrete having been placed in the space between the molding frames 24 and 24 hardens into the body concrete 20, the molding frame 24 is parted to construct the concrete structure, as
10 shown in Fig. 25 (B). This parting work may be done by parting the nut 29, the form tie 28, and horizontal members 27 and the molding frame 24 in the recited order and finally by extracting the connector 25. A cone recess 22 is formed where the connector 25 has
15 been extracted, there is left a cone recess 22. From the inner side of the cone recess 22, there is protruded the end portion of the spacer bolt 21.

The wall material retaining auxiliary tool P of the present invention is employed, when the mortar is
20 applied to the body concrete from which the molding frame has been parted, as the mortar peeling preventing means, as shown in Figs. 5 (A) to (C).

First of all, as shown in Fig. 5 (A), an adhesive 5 is applied to the base portion 1 of the
25 wall material retaining auxiliary tool P. This

adhesive 5 may applied not only to the side of the wall material retaining auxiliary tool P but to the cone recess 22 on the side of the body concrete 20, or to both the base portion 1 and the cone recess 22.

- 5 The adhesive should not be limited in its kind but is preferably exemplified by a thermosetting resin of an epoxy resin or a polyurethane resin.

Next, as shown in Fig. 5 (B), the wall material retaining auxiliary tool P is fixed on the surface of the body concrete 20 by burying its base portion 1 in the corn recess 22. When the wall material retaining auxiliary tool P is fixed, as shown in Fig. 5 (C), a mortar 23 is so applied to a constant thickness to the surface of the body concrete 20 as to cover the wall material retaining auxiliary tool P. The application of the mortar 23 may be performed by one time but by two times, as indicated by a broken line. This twice application can provide a higher adhesion.

The aforementioned wall material retaining auxiliary tool P is not deformed by the application pressure of the mortar but brought deeply into the plastic mortar while keeping its stereoscopic shape, because the retaining portions 2 are shaped to have the rigidity. Therefore, the retaining portions 2 hold the mortar 23 with a strong anchoring effect and

improve the adhesion of the mortar 23 to the body concrete 20.

On the other hand, the wall material retaining auxiliary tool P is attached by inserting the spacer
5 bolt 21 into the insertion hole 3 so that it is fixed without any displacement. On the other hand, the base portion 1 is shaped to have the cavity 4 so that it can be molded of a small amount of resin and manufactured at a low cost. On the other hand, the
10 adhesive 5 flows and hardens in the cavity 4 to exhibit the anchoring effect so that the wall material retaining auxiliary tool P is firmly fixed in the cone recess 22.

In the wall material retaining auxiliary tool P
15 of Fig. 1, the insertion hole 3 is formed as an unloaded hole having an internal diameter larger than the external diameter of the spacer bolt 21, but may be internally threaded to fasten the external thread of the spacer bolt 21, as shown in Figs. 2 (A) and
20 (B). This internal thread may be formed directly in the base portion 1, as shown, but an internally threaded metal spacer may also be buried in the base portion 1.

In the case of the mode in which the insertion
25 hole 3 is internally threaded, there is formed at the

center of the end face on the opposite side an engage
groove 6 for receiving the leading end of a driver so
that the base portion 1 can be turned by inserting the
driver into the engage groove 6. With this engage
5 grove 6 being formed, it is easy to mount the wall
material retaining auxiliary tool P on the spacer bolt
21. The engage groove 6 is formed into a cross (or
plus) shape, as shown, or a bar (or minus) shape
according to the kind (or the tip shape) of the
10 driver.

The outer circumference of the base portion 1
may be the conical flat face as in the mode of Figs. 1
and 2 but may have a seal ring 7 of an elastic
material mounted thereon, as in the mode of Figs. 3
15 and 4. The seal ring 7 can seal the clearance between
the base portion 1 of the wall material retaining
auxiliary tool P and the cone recess 22 of the body
concrete 20 thereby to prevent the spacer bolt 21 from
being corroded with the rain water which may penetrate
20 into the cone recess 22. In the wall material
retaining auxiliary tool P of Fig. 3, there is formed
in the outer circumference of the base portion 1 a
ring-shaped retaining groove 8, in which the seal ring
7 is mounted. In the wall material retaining
25 auxiliary tool P of Fig. 4, on the other hand, there

is formed on the outer circumference of the base portion 1 a stepped portion 9 of a slightly smaller external diameter, on which the seal ring 7 is retained.

5 Figs. 6 (A), (B) and (C) present a wall material retaining auxiliary tool according to another embodiment of the present invention. Although the aforementioned wall material retaining auxiliary tool P of Figs. 1 and 2 is mounted by utilizing the corn
10 recess from which the connector employed for assembling the molding frame has been parted, the wall material retaining auxiliary tool per se acts as the connector in this embodiment of Fig. 6.

 As shown in Fig. 6, the wall material retaining
15 auxiliary tool P is identical to the aforementioned ones of the embodiments of Figs. 1 , 2 and so on, in that it is integrally molded of a thermoplastic resin such that its base portion 1 is formed into a frusto-conical shape and such that the looped retaining
20 portions 2 are formed in multiple columns on one of the narrower area of its two end portions. However, the wall material retaining auxiliary tool has the following different constructions so that it may act as the connector, too.

25 The base portion 1 is provided on the axis of

its end face of the wider surface area with a threaded hole 1s for fastening the spacer bolt (21) and on the axis of its end face of the narrow surface area with a threaded hole 1m for fastening the frame fastening bolt (26). These two threaded holes 1s and 1m are formed coaxially of each other across a partition 10. This partition 10 is not always indispensable, but the two threaded holes 1s and 1m may communicate with each other. With this partition 10, however, it is possible to solve the problems that one of the spacer bolt and the frame fastening bolt may enter the threaded hole of the other to make the threaded hole length of the other short, and that the position for fixing the base portion 1 with respect to the spacer bolt may become unstable. Here, the threaded holes 1s and 1m may be formed directly in the resin base portion 1, but metal inserts having the threaded holes may be buried.

In the other end face having the retaining portions 2 in the columns, on the other hand, there are formed a number of grooves 11 to cross the column direction of the retaining portions 2. The grooves 11 act together with the looped retaining portions 2 to enhance the anchoring effect for the mortar. On the end face having the retaining portions 2, on the other

hand, there is formed an annular frame bank 12 which encloses those retaining portions 2 on the inner side. The frame bank 12 is formed to have a height equal to or larger than that of the retaining portions 2.

5 On the outer circumference of the end portion on the side having the threaded hole 1s, on the other hand, there are formed a plurality of (or four, as shown) protrusions 13. These protrusions 13 may be one in number. The protrusions 13, if plural, are
10 preferably arranged equidistantly for the viewpoint of balance. During releasing the molding frame from the mold, these protrusions 13 are provided so that the wall material retaining auxiliary tool P may be smoothly separated from the threaded hole 1m of the
15 base portion 1 by turning the frame fastening bolt 26 without being turned together with the frame fastening bolt 26. On the other hand, the wall material retaining auxiliary tool P is prevented from easily coming out of the body concrete 20, because the base
20 portion 1 is formed into a frusto-conical shape and has its diametrically larger side buried in the body concrete 20.

 The protrusions 13 as the common turn preventing means may be modified by recesses 13', as in the mode
25 shown in Fig. 7. The number of the recesses 13' may

be plural or single. On the other hand, this common
turn preventing means may be exemplified by the base
portion 1 having a non-circular transverse section
provided with both the protrusions 13 and the recesses
5 13', as in the mode of Fig. 8. The shape of the non-
circular section may be exemplified by a polygonal
shape having three or more angles, a flower shape or a
star shape.

On the other hand, the shape of the base portion
10 1 for preventing the wall material retaining auxiliary
tool P from coming out should not be limited to the
frusto-conical shape but may be made such that the
portion on the side to be buried in the body concrete
has a larger external diameter or a larger
15 circumscribed circle than that of the end face on the
side of the body concrete side.

The aforementioned wall material retaining
auxiliary tool P of the connector type is employed as
the connector and the wall material retaining
20 auxiliary tool, as shown in Figs. 9 (A), (B) and (C).

Fig. 9(A) shows the state in which the wall
material retaining auxiliary tool P is replaced by the
connector 25 in Fig. 25 (A) to connect both the spacer
bolt 21 and the frame fastening bolt 26. As the wall
25 material retaining auxiliary tool P acting as the

connector is pushed by the molding frame 24 by fastening the nut 29, therefore, a fastening pressure of about 200 Kg/cm^2 (or 19.6 MPa) or more is loaded on the end face of the base portion 1. However, the
5 frame bank 12 is disposed on the end face of the base portion 1 to bear the fastening pressure of the molding frame 24 so that the retaining portions 2 are not crushed by that fastening force.

When the freshly mixed concrete is placed, on
10 the other hand, it will not flow into the end face having the retaining portions 2 to prevent the retaining portions 2 from being buried in the freshly mixed concrete, because the frame bank 12 is provided. When the mortar is applied after the molding frame is
15 parted, therefore, the retaining portions 2 can keep the anchoring of the mortar.

When the freshly mixed concrete hardens, the parting work is done, and the frame fastening bolt 26 is finally turned so that it is separated from the
20 base portion 1 of the wall material retaining auxiliary tool P. However, the protrusions 13 are formed on the outer circumference of the base portion 1 so that the frame fastening bolt 26 can be smoothly separated without being accompanied by the turn of the
25 wall material retaining auxiliary tool P. On the

other hand, the base portion 1 is formed into the frusto-conical shape having the larger external diameter the closer to its buried side so that the wall material retaining auxiliary tool P is not
5 extracted even by pulling the frame fastening bolt 26. As shown in Fig. 9 (B), therefore, the wall material retaining auxiliary tool P can be left in the body concrete 20 while being connected to the spacer bolt 21.

10 When the mortar 23 is applied after the state of Fig. 9 (B) to the surface of the body concrete 20, it is possible to establish the state of Fig. 9 (C). The looped retaining portions 2 have the rigidity so that they keep their stereoscopic shape and go deeply into
15 the applied mortar 23 to exhibit the anchoring effect. This anchoring effect can be achieved not only by the retaining portions 2 but also by the grooves 11.

The aforementioned wall material retaining auxiliary tool P plays the role of the connector at
20 the time of assembling the molding frame and is not left as it is but used as the peeling preventing means. In the case of the aforementioned wall material retaining auxiliary tools of Figs. 1 and 2, therefore, there is required neither the work of
25 separating the removed connector nor the subsequent

work of mounting the wall material retaining auxiliary tool. Therefore, the mortar peeling preventing pretreatment can be simplified to shorten the working time drastically. On the other hand, the used
5 connector need not be disposed so that the problem of the environmental contamination with the industrial wastes can be solved.

Figs. 10 (A) and (B) and Fig. 11 show another example of the wall material retaining auxiliary tool
10 of the connector acting type.

This wall material retaining auxiliary tool P is different from the embodiments of Figs. 6 to 8 in that the base portion 1 is formed generally into a disc shape and in that the frame bank 12 disposed on the
15 side of the retaining portions 2 and enclosing the retaining portions 2 is connected through a thin shape-variable joint 16. This shape-variable joint 16 is made to have a height b equal to or more than that of the retaining portions 2 and to have a plurality of
20 holes 17 extending therethrough. These holes 17 are formed to allow pin cores, when inserted into a molding die for allowing the internal diameter of the retaining portions 2 and the grooves 11 simultaneously, to be extracted. The frame bank 12 is
25 formed to have a thickness of 0.5 to 4 mm, preferably

1 to 4 mm so that it is neither bent nor deformed even if it receives a pressure in the axial direction from the molding frames when these molding frames are assembled, but the shape-variable joint 16 is made as
5 thin as 0.05 to 0.5 mm so that it is bent and deformed when it receives the pressure from the molding frames.

At a distance a below the lower edge of the shape-variable joint 16, there is transversely protruded a flanged receiving face 15. This receiving
10 face 15 plays a role to receive the lower end of the frame bank 12 when this frame bank 12 is axially pushed at the molding frame assembling time while the shape-variable joint 16 being bent and deformed. When the frame bank 12 is thus retained on the receiving
15 face 15, its upper edge side is made to have a height equal to or more than the upper end of the retaining portions 2.

On the other hand, the external diameter of the receiving face 15 is made preferably larger than at
20 least the internal diameter (or the inner circumference) of the frame bank 12, more preferably larger than the external diameter (or the outer circumference) of the frame bank 12. On the other hand, the distance a is preferably shorter than the
25 height b of the shape-variable joint 16 ($a < b$), and

the height of the frame bank 12 is preferably equal to or more than the sum ($a + b$) of the distance a and the height b . The aforementioned receiving face 15 is made larger than the external diameter (or the outer circumference) of the frame bank 12 so that the wall material retaining auxiliary tool P is prevented from easily coming out from the body concrete 20. This coming-out can also be prevented by forming such undulations on the outer circumference side face of the base portion 1 as change in height in the thickness direction.

In the base portion 1 on the end face side having the threaded hole 1s, on the other hand, there are formed the fin-shaped protrusions 13 and the cavities 4 alternately and radially around the threaded hole 1s. Of these, the protrusions 13 prevents the common turn of the wall material retaining auxiliary tool P , and the cavities 4 reduce the quantity of resin used.

In the end face on the side having the retaining portions 2, there is formed around the outer circumference of the threaded hole 1m a ring-shaped groove 14 which has a hexagon nut 14a formed on the end portion of its open side. The portion of this hexagon nut 14a is employed when a fastening tool such

as a wrench is brought into engagement with that portion to fasten the threaded hole 1s on the opposite side on the spacer bolt. The boundary, at which the two threaded holes 1s and 1m abut against each other, 5 may be extended through, as in the shown embodiment, but may be exemplified by a partition. On the other hand, the threaded holes 1s and 1m may be formed in metal inserts so that these metal inserts may be buried in the base portion 1, as in the foregoing 10 other embodiments. When the metal inserts are buried, they may be retained by key ways or press-fitted so that they may not turn idly with respect to the base portion 1.

The aforementioned frame bank 12 may be 15 provided, as shown in Figs. 12 (A) and (B), with a number of filament portions 18 which are extended from its inner face into the inside space. These filament portions 18 exhibit a higher effect to anchor the mortar. The positions to provide the filament 20 portions 18 are not specifically limited so long as they are located on the inner face of the frame bank 12. As shown in Fig. 13, for example, the upper edge of the frame bank 12 may be stepped to mount the filament portions 18 on the lower step. On the other 25 hand, the filament portions 18 may have an equal

length to or different lengths from each other. The filament portions 18 may be arrayed regularly or randomly. The filament portions 18 are preferably made to have a thickness of 0.05 to 5.0 mm and a
5 length of 2mm or more and equal to or less than the internal diameter of the frame bank 12.

How to use the wall material retaining auxiliary tool P of the connector type of Fig. 10 or Fig. 12 may be identical to that of the case described with
10 reference to Fig. 9 as to the subsequent steps other than the step of assembling the auxiliary tool P as the connector with the molding frame and at the step of setting the same, as shown in Fig. 14.

Specifically, when the aforementioned wall
15 material retaining auxiliary tool P is assembled as the connector, the molding frame 24 is pushed to the wall material retaining auxiliary tool P by means of the nut 29, as shown in Fig. 14, by connecting the spacer bolt 21 to the threaded hole 1s of the wall
20 material retaining auxiliary tool P and by connecting the frame fastening bolt 26 to the threaded hole 1m on the outer side. By this pushing action, the frame bank 12 is pushed while bending and deforming the shape-variable joint 16 until it comes at its lower
25 end into abutment against the receiving face 15. In

this pushing procedure, the shape-variable joint 16 is bent and turned to be clamped between the frame bank 12 and the base portion 1 until it is clamped in a wedge shape between the inner circumference of the frame bank 12 and the outer circumference of the base portion 1 thereby to fix the frame bank 12. The fastening pressure when the molding frame 24 thus pushes the frame bank 12 is about 200 Kg/cm^2 (or 19.6 MPa) or more and is borne by the frame bank 12 to prevent the retaining portions 2 from being crushed.

Fig. 15 shows still another embodiment of the wall material retaining auxiliary tool P of the connector type. This wall material retaining auxiliary tool P is constructed such that its retaining portions 2 may be molded separately of the base portion 1 and made removable from the base portion 1. For this removable construction, the numerous retaining portions 2 are molded integrally with the surface of a support plate 31, and an external thread 32 is so integrally formed at the center portion of the back side of the support plate 31 as to be fastened in the threaded hole 1m on the side of the base portion 1.

In the case of the wall material retaining auxiliary tool of the connector type having the base

portion 1 and the retaining portions 2 molded integrally, the retaining portions 2 have to be as high as or lower than the upper end of the frame bank 12 so that they may be protected against the pressure from the molding frame or the entrance of the freshly mixed concrete. Accordingly, the retaining strength to the mortar cannot help but being lower, and there arises a disadvantage that the number of spacer bolts has to be increased for enhancing the retaining strength.

According to the mode of Fig. 15, however, the assembly of the molding frame employs only the base portion 1 as the connector, and the retaining portions 2 can be mounted after the molding frame was removed after the placement of the freshly mixed concrete. Therefore, the retaining portions 2 can be made higher than the upper end of the frame bank 12, as indicated by chain lines in Fig. 15, to enhance the retaining strength to the mortar.

In the wall material retaining auxiliary tool of the mode of Fig. 15, on the other hand, a net-shaped sheet 33 can be used together as the retaining auxiliary member, as shown in Fig. 16. This net-shaped sheet 33 is so clamped between the base portion 1 and the support plate 32 of the retaining portions 2

as to extend along the surface of the body concrete 20
to the outside of the wall material retaining
auxiliary tool P. This net-shaped sheet 33 can
strengthen the mortar peeling preventing action in the
5 portion where the wall material retaining auxiliary
tool P is not mounted, thereby to suppress the growth
of the cracking, if any, in the mortar outer wall.

The common use of the net-shaped sheet 33 can
also be adopted in the aforementioned wall material
10 retaining auxiliary tool of the connector type in
which the base portion 1 and the retaining portions 2
are integrally molded. As exemplified in Fig. 17,
more specifically, a bolt 34 is fastened in the
threaded hole 1m so that the net-shaped sheet 33 may
15 be clamped between the head of the bolt 34 and the
surface of the base portion 1. The method of fixing
the net-shaped sheet 33 may be effected not only by
utilizing the bolt, as described above, but also by
adhering it with an adhesive or by fusing it with
20 heating means or ultrasonic waves.

The retaining auxiliary member should not be
limited in its mode or manufacturing method but may be
exemplified by a raschel- or tricot-knitted fabric of
synthetic resin fibers, a net-shaped sheet extruded
25 directly from a synthetic resin, or a porous resin

film. The net may be a polygonal shape having three, four or five angles, a hexagonal shape, a diamond shape an elliptical shape etc.

When the net-shaped sheet is used, the size of the net is preferably larger than the diameter of the fixing bolt and smaller than the bolt head. The size of the net may cover the net-shaped sheet as a whole or may fix the bolt. Specifically, the largest distance is desired to range within 8 to 15 mm.

On the other hand, the size of the net-shaped sheet may be set within the range of 5 to 60 cm, preferably within the range of 15 to 30 cm in the length of its largest side. If the maximum side is shorter than 5 cm, the effect to retain the mortar is hard to exhibit sufficient. The upper limit is determined to 60 cm, which is usually taken by the mounting pitch of the spacer bolts. This is because if the net-shaped sheets overlaps at their end portions, the charge is insufficient in the mortar at the overlapping portions. Where the net-shaped sheets are used together one by one for each wall material retaining auxiliary tool, however, the above-specified sizes are advisable. These sizes are not limitative where there is attached the net-shaped sheet of a wide area crossing the wall material retaining auxiliary

tools at a plurality of portions.

The resin for forming the retaining auxiliary member is preferably exemplified by nylon, polyvinyl alcohol, polypropylene or aramid. Especially, the
5 nylon 6 or the polyvinyl alcohol is preferable because it is excellent in resistance to alkaline mortar and in adhesion to the mortar.

Figs. 18 (A) and (B) show a wall material retaining auxiliary tool according to still another
10 embodiment. The foregoing embodiments are all applied mainly to a newly built concrete structure, but the embodiment of Fig. 18 is employed when mortar is applied to the outer wall of an existing concrete structure.

15 As shown, the wall material retaining auxiliary tool P is so integrally injection-molded that the numerous looped retaining portions 2 are projected in columns on one side surface of the disc-shaped base portion 1 made of a reinforced resin with fibers or
20 fillers. Naturally, the base portion 1 need not be essentially made of the reinforced resin but may be made of an unreinforced region having no fibers or filler as in the retaining portions 2. The base portion 1 is provided not only with the grooves 11 for
25 enhancing the mortar retaining strength together with

the retaining portions 2 and at its central portion but also with the insertion hole 34 for inserting the fixing member such as an anchor pin. This wall material retaining auxiliary tool P may also be
5 provided with the retaining portions 2 and the grooves 11 on the back face side of the base portion 1, as in the mode exemplified in Fig. 19.

The aforementioned wall material retaining auxiliary tool P is employed, as shown in Figs. 20 (A) and (B), for applying mortar, when the outer wall of
10 the existing concrete structure is to be repaired, to the old outer wall without removing it.

The existing concrete structure is constructed, as shown, by applying mortar 23' to the surface of the
15 body concrete 20. For this old wall remedy, the back face side of the base portion 1 of the wall material retaining auxiliary tool P of Fig. 18 is brought at first into abutment against the outer wall of the old mortar 23', as shown in Fig. 20 (A), and an anchor pin
20 35 is inserted into the central insertion hole 34 and is driving in the arrow direction by a hammer or the like.

The anchor pin 35 to be employed may be well known such that a pin body is formed into a
25 cylindrical shape having a head 35a with a flanged

portion and a sharp leading end portion 35b, and such that an axially movable core portion 23c is inserted into the leading end portion 35b. This anchor pin 35 is driven at its head 35a to bring the head 35a into
5 contact with the upper face of the base portion 1 of the wall material retaining auxiliary tool P. Next, a rod-shaped jig is inserted into the anchor pin 35 to drive only the internal core portion 35c. Then, the leading end portion 35b is bifurcated and locked, as
10 shown in Fig. 20 (B), so that the wall material retaining auxiliary tool P is fixed on the outer wall surface.

As the unhardened mortar 23 is applied to the surface of the mortar 23' thus fixing the wall
15 material retaining auxiliary tool P, the retaining portions 2 of the wall material retaining auxiliary tool P go deeply into the mortar 23 so that they are firmly held after the mortar 23 hardens. On the other hand, the mortar retaining strength of the wall
20 material retaining auxiliary tool P is independent for each of the individual wall material retaining auxiliary tools P so that it does not influence the retaining strength of another wall material retaining auxiliary tool P. Therefore, the wall material
25 retaining auxiliary tool P may be mounted on the outer

wall face without considering any mutual displacement. Therefore, no special skill is required to make the applying works easy.

Where the base portion 1 is made of the
5 reinforced resin whereas the retaining portions 2 are made of the unreinforced resin, as in the mode of Figs. 18 (A) and (B), on the other hand, the mortar retaining strength and the supporting strength can be better improved to augment the mortar peeling
10 preventing effect more, because the base portion 1 has a high strength and a high modulus of elasticity (or rigidity) whereas the retaining portions 2 are sticky and have a high toughness.

The outer wall of the existing concrete
15 structure may also be repaired by the aforementioned wall material retaining auxiliary tool, as shown in Fig. 21.

According to the method shown in Fig. 21, the mortar 23 is applied as in Fig. 20 by forming a recess
20 36 having a depth corresponding to the thickness of the base portion 1 in advance in the outer wall of the old mortar 23', and by fitting the base portion 1 of the wall material retaining auxiliary tool P in that recess 36. According to this repairing method, the
25 height of the wall material retaining auxiliary tool P

to protrude from the surface of the outer wall can be lowered to thin the mortar 23.

In the aforementioned mortar repair of the outer wall of the existing concrete structure, the
5 distribution (or density) of the wall material retaining auxiliary tools P to be attached may be set according to the situation of the face to be worked but may preferably be 4 or more per 1 m². On the other hand, the anchor pin to be used for fixing the
10 wall material retaining auxiliary tool P on the wall face may be exemplified by not only those of the aforementioned working examples but also nails or screws. These nails or screws may preferably be made of stainless steel having excellent corrosion
15 resistance.

The wall material retaining auxiliary tool of the present invention is constructed the base portion and the retaining portions as its basic components, as described hereinbefore. Wherever the wall material
20 retaining auxiliary tool might utilize the corn recess of the connector, might act as the connector or might be fixed with the anchor pin, the retaining portions may preferably have the loop shape, to which they should not always be limited.

25 In the case of the connector type, for example,

the retaining portions may have either a hook shape, as shown in Figs. 22 (A), (B), (C) and (D), or a rod shape, as shown in Fig. 22 (E). Of the former hook shapes: Fig. 22 (A) shows arcuate hooks; Fig. 22 (B) 5 shows L-shaped hooks; Fig. 22 (C) shows T-shaped hooks; and Fig. 22 (D) shows mushroom hooks or spherical hooks.

On the other hand, these retaining portions 2 may be arrayed not only in parallel but also radially, 10 as shown in Fig. 23, for any mode of the wall material retaining auxiliary tools. In the case of the connector type, the retaining portions 2 may be protruded from the inner circumference of the frame bank 12, as shown in Figs. 24 (A) and (B).

15 The material to be employed for molding the wall material retaining auxiliary tool of the present invention can be exemplified by a resin or a metal such as stainless steel. As the resin, there can be used a thermoplastic resin or a thermoset resin, but 20 there is preferably used the thermoplastic resin which can be easily injection-molded.

The thermoplastic resin can be exemplified by nylon, polyphenyl sulfide (PPS), polyester, polyethylene, polypropylene, polystyrene, high-impact 25 polystyrene (HIPS), an ABS resin, modified

polyphenylene oxide (modified PPO), a polyamide elastomer (e.g., "Pebax" of Toray Industries, Inc.), or a polyester elastomer (e.g., "Hytrel" of Du Pont-Toray Co., Ltd.) Of these, the PPS resin or the nylon resin which is excellent in alkali resistance and heat resistance is especially preferred, because the concrete is alkaline.

On the other hand, these resins may be exemplified by a fiber-reinforced resin which is mixed with reinforcing short fibers such as glass fibers or carbon fibers. This fiber-reinforced resin can improve the adhesion of the mortar and the peeling preventing performance better.

The retention of one wall material retaining auxiliary tool of the present invention for the wet type wall material such as the mortar is preferably designed to 500 N or more, although depending upon the number of spacer bolts to be employed per unit area. In order to satisfy these characteristics, the retaining portions in the loop shape are preferred to have a loop thickness (or diameter) of 0.05 to 5.0 mm and a loop diameter of 1.0 to 10 mm. In the case of the hook shape or the rod shape, on the other hand, it is preferable that the thickness (or diameter) is 0.05 to 5.0 mm. On the other hand, the height is preferred

to range within 2 to 10 mm.

On the other hand, the number of retaining portions to be provided for one wall material retaining auxiliary tool is preferably 20 to 100 in
5 the case of the fiber-unreinforced resin but 5 to 70 in the case of the fiber-reinforced resin.

INDUSTRIAL APPLICABILITY

The wall material retaining auxiliary tool can
10 be utilized either for works to apply a wet type wall material (e.g., mortar) to the outer wall of a concrete structure to be newly constructed, or for works to repair the outer wall of the existing concrete structure by applying the wet type wall
15 material (e.g., mortar), so that the wet type wall material may be applied without any peeling.

CLAIMS

1. A wall material retaining auxiliary tool molded of a resin to include: a base portion to be buried in a cone recess formed in the surface of a body concrete; and retaining portions to engage with a wet type wall material to be applied to said body concrete surface, so that a cavity may be formed in said base portion.

2. A wall material retaining auxiliary tool as set forth in Claim 1, wherein a seal ring is mounted on the outer side face of said base portion.

3. A wall material retaining auxiliary tool molded to include: a base portion to be fixed by a spacer bolt arranged in a molding frame and to be connected to a molding frame fastening bolt; retaining portions to engage with a wet type wall material; and a frame bank extending along the outer circumferential edge of said base portion for enclosing said retaining portions on the inner side and made higher than said retaining portions.

4. A wall material retaining auxiliary tool as set forth in Claim 3, wherein a shape-variable joint interposed between the outer circumferential edge portion of said base portion and said frame bank.

5. A wall material retaining auxiliary tool as set forth in Claim 3 or 4, wherein a multiplicity of filament portions disposed on the inner side of said frame bank.

6. A wall material retaining auxiliary tool as set forth in Claim 3, 4 or 5, wherein said retaining portions are molded separately of said base portion so that they may be removable with respect to said base portion.

7. A wall material retaining auxiliary tool as set forth in any of the preceding claims, wherein a net-shaped sheet larger than the end portion area of said base portion is attached to the outer side of said retaining portions.

8. A wall material retaining auxiliary tool as set forth in any of the preceding claims, wherein said retaining portions are formed into a loop shape, a hook shape or a rod shape.

9. A wall material retaining auxiliary tool as set forth in any of the preceding claims, wherein said resin is nylon or polyphenylene sulfide.

10. A method of manufacturing a wall material retaining auxiliary tool as set forth in any of the preceding claims, characterized in that it is molded of an injection-molding method using a resin.

11. A method of constructing a concrete structure characterized: by employing a wall material retaining auxiliary tool as set forth in any of Claims 1, 2, 7, 8 and 9; by burying the base portion of said wall material retaining auxiliary tool in a cone recess formed in the surface of a body concrete; and then by applying a wet type wall material to cover the surface of said body concrete and said wall material retaining auxiliary tool.

12.. A method of constructing a concrete structure characterized: by fixing a wall material retaining auxiliary tool, as including retaining portions formed on a molding frame side end of a base portion and a frame bank higher than said retaining portions, to a spacer bolt arranged in a molding frame; by placing a freshly mixed concrete in said molding frame to harden the concrete into a body concrete; next by parting said molding frame; and then by applying a wet type wall material to cover the

surface of the body concrete and the wall material retaining auxiliary tool.

13 . A method of constructing a concrete structure characterized: by fixing a wall material retaining auxiliary tool, as including a frame bank formed on the molding frame side end of a base portion, to a spacer bolt arranged in a molding frame; by placing a freshly mixed concrete in said molding frame to harden the concrete into a body concrete; next by parting said molding frame; by fixing retaining portions formed separately of the base portion, to a level higher than the frame bank, to the base portion; and next by applying a wet type wall material to cover the surface of the body concrete and the wall material retaining auxiliary tool.

14 . A method of constructing a concrete structure characterized: by fixing a wall material retaining auxiliary tool including retaining portions and a flat base portion to a body concrete by anchor means so that the base portion may be directed to the side of the body concrete; and next by applying a wet type wall material to cover the surface of the body concrete and the wall material retaining auxiliary tool.

15 . A method of constructing a concrete

structure characterized: by fixing a wall material retaining auxiliary tool, as including retaining portions formed on a molding frame side end of a base portion and a frame bank higher than said retaining portions, to a spacer bolt arranged in a molding frame; by placing a freshly mixed concrete in said molding frame to harden the concrete into a body concrete; next by parting said molding frame; after by fixing a retaining auxiliary member to the wall material retaining auxiliary tool; and by applying a wet type wall material to cover the surface of the body concrete and the wall material retaining auxiliary tool.

16. A concrete structure constructed by a manufacture method as set forth in any of Claims 11 to 15.

ABSTRACT

A wall material retaining auxiliary tool to be employed, when a wet type wall material (such as
5 mortar) is applied to the wall face of a concrete structure, as means for preventing the wall material from peeling off. A base portion (1) to be buried in a body concrete (20) and retaining portions (2) for retaining the wet type wall material (23) on the
10 surface of the base portion (1) are integrally molded of a resin.